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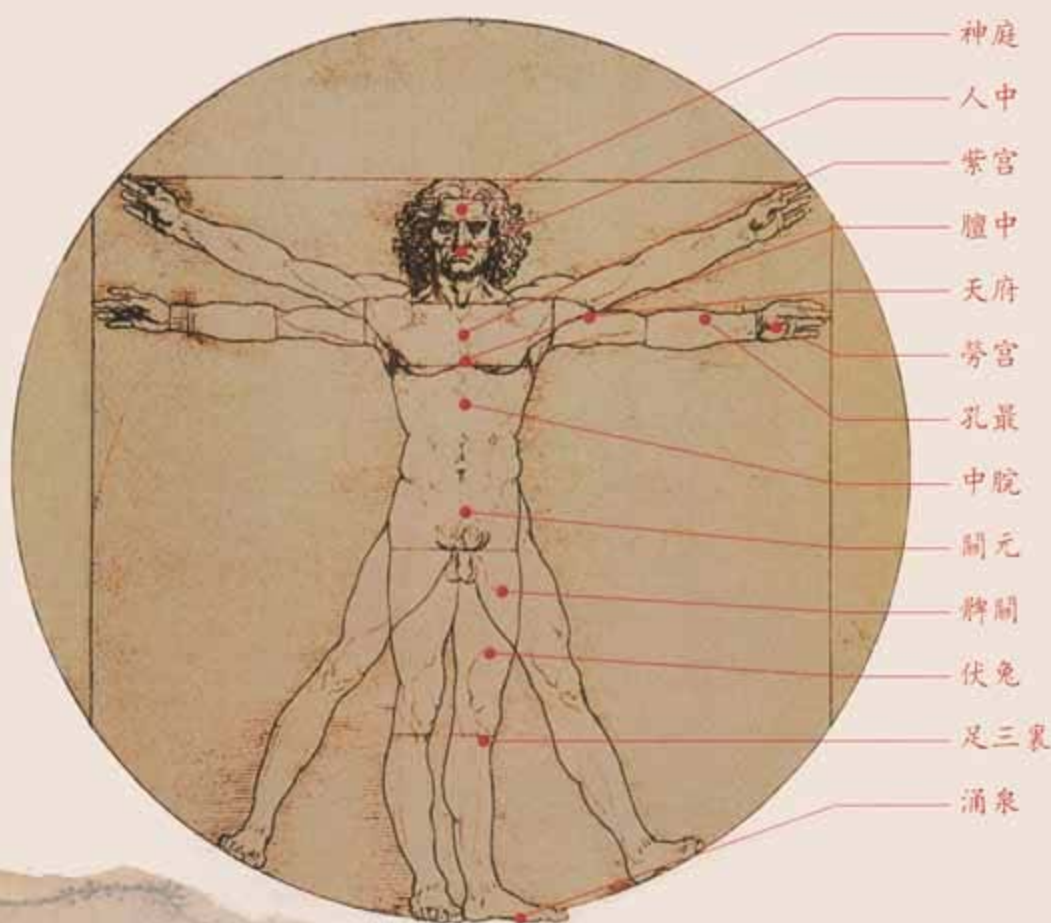
Medical Acupuncture

— A Systems Approach

Guan-Yuan Jin

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Contemporary Medical Acupuncture

— A Systems Approach

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Higher Education Press

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Dedication

To our teachers and colleagues who have devoted themselves to clinical and laboratory studies of acupuncture as well as greatly contributed to the contemporary development of acupuncture theories and techniques, and to our loved ones, Songshou Jin and Ruiwen Mao, Dequan Xiang and Guangyu Geng, Jin Zheng and Bonnie X. Jin.

About the Authors



Guan-Yuan Jin, MD, L.Ac., is one of world's forefront medical acupuncturists besides a physiologist and chronobiologist. With a rich clinical and research experience of over 40 years in both Chinese medicine and Western medicine, he has authored 18 academic/professional books, including representative works of *Clinical Reflexology of Acupuncture and Moxibustion*, *Self-Healing with Chinese Medicine*, *Acupuncture and Cybernetics*, *Whole Body Reflex Zones*, *Contemporary Chronomedicine*, and *Biological Clock and Health*. In the late 1960s, Dr. Jin began to study and practice acupuncture and TCM by completing an apprenticeship under Master Jiao, Mianzhai as well as Profs Zheng, Kuishan, Wei, Jia, etc. In 1982, he graduated from Zhejiang Medical University, China, where he later taught Physiology and engaged in numerous researches on acupuncture. After coming to US in the late 1980s, Dr. Jin completed post-doctoral fellowship at Medical College of Wisconsin and became one of 'grandfather' acupuncturists and Chinese herbologists certified by NCCAOM (National Certification Commission for Acupuncture and Oriental Medicine), USA. At his private practice (www.AceAcupuncture.com), Dr. Jin specializes in treating intractable cases with acupuncture, Chinese herbs, and *Qigong* therapy, striving for "Highest Successes with Least Sessions." Dr. Jin is currently an Honorary Professor at Guangzhou University of TCM, China. As the president of International Institute of Holistic Medicine, Dr. Jin is a strong advocate in raising public awareness of TCM through lectures at local communities as well as national and international conferences. From 1993–2005, he served as an Acupuncture Advisor for the State of Wisconsin, and under his efforts, the Governor of Wisconsin, and Mayors of Milwaukee and Brookfield proclaimed "Acupuncture and Oriental Medicine Day" and "World *Tai Chi* and *Qigong* Day", respectively.



Jia-Jia X. Jin, OMD, L.Ac., is a NCCAOM board certified and Wisconsin licensed acupuncturist, Chinese herbologist, as well as *Qigong* instructor. She has been working in the medical field for over three decades. Since coming to USA in 1990, she and her husband Dr. Jin co-founded Ace Acupuncture Clinic of Milwaukee, one of the most reputable TCM clinics in the Midwest. Jia-Jia specializes in caring for the pediatric, female, and elderly patients with gentle needling techniques or acupressure. Jia-Jia was a co-author of *Clinical Reflexology of Acupuncture and Moxibustion*, *Self-Healing with Chinese Medicine*, *Contemporary Chronomedicine*, and *Whole Body Reflex Zones*, as well as an instructor in a series of Dr. Jin's self-healing classes.



Louis L. Jin, MS, BS., has a unique background of both Information Technology and Chinese Medicine. He holds a Master's degree in Computer Science and Software Engineering, and has completed a four-year apprenticeship in Acupuncture and Chinese Medicine under the tutelage of his father Dr. Jin. Louis has been dedicating his efforts at advancing the modernization of classical diagnostic and therapeutic means in the field of TCM, such as developing computerized technologies of tongue and pulse diagnoses, as well as investigating scientific bases of *Qigong* therapy. Louis was a co-author of *Whole Body Reflex Zones*, *Clinical Reflexology of Acupuncture and Moxibustion*, and *Self-Healing with Chinese Medicine*, as well as an instructor in a series of Dr. Jin's self-healing classes.

Pre-publication
**REVIEWS
COMMENTARIES
EVALUATIONS**

"To create a textbook of acupuncture that includes both classic and modern theories and therapy is a formidable task. The authors can rightly lay claim to the premier position held by this textbook as the most authoritative and current source of information about acupuncture, the meridian, and the whole body reflex zones, a unique term originally coined by the authors. As a respected resource, it has covered the key concepts and topics that acupuncture practitioners and students will experience in their studies and working environment. The beginning part introduces readers to the current challenges and modernization of acupuncture therapy and its scientific bases, as well as acquaint with the concepts of meridians, the whole body reflex zones, and reflexotherapy. The later part explains the systemic or cybernetic method including the black box theory and its applications in guiding clinical acupuncture and raising curative effects, as there may be an uncertain outcome. The last part describes the indications of acupuncture, their treatment, and rehabilitation. Advanced students will learn how to choose acupoints and use appropriate techniques to attain optimal acupuncture effects. Acceptance of acupuncture as both an art and a science helps to create an integrating link between oriental medicine, contemporary medicine, and the principles of holistic care, thus fostering the well-being, the care, and the cure of patients worldwide."

Frances Talaska Fischbach, RN, BSN, MSN

Associate Professor of Nursing

University of Wisconsin-Milwaukee

Author of A Manual of Laboratory and Diagnostic Tests

“After reading the manuscript carefully, I can say it is truly going to be an outstanding book compared to its counterparts on acupuncture. It has abundant contents and data, a distinct theme, innovative theories, and simple but in-depth analyses. This book systemizes, summarizes, and develops the acupuncture therapy and its theoretical basis, the meridian theory from the perspective of contemporary acu-reflexology, making a great milestone toward modernizing classical acupuncture. Today, as the “acupuncture fever” continues to prevail worldwide, increasingly Western doctors are aspiring to learn and integrate acupuncture into the mainstream of contemporary medicine. The publication of this book will definitely provide them with an excellent reference. Moreover, realizing the standardization of acupuncture therapy is an essential component of propagating medical acupuncture internationally and making its prospective progress. The authors of this book have made a penetrating analysis about how to control the randomness of the acupuncture therapy and enhance its effectiveness and reproducibility. Thus, this book is a must-read for all acupuncture practitioners, medical professionals, and researchers in the field of acupuncture, as well as students of TCM. “

Xuemin Shi

Academician of China Academy of Engineering

Vice President of China Association of Acupuncture

Professor & Vice President of Tianjin University of TCM, China

“The birth of *Contemporary Medical Acupuncture* fully reflects the authors’ unique background and expertise. Dr. Jin possesses a profound knowledge of both Chinese medicine and Western medicine, and he has a rich clinical expertise of acupuncture practice for many years, including over two decades of practice in China and seventeen years of practice in the USA. These kinds of integration between Chinese medicine and Western medicine, scientific research and clinical expertise, plus his background on scientific methodology, make him a qualified authority with full capability of clarifying classical acupuncture systemically and scientifically through this book. Personally, I have a master-apprentice relationship with Dr. Jin, and I am grateful to see that he has finally completed this masterpiece for publication. This work is based on inheriting the meridian theory of Chinese medicine as well as citing numerous scientific references through many years of research. Its content is comprehensive and refreshing, and its recommended methods are simple and practical. No doubt, the publication of this authoritative book will promote the development of medical acupuncture, benefit our fellow acupuncture practitioners, enhance the effectiveness of acupuncture therapy, as well as have a profound influence on the academic exchange between Eastern and Western medicine. It will certainly be a useful reference for anyone engaged in academic study, scientific research, and clinic practice with acupuncture.”

Kuishan Zheng

Professor & Honorary Chair

Dept. of Acupuncture, Gansu College of TCM, China

Honorary President of Gansu Acupuncture Society

Forewords

Foreword by Li

Acupuncture, which originated in China more than 2 000 years ago, is the most commonly used alternative medical procedure worldwide. America's keen interest in this modality intensified in the 1970s. During this era, New York Times reporter James Reston wrote a pivotal story about how Chinese practitioners used needles to ease his postoperative pain. Since that time, physicians and their patients have generated more inquiries about acupuncture. A 2002 comprehensive survey indicated an estimated 8.2 million of USA adults had used acupuncture, according to study sponsor National Center for Comparative and Alternative Medicine (NCCAM), a component of National Institutes of Health (NIH). A similar national survey found that approximately one in 10 adults had received acupuncture at least one time with good results.

The potential for acupuncture is vast, as a 1997 NIH Consensus Statement on Acupuncture indicated. Documented results indicate that this procedure can reduce the side effects of cancer treatment and provide analgesia during surgical procedures. Patients with drug and nicotine addictions, stroke, asthma, and pain benefit from alternative therapy. In January 2005, a NIH-funded clinical trial at the University of Maryland, Center Integrative Medicine (UMCIM), showed that acupuncture could provide pain relief, while improving the function of patients with osteoarthritis of the knee. Acupuncture clearly serves as an effective complement to conventional care.

International academic and clinical studies, supplemented by the contributions of acupuncture practitioners and physicians, have generated greater acceptance of this treatment. For this reason, NCCAM and other NIH-affiliated research institutions continue to fund a variety of research projects on acupuncture. These

efforts have received attention, not only from NIH, but also from many public or private organizations. UMCIM received \$10 million federal grant in October 2005 to build two new centers to study complementary and alternative medicine (CAM), specifically acupuncture and Chinese herbal medicine for pain relief. The university is also forming an international collaboration with Chinese scientists to examine methods in treating bowel disorders.

Many medical schools nationwide are integrating acupuncture programs into their curricula. For example, the University of Pennsylvania (UPenn) has initiated collaborative undertakings with Tai Sophia Institute, a CAM school in Maryland, USA. Since that time, the primary focus of the UPenn program has been to teach medical students about holistic approaches. A number of other schools are initiating their own CAM programs or working with consultants to this end. Many faculty members and students in my school (Medical College of Wisconsin) are interested in incorporating CAM programs into their practice or curricula.

Despite the growing interest and demand for knowledge about acupuncture, there is a profound lack of availability of reference textbooks. Dr. Guan-Yuan Jin has stepped forward to meet this need by writing *Contemporary Medical Acupuncture*. Medical students and practitioners will find this book unique in that it introduces the principles of contemporary medicine as a means of understanding the mechanisms of an ancient therapy. It lends insight into its theoretical basis by summarizing and reviewing the advances regarding the meridians and specific mechanisms. Dr. Jin concludes that the former is simply a system of physiological and pathological reflexes in the body and that acupuncture is actually a type of reflexotherapy. By utilizing the systems theory, he outlines the entire acupuncture process and the specific factors that elicit acupuncture's therapeutic effectiveness. The book's emphasis on clinical applications is particularly valuable in that he provides case studies and the latest clinical trials in the West.

I believe that this book will significantly advance the clinical practice of acupuncture because its cutting-edge material will promote academic research in the area of acupuncture mechanisms. Because of Dr. Jin's work, and others like him, acupuncture will progress from an ancient healing art to a modern scientific therapy in the West, and across the globe.

Shi-Jiang Li, PhD

Professor of Biophysics

Medical College of Wisconsin, USA

Foreword by Ling

A late night in March, I finally flew home after a 30-hour trip from Argentina, and found a book entitled *Clinical Reflexology of Acupuncture and Moxibustion* by Prof. Jin and his colleagues delivered to my door. As I glanced through the first few pages, novel perspectives about acupuncture therapy and the meridian theory immediately caught my attention and I could not put it down until the wee hours of the next morning, almost forgetting my fatigue due to the long trip.

In this book, most theories and principles proposed by the authors are creative and convincing. Especially the viewpoint of realizing the impending leap of acupuncture from art to science through establishment and development of contemporary medical acupuncture is indeed relevant. I could identify with Prof. Jin as I had similar clinical experiences in the past. In early 1970s, I engaged in numerous studies of clinical acupuncture, especially of the auricular acupuncture, and experienced both its benefits and limitations. Since 1980s, in my medical practice as a neurosurgeon, acupuncture has also been extensively applied to rehabilitate patients with various cerebrovascular diseases. Currently, in my hospital, like most hospitals in China, acupuncture therapy has become a routine method of treatment in the fields of neurosurgery and neurology. However, we also met those challenges of classical acupuncture mentioned in the book by Prof. Jin. Thus, I believe that those acupuncture techniques with consistent or reproducible effects will definitely benefit patients.

This summer, it was my pleasure to meet Prof. Jin in person at Milwaukee, USA after attending an international conference in Hawaii. I was not only deeply impressed with his rich expertise in medicine, including acupuncture, but also awed by his expert knowledge in science, education, and methodology of the

systems theory or cybernetics. His book *Best Methods of Learning* published in 1986 was just another example in applying a systems approach in the field of education. Currently, he is dedicating his energy and enthusiasm to the study of integrative medicine, and together, we are exploring potential research collaborations.

In short, this book takes a systems approach to learning yet is comprehensive enough to teach the fundamentals as well as venturing into the advanced concepts of acupuncture. In my opinion, few today's acupuncture books are like this one that is written in such concise, modern, evidence-based, and scientific language. This book is suitable to all medical professionals, I highly recommend it as an advanced textbook or reference guide to surgeons, physicians, and other medical doctors interested in integrating acupuncture into their clinical practice and research.

Feng Ling, MD

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Honorary Chair, Asia-Australian Society of Interventional Neuroradiology

Foreword by Wei

In order to advance acupuncture and its theory, merely relying on the inheritance is no longer sufficient; and it is time to strive for innovation. As one of such innovations, the book *Contemporary Medical Acupuncture* has unique features and is still a gem among the existing boatload of books on acupuncture.

Never before have we seen a book like this one that applies the perspective of acu-reflexology to clarify the meridian phenomena, summarize the meridian theory, and guide the process of clinical acupuncture. The authors classified all acupoints of the 14 meridians, extraordinary and new points distributed on body surface into three main types of reflex zones: somatic, visceral and central, as well as proposed that acupuncture therapy is actually a type of reflexotherapy. The word *reflex* simply reveals the essence of meridians and the mechanism of acupuncture. During acupuncture therapy, no medication has been administered into the body, its therapeutic effectiveness are purely resulted from the reflex, whether through the viscera-body surface correlation or the body surface-body surface correlation. To propose the novel theory of acu-reflexology, Dr. Jin spent almost 40 years in actively researching and applying to clinical studies. Because he is one of my former pupils, his talent and creativity exhibited in the field of acupuncture have impressed me for many years. You might have realized that the theory of acu-reflexology is actually derived from the perspective of reflex point, while the notion of ancient *Ashi* point is the primitive description about the modern reflex point.

In the early 1960s, I began analyzing *Ashi* points including the relationship between their appearance and the illness course in one of my articles published

in the Journal of TCM. Later on, this article became the “media” that lead to my discovery of Dr. Jin, who wrote a letter to me after reading the article. Our karma in the field of acupuncture began ever since then. In his clinical practice, Dr. Jin has paid great attention to the study of *Ashi* or reflex points. In scores of published reports by Dr. Jin in 1970s, selecting reflex points, controlling the propagation of needling sensations and the arrival of *qi* at the diseased region were the primary factors for his successes. Accordingly, classical traveling courses of the meridians and locations of acupoints becomes a mapping-system on the body surface that could indicate reflex points or zones.

There are incisive discussions about the relationship of reflex points and acupoints in this book. Most acupoints are reflex points, tender spots, electro-permeable points with a low electrical resistance, or those sensitive to thermal stimulation. On the other hand, reflex points mostly possess the features of tenderness, low electrical resistance, or local hard nodules. Moreover, their locations are mostly in accordance with those of classical acupoints. Of course, this does not mean acupoints are just reflex points, as there is a large difference between them. Many reflex points are located completely out of traveling courses of the meridians. Therefore, the authors emphasized that point selection must not be tied up by the meridians. As we know, a classical TCM statement *better missing acupoints than the meridian* emphasized the importance of the meridians over acupoints during point selection process. In Dr. Jin’s book, however, a complementary statement *better missing the meridian than reflex points* to arose, namely, no matter where reflex points may appear on the meridians or not, they all can be selected for acupuncture.

I strongly support the above perspective about reflex points. Not only locations of reflex points have great individual differences in various patients or diseases, but also their sensitivities may vary with disease courses and treatments. I recently proposed the notion of dynamic points, namely, most acupoints possess dynamic characteristics. Perhaps this notion can be used in conjunction with acu-reflexology to clarify the relative specificity in actions of acupoints.

Jia Wei

*Professor of Acupuncture, Jiangxi College of TCM, China
Board Member of China Association of Acupuncture*

Foreword by Zhao

It is well known that science means reducibility, reproducibility, and predictability. In certain fields, various correlated phenomena could be reduced into a model or a theory; based on theory and its methodology, others should reproduce same expected results. Moreover, certain related but unclear mechanisms can be explained, and even unknown phenomena can be predicted. That is science. These criteria posed enormous challenges to the ancient theory and practice of classical acupuncture. Some phenomena related to acupuncture were reduced into *yin* and *yang* and the meridians theory, in which *qi*, a kind of energy stream, flows through the meridians that are composed of acupoints on the body surface. Under such theories, the reproducibility and predictability of acupuncture therapy are questionable. However, this book, *Contemporary Medical Acupuncture* is a breakthrough. The authors, Dr. Guan-Yuan Jin and his collaborators, have initiated and led this revolution.

First, based on the knowledge of modern science and contemporary medicine, combining their 40 years of clinical expertise and research accomplishments, the authors have proposed a new concept of whole body reflex zones to replace the meridians. This key concept has built a bridge between medical theories and practices in the West and East while creating a very natural connection between the ancient meridian system and contemporary recognition about physiological and pathological functions of the human body. Moreover, it inherited the rational but eliminated unscientific components of the meridian theory, and further paved a scientific platform for global discussion and exchange in the field of acupuncture.

Second, based on the systems and information theories as well as cybernetics,

the authors proposed a new approach or methodology to deal with the acupuncture process. Black box, not new in computer science or in engineering fields, is actually proper and innovative in dealing with the incredibly complex human body, as well as the coupling system between patients and doctors. Let us consider the following facts: the human body has not changed significantly in the past 40 000 to 50 000 years; our body consists of roughly 50 trillion cells, each cell has an order of 10^{13} components, many of which are proteins. In order to simulate the activity of a single protein, even using a computer of speed 10^{15} calculations per second, it would take several months. Black boxes always exist in our body no matter how deeply recognitions about the body are progressing.

Third, authors have explicitly pointed out indications, effectiveness, and the limitation of classical acupuncture. Indeed, in the ancient acupuncture therapy, there are many uncertainties coexisting with its scientific core, as well as some ambiguous terminologies, classical literature flavors, philosophic explanations, superstitions, or fictional stories. This book has “filtered” and “thrown away” all the “garbage” portions and given classical acupuncture a fresh, objective position in contemporary medical field.

I am proud of the authors’ contribution to the global community. They have applied an internationally acceptable and simple language to describe and express acupuncture theories and practice, which is indeed a very firm, important and significant step.

Shensheng Zhao, PhD

*Professor of Computer Science
Governors State University, IL, USA*

Preface

Acupuncture, as a kind of ancient external therapy, is a jewel of **traditional Chinese medicine (TCM)**. Spanning over several thousands years of history since the first usage of *bianzhen* (flint needle), it has made tremendous contributions toward preventing and treating diseases as well as promoting the well-being of the humankind. Even today, when contemporary medicine is highly developed, the unique functions of acupuncture therapy still stand irreplaceable by any other therapeutic means. The meridian theory is the basis of acupuncture therapy and is the collection of wisdom, experience, and results of research from generations of pioneering acupuncture practitioners. Ever since the beginning, when I first started to learn acupuncture nearly four decades ago, I have paid much attention to the inheritance of classical theories and techniques of acupuncture.

However, as I gained more experience through years of clinical acupuncture and scientific research, especially after I graduated from studies of Western medicine, my recognition about acupuncture has been evolved and deepened.

In current studies of the meridian theory and mechanisms of acupuncture, the greatest challenge is that there have not been any special structures of the meridians discovered that are unknown to anatomy. In addition, increasing extraordinary points or newer points found later are excluded from the meridian system, while most original acupoints have multiple functions that are complex and uncategorized. In fact, the therapeutic intervention of acupuncture is a non-specific physical stimulation compared with medications. Its curative effects can be markedly influenced by many factors, either individual differences of patients or therapeutic techniques of acupuncture practitioners. Thus, classical acupuncture therapy involves great uncertainty in its curative effects. In other words, various types of randomness during acupuncture restrict the

reproducibility of such effects.

Reproducibility is one of the most distinguishable characteristics of science. Obviously, given the current state of acupuncture therapy, to date, it shows a less proportions of science component (the certainty of effectiveness) than art component (the randomness of techniques). In order to integrate classical acupuncture into contemporary medicine, the key is to raise its certainty of effectiveness and to reduce its randomness of techniques, i.e., enlarge its proportions of science. Modern scientific knowledge and methodologies must be applied to examine this ancient therapy and to probe its rational core. Motivated by this, I have engaged in numerous clinical acupuncture trials and dove into many studies on the mechanisms of acupuncture as well as the essence of meridians, and set my life-long goal to develop the field of contemporary medical acupuncture.

Because contemporary medical acupuncture focuses on the latest, evidence-based achievements in experimental or clinical aspects of acupuncture, it has been widely accepted by many Western medical professionals. During the past few decades, there have been numerous scientific studies on the clarification of the essence of meridians and mechanisms of acupuncture as well as trials on the clinical applications of acupuncture. However, until now, the majority of these studies is rather scattered, localized, or limited in some aspects; often lack a central theme and a scientific methodology that allows full integration of these achievements. On the other hand, some research accomplishments, particularly from China, are overly academic, thus become limited in guiding clinical acupuncture, while high-quality clinical trials done in the West are almost completely dissociated from the meridian theory. Although there have already been several pioneering books published on medical acupuncture, the objective of this book is to instill a new vision into medical acupuncture from the systems level.

In the late 1970s, by studying the principles and methodology of systems theory or cybernetics, I began to realize that applying a systems approach to develop acupuncture and the meridian theory is a truly enlightened direction. Meanwhile, the perspectives of systems theory just began to be used to simplify and advance acupuncture in China. In 1976, along with my colleague Dr. Bao, Wenjun, we proposed a new theory, **information zone theory** to extract the essence of meridians. We also established a simplified model of the meridians and illustrated an atlas of whole body information zones for clinical applications. The traveling courses of meridians on the body surface composed of acupoints were considered a type of manifestation within information zones. Our book, entitled *Acupuncture and Cybernetics*^[1] published in 1978, has clarified the meridian system, mechanisms of acupuncture, and the process of the acupuncture therapy, and so on.

Through over three decades of clinical applications, the rationality of whole body information zones and their distribution rules have successfully passed the test of practice. In 1998, we further adopted the term **reflex zone**, which is recognized internationally, to replace the term **information zone**. In addition, we reproduced a full-colored atlas entitled **whole body reflex zones** ^[2]. In 2004, our latest book entitled *Clinical Reflexology of Acupuncture and Moxibustion* ^[3] was published in China. It applied the perspective of systems theory/cybernetics and contemporary physiology, established a novel theory of **acu-reflexology** to elucidate and simplify the meridian theory, and guided clinical treatments of intractable cases. Since its publication, we have received numerous enthusiastic reviews from our acupuncture peers and other medical professionals, which greatly inspired us to complete this book on time. This book is a continuation and advance of the above studies

Of course, since the mechanisms of acupuncture and the essence of meridians are very complicated, many viewpoints proposed in this book may not be fully developed, and some hypotheses may still need to be validated. However, we deeply believe that by conducting further studies under the guidance of modern science, the eventual integration of ancient acupuncture therapy and contemporary medicine will arrive shortly.

Synopses of the Units and Appendices

The pedagogical process of this book begins from the fundamental theories to the methodology of acupuncture, then to its clinical applications. It is organized into three main parts with three appendices.

Part One: Overviews of the current state and challenges of classical acupuncture and its theoretical basis—the meridian theory. Examines the anatomophysiological basis of the acupuncture therapy and extracts the essence of meridians. Proposes the novel theory of acu-reflexology and clarifies the formation of meridians and acupuncture mechanisms through a series of models and hypotheses. Introduces classifications and distribution rules of whole body reflex zones, as well as analyzes their relationships with the meridian system.

Part Two: Analyzes the coupling system of patient-acupuncturist and the entire therapeutic process. Discusses acupuncture techniques, including the collection of pathological information from the body surface, application of acupuncture intervention, timely adjustments of the treatment plan, as well as control of various influencing factors. Introduces the strategy to enhance clinical effectiveness and covers advanced needling techniques, including increasing stimulation amount, altering preexisting functional states of patients, point-associations, heat-or

cool-producing methods, and control of propagating needling sensations, and so on.

Part Three: Focuses on the treatment of common indications of acupuncture, especially applying theories or principles introduced in previous units for intractable cases. Presents up-to-date references on clinical trials of acupuncture and case studies from our clinical expertise of 40 years. Contains treatment strategies for each indication of acupuncture and their mechanisms, the handling of clinical scenarios, and predicted effectiveness.

Appendix A: Describes in detail and illustrates whole body reflex zones (visceral, somatic, and central zones) and their distribution territories, which are mapped by the meridian system and their main acupoints.

Appendix B: Lists all 361 classical acupoints and most-commonly used extraordinary points or new points, including their anatomic locations.

Appendix C: Provides a FAQ (Frequent Asked Questions) on the book.

Readership

By utilizing medical terminology and scientific methodology, this book can guide both the clinical practice and scientific research of acupuncture, and is ideal for both Western and Eastern medical professionals.

It is a practical, advanced, and valuable resource for acupuncture practitioners who seek to sharpen clinical skills. It can help them either repeat the past successful experiences or seek novel solutions for intractable cases.

It is an essential and comprehensive text for medical doctors, dentists, psychologists, chiropractors who are interested in integrating acupuncture into their clinical practice and research.

It may also serve as a suitable reference for medical students, TCM students, and other healthcare professionals such as nurses, physical or occupational therapists, massage therapists, and reflexologists who desire to learn more about acupuncture.

Correspondence

All books of this nature and magnitude will invariably contain errors of omission and commission. Any constructive comments, corrections, and suggestions about the book as well as any proposals for collaborative research are welcome.

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Acknowledgments

This book is only made possible by numerous scientific achievements of many internationally renowned acupuncture practitioners, physiologists, and clinical practitioners. Our personal contribution is only a very small part among them. Therefore, we salute those contributors who made substantial achievements in the development of theories and techniques of acupuncture, especially those authors of the references used in the book.

On behalf of the authors, I would also like to acknowledge experts who reviewed the manuscript and have provided forwards: Profs. Shi-Jiang Li, Xuemin Shi, Frances Talaska Fischbach, Feng Ling, Kuishan Zheng, Jia Wei, and Shensheng Zhao. Finally, our special thanks go to Ms. Mary Ann Brennell, RN, Ms. Trudy Munding, and Ms. Xin Yu for their dedicated efforts in editorial assistance of the manuscript.

Guan-Yuan Jin, MD, L.Ac.

Contents

PART ONE SCIENTIFIC BASES OF ACUPUNCTURE

CHAPTER 1	CHALLENGES IN ADVANCING CLASSICAL ACUPUNCTURE	3
1.1	THE CURRENT STATE OF ACUPUNCTURE THERAPY	3
1.2	METHODS OF STUDYING COMPLICATED SYSTEMS	5
1.3	MODERN EXPRESSION OF ANCIENT TERMINOLOGY	7
1.4	A SYSTEMIC VIEW OF MEDICAL ACUPUNCTURE	9
CHAPTER 2	REFLEX ARCS: BASIS OF ACUPUNCTURE	12
2.1	HOMEOSTASIS AND REFLEX	12
2.2	STIMULATION SIGNALS OF ACUPUNCTURE	15
2.3	TISSUE STRUCTURES AND SENSORY RECEPTORS OF ACUPOINTS	17
2.4	AFFERENT PATHWAYS OF NEEDLING SENSATIONS	24
2.5	STRETCH REFLEX AND REACTIONS AROUND NEEDLES	26
2.6	INPUT LOCATIONS OF ACUPUNCTURE STIMULATIONS	32
2.7	REFLEX CENTERS AND AUTONOMIC EFFERENT PATHS OF ACUPUNCTURE	35
2.8	LONG REFLEXES OF NERVE-HUMORAL REGULATION	37
2.9	THERAPEUTIC FUNCTIONS OF ACUPUNCTURE	39
2.10	ACUPUNCTURE ANESTHESIA	42
CHAPTER 3	REFLEX ZONES: ESSENCE OF THE MERIDIANS	44
3.1	CONTEMPORARY STUDIES OF THE MERIDIAN PHENOMENA	44
3.2	REFERRED PAIN AND VISCERA-BODY SURFACE CORRELATION	48
3.3	RADIATING PAIN AND BODY SURFACE-BODY SURFACE CORRELATION	52
3.4	REVOLUTIONIZE THE MERIDIAN THEORY	56
3.5	REFLEX ZONE: A SUBSTITUTABLE CONCEPT FOR THE MERIDIAN	59

3.6	FORMATION OF REFLEX ZONES OR THE MERIDIANS	62
3.7	CLASSIFICATION AND DISTRIBUTION RULES OF REFLEX ZONES	65
3.8	RELATIONSHIPS BETWEEN REFLEX ZONES AND THE MERIDIANS	74
3.9	LOCAL OVERLAPPING AND LAYERING OF REFLEX ZONES	77
3.10	RELATIONSHIPS BETWEEN MICRO AND MACRO REFLEX ZONES.....	80
3.11	A SIMPLIFIED MODEL OF REFLEX ZONES OR THE MERIDIANS	82
3.12	REFLEXOTHERAPY: THE ASCRIPTION OF ACUPUNCTURE	85
CHAPTER 4 MECHANISMS OF ACUPUNCTURE FUNCTIONS		88
4.1	RELATIVE SPECIFICITY IN ACTIONS OF ACUPOINTS	88
4.2	MECHANISMS OF REGULATORY FUNCTIONS OF ACUPUNCTURE	93
4.3	MECHANISMS OF ACUPUNCTURE ANALGESIA	96
4.4	MECHANISMS OF ACUPUNCTURE REHABILITATION	108
CHAPTER 5 MECHANISMS OF PROPAGATION OF NEEDLING SENSATIONS		112
5.1	CLASSIFICATION OF PROPAGATION OF NEEDLING SENSATIONS	112
5.2	PROPAGATION OF EXCITATION INSIDE NERVOUS CENTERS	114
5.3	ACTIVATION OF PERIPHERAL FACTORS.....	119
5.4	HYPOTHESIS: PROPAGATION OF MUSCLE TENSION WAVES	121
5.5	HYPOTHESIS: TRANSMISSION AMONG SENSORY NERVE ENDINGS	125
5.6	HYPOTHESIS: THE RETRIEVAL OF SENSORY MEMORY	128
 PART TWO SYSTEMIC METHODOLOGY OF ACUPUNCTURE		
CHAPTER 6 BLACK BOX OF THE PATIENT		135
CHAPTER 7 GATHERING REFLEX INFORMATION FROM THE BODY SURFACE		138
7.1	SKIN TEMPERATURE	139
7.2	APPEARANCE AND TENSION OF LOCAL SOFT TISSUES	141
7.3	TENDER SPOTS	142
7.4	ELECTRICAL RESISTANCE OF THE SKIN	144
CHAPTER 8 INPUT OF INTERVENING INFORMATION OF ACUPUNCTURE.....		146
8.1	OPTIMAL STIMULATION LOCATIONS.....	146
8.2	TYPES OF STIMULATION	149
8.3	INTENSITY AND DURATION OF STIMULATION.....	152
8.4	STIMULATION FEATURES OF BASIC NEEDLING METHODS.....	155
8.5	PROPERTIES AND GENERATIONS OF NEEDLING SENSATIONS	157
8.6	SEPARATION OF EFFECTS AND NEEDLING SENSATIONS	162

8.7	TREATMENT COURSE AND INTERVALS BETWEEN SESSIONS	163
CHAPTER 9 FEEDBACK PRINCIPLE OF TREATMENT		166
9.1	THE ASSESSMENT OF ACUPUNCTURE EFFECTIVENESS.....	166
9.2	TIME MODELS OF THE EFFECTIVENESS	169
9.3	INDICATORS OF REVISING TREATMENT PLAN	171
9.4	SELF-CONTROL AND INSTANT RESPONSES	173
9.5	RAPIDLY REVISING TREATMENT PLAN	174
9.6	THE FLOW CHART OF ACUPUNCTURE THERAPY	175
CHAPTER 10 FACTORS INFLUENCING EFFECTIVENESS OF ACUPUNCTURE		179
10.1	THE SENSITIVITY OF THE BODY SURFACE	179
10.2	PROPER BODY POSTURES	182
10.3	PSYCHOLOGICAL FACTORS	186
10.4	MENTAL STATE OF THE PATIENT	187
10.5	THE FINGER STRENGTH OF THE PRACTITIONER	189
10.6	PAINLESS NEEDLE-INSERTION TECHNIQUES	190
10.7	THE SETTINGS OF THERAPEUTIC ENVIRONMENT	192
10.8	THE ORDER OF STIMULATION	193
10.9	THE AREA OF STIMULATION	196
10.10	THE SIZE OF NEEDLES	198
10.11	THE ANGLE, DEPTH AND DIRECTION OF NEEDLING	199
CHAPTER 11 STRATEGIES TO RAISE THERAPEUTIC EFFECTIVENESS.....		203
11.1	SELECTION OF TENDER SPOTS	203
11.2	MULTIPLE NEEDLES AT A SINGLE POINT	205
11.3	SINGLE NEEDLE THROUGH MULTIPLE POINTS.....	207
11.4	INTEGRATING WITH ELECTRICAL STIMULATION	210
11.5	TECHNIQUES OF HEAT-PENETRATING MOXIBUSTION	213
11.6	PROLONGING STIMULATION	215
11.7	POINT-ASSOCIATIONS THROUGH MULTIPLE PASSAGES.....	217
11.8	ALTER PREEXISTING FUNCTIONAL STATES OF THE PATIENT	223
11.9	MISCELLANEOUS NEEDLE-MANIPULATION TECHNIQUES	227
CHAPTER 12 ADVANCED NEEDLING TECHNIQUES		229
12.1	POINT-PROBING AND REPEATEDLY NEEDLE-THRUSTING METHODS	229
12.2	NEEDLE-MANIPULATIONS WITH BOTH HANDS	231
12.3	POINT-PROBING WITH ELECTROACUPUNCTURE	232
12.4	NERVE-STIMULATION TECHNIQUES.....	233

12.5	PULSATING RESPONSES AND PULSATING POINTS	235
12.6	BLOOD VESSEL STIMULATION TECHNIQUES	239
12.7	RESISTANCE-NEEDLING METHOD	241
12.8	HEAT/COOL-PRODUCING TECHNIQUES	243
12.9	CONTROL THE PROPAGATION OF NEEDLING SENSATIONS	245

PART THREE CLINICAL TRIALS AND CASE STUDIES

CHAPTER 13	DISORDERS OF THE MUSCULOSKELETAL SYSTEM	253
13.1	FROZEN SHOULDER/SHOULDER PAIN	253
13.2	CERVICAL SPONDYLOPATHY/CHRONIC NECK PAIN	256
13.3	STIFF NECK/WHIPLASH	259
13.4	LUMBAGO	262
13.5	HIP OSTEOARTHRITIS/GROIN PAIN	268
13.6	KNEE ARTHRITIS/KNEE PAIN	270
13.7	RHEUMATOID ARTHRITIS/ARTHRITIS OF SMALL JOINTS	274
13.8	FIBROMYALGIA	277
13.9	TENDONITIS/HEEL PAIN	279
13.10	TENNIS ELBOW/EPICONDYLITIS	281
13.11	CARPEL TUNNEL SYNDROME	284
13.12	TENOSYNOVITIS/TRIGGER FINGER/GANGLION	286
13.13	INJURED SOFT TISSUES OR SPRAINED ANKLE	289
13.14	SCIATICA	290
CHAPTER 14	DISORDERS OF THE NERVOUS SYSTEM	295
14.1	INTERCOSTAL NEURALGIA/CHEST PAIN	295
14.2	LATERAL FEMORAL CUTANEOUS NEURITIS	298
14.3	PERIPHERAL NEUROPATHY	299
14.4	REFLEX SYMPATHETIC DYSTROPHY	301
14.5	TRIGEMINAL NEURALGIA	304
14.6	BELL'S PALSY	307
14.7	FACIAL SPASM	310
14.8	HEADACHE	312
14.9	APOPLEXY/HEMIPLEGIA	316
14.10	TREMOR/PARKINSON'S DISEASE	324
14.11	MULTIPLE SCLEROSIS	327
14.12	ALZHEIMER'S DISEASE	329
14.13	EPILEPSY	330

CHAPTER 15	MENTAL DISORDERS	333
15.1	INSOMNIA	333
15.2	NEUROSIS/NERVOUSNESS/ANXIETY	336
15.3	HYSTERIA	339
15.4	DEPRESSION/SCHIZOPHRENIA/PSYCHIATRIC DISORDERS	340
CHAPTER 16	DISORDERS OF OPHTHALMOLOGY	344
16.1	MYOPIA / AMETROPIA	344
16.2	RETINOPATHY / OPTIC ATROPHY / GLAUCOMA	347
CHAPTER 17	DISORDERS OF OTORINOLARINGOLOGY	352
17.1	TINNITUS/NEUROSENSORY DEAFNESS	352
17.2	MENIERE'S DISEASE	354
17.3	RHINITIS/SINUSITIS	355
17.4	DYSPHONIA	357
CHAPTER 18	DENTAL DISORDERS	360
18.1	TOOTHACHE/DENTAL PAIN	360
18.2	DYSFUNCTION OF TEMPOROMANDIBULAR JOINT	362
CHAPTER 19	DISORDERS OF CIRCULATORY SYSTEM	364
19.1	HYPERTENSION	364
19.2	ANGINA PECTORIS/CORONARY ARTERY DISEASES	367
19.3	ARRHYTHMIAS	369
19.4	RAYNAUD'S SYNDROME	370
CHAPTER 20	DISORDERS OF RESPIRATORY SYSTEM	373
20.1	COMMON COLD/TONSILLITIS	373
20.2	ASTHMA/BRONCHITIS	374
CHAPTER 21	DISORDERS OF DIGESTIVE SYSTEM	378
21.1	NAUSEA/EMESIS/HICCUPS.....	378
21.2	GASTRITIS/PEPTIC ULCER/REFLUX ESOPHAGITIS	382
21.3	ULCERATIVE COLITIS/IRRITABLE BOWEL SYNDROME/CROHN'S DISEASE	384
21.4	CHOLELITHIASIS	386
21.5	HEPATITIS	388
CHAPTER 22	DISORDERS OF UROGENITAL SYSTEM	391
22.1	URINARY RETENTION	391

22.2	NOCTURNAL ENURESIS/NOCTURIA/BEDWETTING	392
22.3	URINARY INCONTINENCE	394
22.4	PROSTATITIS/PROSTATE CANCER	396
22.5	IMPOTENCE/PROSPERMIA	398
22.6	DYSMENORRHEA/ENDOMETRIOSIS	400
22.7	MENOPAUSE/HOT FLUSH	401
22.8	INFERTILITY	402
22.9	MALPOSITION OF THE FETUS	405
22.10	HYSTEROMYOMA	407
CHAPTER 23 DISORDERS OF THE SKIN		408
23.1	HERPES ZOSTER	408
23.2	URTICARIA/PRURITUS/NEURODERMATITIS/PSORIASIS	410
23.3	ACNE	413
CHAPTER 24 DISORDERS OF ENDOCRINE		415
24.1	OBESITY	415
24.2	DIABETES	419
24.3	THYROID DISEASES	420
CHAPTER 25 OTHER DISORDERS		424
25.1	SMOKING CESSATION	424
25.2	ALCOHOLISM	427
25.3	DRUG ADDICTION	429
25.4	HIV/AIDS	432
25.5	CANCERS	434
APPENDIX A THE ATLAS OF WHOLE BODY REFLEX ZONES		437
APPENDIX B INDEX OF ACUPOINTS AND EXTRAORDINARY POINTS		453
APPENDIX C FREQUENT ASKED QUESTIONS (FAQS)		477
REFERENCES		486
INDEX		521



Contemporary Medical Acupuncture

— A Systems Approach

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PART One

Scientific Bases of Acupuncture

Acupuncture, as an ancient Chinese external therapy through thin needles that are inserted into specific points, has been practiced prevalently throughout the world. Since the last half-century, there have been numerous scientific studies about acupuncture. The objective of this part is not to list every available achievement in those studies but to lay a foundation for establishing a novel and integrative link between classical acupuncture and contemporary medicine. Accordingly, the knowledge of physiology and perspectives of systems theory or cybernetics are applied to examine the scientific bases of acupuncture therapy and extract the essence of meridians. A series of models or hypotheses are proposed to clarify the complex mechanisms of acupuncture.

Challenges in Advancing Classical Acupuncture

By reviewing the current state of acupuncture therapy, there is a series of challenges in advancing classical acupuncture and its theoretical basis – **the meridian theory**. Modernization of acupuncture involves not only a scientific expression of its ancient terms, but also a revolution of its theoretical contents and methodology. The objective of this chapter is to introduce a systemic view of establishing contemporary medical acupuncture.

1.1 The Current State of Acupuncture Therapy

Due to the simplicity, practicality, safety, and ease of operation with no need for complex equipment, classical acupuncture therapy with thousands years of history has developed rapidly and extensively over time. Especially because of its wide array of indications and profound effectiveness, today, more and more countries are accepting this ancient therapy as the trend of back-to-nature continues. However, in retrospect, we can see the theoretical basis of classical acupuncture therapy (the meridian theory), and those embodied therapeutic techniques are indeed products of an ancient cultural environment. It

carries over many primitive terms, philosophy, and recognitions about the human body and the genesis of illness, which are now facing validations and challenges from modern science, especially contemporary medicine. The following are some of most obvious issues surrounding the current state of the acupuncture therapy.

The first is the randomness of point selection and association. Because many points can be used to treat a single kind of disease and there is an abundant pool of points to choose from, local, adjacent, or distant, sometimes a single point is chosen while other times multiple points can be chosen at once. However, to date, there is an obvious lack of scientific comparison in determining which point has the greatest effectiveness for a certain type of disease, or how many points can be used in combination to obtain the optimal results. Besides, for most points, a single point may be of many indications, thus it is difficult to distinguish between their specific and non-specific actions.

The second is the lack of gold standard in needle-manipulation or moxibustion techniques. After determining which points to be stimulated, one has to select which type of stimulation and manipulation technique to be used. Although general manipulations of needling or moxibustion are easy to comprehend, other advanced stimulative methods may

need to be cautiously handled. Take needling as an example, besides the selection of needles from various sizes and shapes, either manual acupuncture or EA (electroacupuncture) can be chosen, and different intensities of stimulation can be applied at different depths and angles at a single point. Even for manual acupuncture, its manipulation techniques include twisting, lifting-thrusting, vibrating, and other advanced techniques that are composed of various speed or strengths. During clinical trials of acupuncture, the selection of stimulation techniques completely relies on the individual expertise of the practitioner. Reviewing some recently published clinical trials or laboratory studies involving acupuncture, it is surprising to see many of them lacked detailed remarks about the needle-manipulation techniques used. In effect, non-standard manipulations often result in a reduced comparability in those reported effectiveness or mechanisms of acupuncture therapy.

The third is the uncertainty of therapeutic effectiveness. Because acupuncture effects are accomplished through stimulation on the body surface and through automatic regulation of body functions, many factors may influence the effects. For example, since everybody has individual body sensitivity to the external stimulation, even with the same type of stimulation at the same intensity, therapeutic information inputted into the body may still vary. The intervention of acupuncture is a non-specific stimulation compared with medications, whether it is mechanical (manual needling), electrical (electroacupuncture/EA), or thermal (moxibustion or infrared radiation). Moreover, acupuncture effects can be easily influenced by preexisting conditions of the patient such as the behavioral or psychological states. With the addition of above-mentioned randomness in selecting and associating points, the uncertainty of acupuncture

effectiveness looms even larger. A patient treated by several acupuncture practitioners or several patients suffering from the same disease treated by an acupuncture practitioner might produce completely different results. Sometimes, even for two separate onsets of the same disease in the same patient, all with the same acupuncture practitioner providing the same type of treatment, the results may still vary. On the contrary, there is a much greater certainty of effectiveness in Western medicine. For example, when a patient takes one kind of antibiotics for a certain bacterial infection, no matter which brand it is, usually similar results can be expected.

The fourth is the primitiveness of the basic theory. The primary theoretical basis of acupuncture therapy is the meridian theory. Though classical 14 meridians and their acupoint components describe connections of specific locations on the body surface or other portions of the body, *zangfu* (viscera or internal organs) in TCM does not exactly match the exact viscera specified in modern anatomy. In addition, the theoretical hypothesis of the correlations between different *zangfu* contains many concepts with stretched meanings, and the definitions of many TCM terms possess features of broadness and vagueness, such as *yin and yang*, **deficiency and excess**, **tonification and purgation**, *deqi* and so on. Therefore, most descriptions about acupuncture mechanisms or techniques using such ancient terms are only at a level of naive dialectical thoughts and are difficult to be integrated into contemporary medicine.

In summary, the basic theory of classical acupuncture is rather primitive with much randomness within its treatment protocol. The reproducibility of its effectiveness is comparatively lower than that of contemporary medicine. Because reproducibility is one of the most distinguishable characteristics of

science, in the current state of classical acupuncture therapy, the major component can be considered as an art. In order to integrate classical acupuncture into the mainstream of contemporary medicine, the key is to raise the certainty of acupuncture effectiveness (the science component) and to reduce the randomness of techniques (the art component) (Figure 1.1) ^[4]. The ideal state of acupuncture is that the major component is science while keeping the art component minor. Accordingly, it is critical for all clinical acupuncture practitioners and academic researchers to begin revolutionize the meridian theory and related acupuncture techniques. In recent years, however, certain importance about the art component in contemporary medicine has been addressed, which may refer to an individualized therapy. Such art component is prevailing in classical acupuncture, thus it should not be discarded.



Figure 1.1 Current and Ideal States of Acupuncture Therapy

1.2 Methods of Studying Complicated Systems

The general methodology applied in this book is in accordance with that of contemporary medicine, which is evidence-based, from either laboratory experiments or clinical trials of acupuncture. The perspective and methodology of systems theory is

the main tool used in this book to explore the essence of meridians, to form the scientific bases for medical acupuncture and eventually to fully integrate classical acupuncture therapy with contemporary medicine.

Today, as computers have become a necessity for everyday life, the term of cybernetics may be familiar to many. In fact, if there were no cybernetics, then there would not be any computers. The founder of the cybernetic theory, Norbert Wiener defined **cybernetics as the science of transmitting messages between man and machine, or from machine to machine** ^[5]. As a generalized controlling theory that can be used in any system, it has already played an important role in extensive fields like science, engineering, and medicine for dealing with complex problems.

Like a computer, the human body is a complicated automatic control system, made of multiple sub-systems. In studies of modern physiology, general principles of systems theory have already been extensively applied to analyze functions of the body, which has greatly deepened the recognition of various regulatory mechanisms. For example, these regulatory systems of the body can be viewed as closed-loop automatic control systems, which are realized through neural, humoral or self-regulations. In these systems, the controlling components are reflex centers or endocrine glands, and so on, while the controlled components are effectors, target organs or target cells. There are information transmissions of different types of signals (electrical, chemical, mechanical, and so on) between the controlling and the controlled components. The controlling delivers information to modify the state of the controlled, while the controlled delivers feedback information, including self-state or regulatory effects, to the controlling. With a continuous adjustment of the impact from the controlling on the controlled, the

body can maintain its various types of homeostasis as well as achieving normal somatic movements^[6].

Moreover, the automatic control system of the body also exchanges its internal information with stimuli of the external environment through sensory receptors or sensory organs on the body surface. The meridians or reflex zones are established from a lengthy period of evolution through communications between the internal and external environments. Either the meridian phenomena that may appear on the body surface or regulatory functions of acupuncture are all results of these communicative activities. Stimulation signals of acupuncture are types of artificial interventions that may influence the automatic control system of the body. Classical acupuncture therapy, which is based on the meridian system, inputs regulating and controlling information into the body by stimulation of certain points on the body surface and through preexisting **information pathways** at various portions of the body.

On the other hand, there is a coupling relationship between the acupuncture practitioner and the patient through diagnosis (collections of internal information about diseases) and treatment (external interventions to the body). This is another complicated system within the process of acupuncture therapy. As an external therapy, in either point selections or changes of needle-manipulation techniques, acupuncture has much randomness and requires a continuous adjustment of feedback depending on the individual responses of the body to stimulation. Moreover, the intervention information inputted by acupuncture is a non-specific stimulation to the body, which can only be converted to electrical impulses. The realization of acupuncture effects has to rely on the automatic regulatory functions of the body. Accordingly, acupuncture effectiveness may be influenced by many factors, either inside or outside of the body.

While researching such complex systems with

multiple layers, the scientific method presented by systems theory^[7] seems to be unique. It describes how to deal with relationship between internal sub-systems and between internal homeostasis and external stimuli as well as how to select strategies and solutions to control miscellaneous conditions to reach pre-set goals efficiently. There is no doubt that using a systemic methodology will be able to help control the entire process of acupuncture therapy, to overcome various randomness and to raise the certainty of effectiveness.

Since the 1970s, the meridian phenomenon was primarily studied using cybernetics and was categorized as a type of information exchange within the body. In 1976, we first proposed a simplified model of the meridian system, titled *information zones of body*^[1] which clarified in detail the essence of meridians, mechanisms of acupuncture regulatory functions, and the process of acupuncture therapy. Mechanisms of acupuncture analgesia and methods on how to deal with the three major difficulties (incompleteness of analgesia, hypermyotonia, and reactions due to stretched viscera) during acupuncture anesthesia were also explored. Through plenty of clinical applications, in 1998, we further polished our model and introduced the term **reflex zone**, which is now being increasingly recognized internationally, to replace the term **information zone**. At the same time, we illustrated a color chart titled **whole body reflex zones (WBRZ)**^[2]. Today, the newly developed **systems theory** is also being used to systematize, discover, and develop valuable inheritances of acupuncture, including the meridian phenomenon^[8]. This book, in essence, will venture into the best of both worlds. Not only will it represent a continuation of development and inheritance of ancient theories, but also referencing up-to-date advancements in modern scientific research about clinical acupuncture and its techniques.

In classical systems theory, methods of mathematics were often used to study the transmission, storage, and alteration of information during the controlling process, while less attention was paid to the biological meanings of that information. In this book, whenever the concept of systems theory is used, it mainly focuses on the general systemic analysis of acupuncture or the meridians and on establishing practicable models of biology or physics, with as little mathematics as possible. For example, the term **acupuncture information** is used in this book to represent various acupuncture signals with a certain stimulation amount or other characteristics of the sequence. These signals may be from different types of physical stimulation, such as manual acupuncture, thermal stimulation from moxibustion, electrical stimulation from EA, and so on. In addition, pathways of acupuncture information and their feedback circuits are used to represent tissue structures of components in reflex arcs and their biological characteristics. Actually, many contemporary studies in physiology are accomplished this way^[6]. In the field of acupuncture, application of the **systems methodology** is helpful not only in clarifying the essence of meridians and mechanisms of acupuncture, but also in guiding acupuncture therapy and increasing its certainty of clinical effectiveness.

1.3 Modern Expression of Ancient Terminology

Today, when the ancient acupuncture therapy has been increasingly popular globally, it is time to utilize scientific expression to explain ancient terminology of TCM. Indeed, throughout its history, the holistic perspectives and dialectic thinking of

TCM including its meridians theory continues to have a strong vitality, even until today. However, many of the ancient TCM terminology carry too much primitiveness and vague definitions, which are often hard to comprehend until translated to modern expressions. This drawback may even have already hindered the global development of TCM and its integration process with contemporary medicine.

In the field of acupuncture, an already accomplished task is the international standardization of nomenclatures for the 14 meridians, their 361 classical acupoints, as well as major extraordinary points. These standardized international codes are in English. For example, for the meridians, they are LU (lung meridian), HT (heart meridian), LI (large intestine meridian), SI (small intestine meridian), and so on. In addition, acupoints of each meridian are sorted in an ascending order using the numerical system. For example, 20 acupoints of LI meridian are named from 1~20, such as LI1 (Shangyang), LI4 (Hegu), LI5 (Yangxi), LI10 (Shousanli), LI11 (Quchi)^[9] (refer to Appendix B). These naming schemes simplified the task of memorizing acupoints for non-native Chinese acupuncture practitioners, and making it easy to identify the meridians and acupoints, thus easing the learning curve of acupuncture and further its popularity in the West. In this book, an **acupoint** is defined as one of 361 classical points in the 12 regular meridians plus the Governing Vessel (GV) and the Conception Vessel (CV). A **point** is defined as a unified name for any location that can be stimulated by acupuncture or other external therapies. **Points** may include acupoints, extraordinary points, reflex points, trigger points, and so on.

However, there are still some limitations after numerical codes were implemented. For example, in the ancient time, the 12 regular meridians are composed of three parts: the meridian-connecting

viscera, hands or feet, as well as the level of extent of *yin* or *yang* represented. Case and point, the Chinese name of gallbladder meridian (GB) of the foot (Shaoyang) not only represents its traveling routs on the foot connecting to the gallbladder or the chest and hypochondriac areas of the body, it also pertains to one of *yang* meridians, called lesser *yang*, which is between predominant *yang* (Taiyang) and beginning *yang* (Yangming). Obviously, with the invention of numerical codes, those creative meanings of the ancient Chinese names become encapsulated and cannot be derived immediately from the two-letter code (GB).

Besides, the Chinese names for many acupoints carry specific characteristics of their functions or regional morphology. When they are replaced by the codes, those additional characteristics are lost concurrently. For examples, when Shenmen (mind door) becomes HT7, no one could tell the point's primary function, which is to guard the mind. When Quchi (pool on bend) becomes LI11, the implication of "bend of the elbow" where the point is located is missed. Indeed, this is a serious concern. With the international standardization of the ancient TCM terminology, it is important to seek new solutions that preserve the creative essence of Chinese nomenclature for acupoints that might be completely lost due to oversimplification.

Due to the certainty of anatomical locations for the 14 meridians and the 361 classical acupoints, except for the above implications, a meridian or an acupoint also serves as a geographic marker on the body surface, which is like the longitude and latitude lines on the map. Actually, this was just the original meaning for the term **meridian** and it cannot represent the true scientific essence of the meridian. In the subsequent text, we suggest using the term **reflex zone**, which is internationally recognized and clearly defined, to replace the term **meridian** because

the essence of meridian phenomenon is actually reflex activities between different body parts. Similarly, the term acupoint, beside its localizing role, is inadequate in hinting its reflective connection with the diseased organ or tissues compared with the term **reflex point**, or even the term **trigger point**. On the reflex zone charts affixed in this book, the borders of various reflex zones are located by commonly known acupoints, and the meridian system and their acupoints are used to serve a reference for reflex zones. For your reference, all 361 classical acupoints and most frequently used extraordinary points and anatomical locations are listed on Appendix B.

In addition, there are many other ancient terms or phrases in TCM or in related classical acupuncture techniques, such as *deqi*, **propagation of needling sensation along the meridians (PNSAM)**, tonification-purgation needling techniques, heat-producing needling techniques, and cool-producing needling techniques. They all describe various phenomena related to acupuncture effects but have never been scientifically defined, neither their mechanisms nor physiological or physical characteristics. In this book, we try to explore the key factors of these advanced needle-manipulation techniques from the perspective of modern physiology or physics and to express them scientifically.

On the other hand, when analyzing the human control system and acupuncture therapy using methodology of systems theory, we also introduce certain modern scientific terms into this book, such as **information pathway**, **homeostasis**, **feedback**, **neural network**, **threshold**, and **black box**, which all have been clearly defined, frequently used, and can be easily comprehended.

In order to realize acupuncture's ultimate leap from art to science or to establish a contemporary medical acupuncture from the bases of classical

acupuncture theory and techniques, modern and scientific expression of ancient terminology is no doubt relevant and critical.

1.4 A Systemic View of Medical Acupuncture

Concerning the challenges in advancing classical acupuncture, either on its theoretic basis or techniques, a revolution in the field of acupuncture is required to establish a novel field called contemporary medical acupuncture, which may be defined as **the theory and practice of acupuncture directed by modern science** and categorized into two main aspects. First, to apply the knowledge of contemporary medicine and perspectives of scientific methodology to validate, simplify or refresh the meridian theory, as well as clarify primary efficacies of acupuncture. Second, to control the randomness throughout the entire process of acupuncture therapy, aimed to raise the reproducibility of its therapeutic effectiveness.

It should be noted that the term **acupuncture** appears frequently in this book also includes moxibustion. This term is used instead of **acupuncture and moxibustion** in a way similar to the term **acupuncturist** often used to depict practitioners of acupuncture and moxibustion in the West. In those circumstances using only needles for stimulation, the term **needling** or **puncturing** is typically adopted although some other terms such as **body acupuncture**, **auricular acupuncture**, and **scalp acupuncture** are still used to describe certain special needling techniques.

There are at least 10 components in contemporary medical acupuncture:

(1) Physiological and anatomical basis of classical

14 meridians and all of their acupoints, extraordinary points, or other new points.

(2) Formation process and the essence of meridian system.

(3) Clarifications and classifications of acupoint efficacies as well as distribution rules of acupoints or reflex points with similar functions.

(4) Reciprocal relationships between the body surface and the viscera, as well as relationships between different portions of the body.

(5) Main functions and mechanisms of acupuncture.

(6) Acupuncture indications and the standardization of their treatment methods.

(7) Analysis of the process of acupuncture therapy and controlling methods of its randomness.

(8) Collection of the pathological information before acupuncture and the subsequent differential diagnosis.

(9) Various factors affecting acupuncture effectiveness and strategies to raise curative effects of acupuncture.

(10) Other issues in the integration process between classical acupuncture and contemporary medicine.

Actually, since 1950s, studies on the contemporary medical acupuncture had begun in China. One of the most significant advances at the time was the application from a neural reflex perspective to explain acupuncture mechanisms^[10] under the influence of Pavlov's conditional reflex theory. For example, relief of toothache by puncturing Hegu (LI4) was thought to be due to a newly formed exciting focus replacing the original pain focus in the cerebral cortex. In addition, the propagation of needling sensations along the meridians (PNSAM) or other similar meridian phenomena were regarded as a type of neural exciting waves spread within the sensory area of cerebral cortex. However, due to the

limited knowledge of physiology and related medical studies at that time, there was only a rough understanding of acupuncture mechanisms, which was not helpful in guiding clinical acupuncture.

However, during the past 50 years, there has been a great deal of progress in both the knowledge of physiology as well as studies on the meridian essence and acupuncture techniques. The viewpoints of neural reflex are developed in synthesizing most evidence-based conclusions or hypotheses about acupuncture. Besides the fact that every component of reflex arcs has been fully explored, neural transmissions or chemical changes in nervous centers induced by acupuncture are becoming increasingly known. Different kinds of neural reflexes, with or without the involvement of humoral factors, as well as negative feedback mechanisms, are involved in the control of homeostasis in the body. In addition, substantial practice of acupuncture, especially clinical trials with a randomized control and double-blinded designs have further verified and broadened indications of acupuncture. Moreover, the perspective of systems theory has been applied to deal with the complex system of human body in modern physiology. In many recent articles, acupuncture therapy has been categorized as a kind of **reflexotherapy**. Since 2004, we have proposed a new theory called **acu-reflexology** to encompass almost all past and modern studies in the field of contemporary medical acupuncture. Acu-reflexology is best defined as the **theory and techniques of acupuncture directed by reflex theory**^[3], which is the core of contemporary medical acupuncture. Actually, acu-reflexology has covered almost all the above aspects of contemporary medical acupuncture.

However, note the large difference between acu-reflexology and classical reflexology though the former is derived from the latter. The term reflexology has been used to describe a zone therapy by

finger pressure techniques at the feet and hands for many years. Actually, it is one kind of massage therapy based on the premise that there are reciprocal reflexes on different parts of the body, such as certain reflex zones emerging on the feet and hands corresponded to other parts, glands, and organs of the body. The reason we coined a new term “acu-reflexology” from an integration of terms “reflexology” and “acupuncture” is that both acupuncture and reflexology have the same rational core: reflex. The theory and techniques of acupuncture can be considered as a generalized reflexology. Nevertheless, stimulation means of acupuncture does not only rely on finger pressure, and stimulation locations of acupuncture are not only limited to the feet and hands. Instead, acupuncture including needling and moxibustion can be applied on the entire body surface where the meridian system or **whole body reflex zones (WBRZ)** lodge. Thus, the contents of acu-reflexology are much broader and deeper than that of classical reflexology.

In the remaining Chapters of Part One, we will systemically introduce a series of summaries and discussions on the latest accomplishments of reflex circuits related to acupuncture, meridians, acu-reflexology, and their related main concepts and theories to reach a new level of depth and breadth in contemporary medical acupuncture. Although there may be other ways to reach the same goal, we believe that acu-reflexology applying the perspectives of systems theory and contemporary reflex theory is the optimal shortcut that can be used to explore the complex meridian system and guide various dynamic external interventions including acupuncture.

Actually, while there is more knowledge about the essence of meridians or the mechanisms of acupuncture, there is an increasing need to conduct a systemic consideration for both of them, similar to

the recent progress in the field of biology. Because a system of cell or organism is not just an assembly of genes and proteins, its properties cannot be fully understood merely by drawing diagrams of their interconnections. While an understanding of genes and proteins continues to be important, the focus is on the understanding on a system's structure and dynamics, rather than just the characteristics of

isolated parts of a cell or organism. Just few years ago, a novel subject called **systems biology** has been created and made a great impact on pharmaceutical industries and medical practices^[11].

Similarly, an understanding of ancient theories and techniques of acupuncture at the system level can propel the modernization of acupuncture sooner.

Reflex Arcs: Basis of Acupuncture

During the past few decades, there have been numerous experimental studies surrounding the mechanisms of acupuncture therapy, acupuncture anesthesia, and the essence of meridians by medical professionals, acupuncture practitioners, and scientists all over the world. Overwhelming evidences have shown that the basis of acupuncture is the reflex process. Acupuncture therapy is actually one kind of reflexotherapy through reflexes of the whole body, and the main functions of acupuncture therapy are regulatory actions, analgesia, and rehabilitation.

2.1 Homeostasis and Reflex

Homeostasis is defined as a relatively stable state of physical and chemical properties of internal environment of the body. This concept, proposed by W.B. Cannon, the “father of physiology”, describes a complex dynamic equilibrium maintained by various regulatory mechanisms of the body. An example of such is the one of the basic living conditions for organisms, the normal body temperature, which for human is always kept at or around 37°C. All the living activities of the organism are maintained and regulated in the process during

which homeostasis is repeatedly damaged and recovered. Today, the concept of homeostasis has been broadened and extended. It not only represents the dynamic equilibrium of physical and chemical properties of internal environment, but also can be applied for certain cell functions, biochemical reactions, or activities of an organ or a system, even the maintenance and regulation of a relative stable state in the entire organism ^[6, 11].

As human, we all live in a natural external environment. When the conditions of the environment changes, our internal systems of the body will react accordingly, including making certain somatic movements and visceral regulatory activities to maintain homeostasis. These systemic responses are achieved by three kinds of regulatory mechanisms in the body: neuroregulation, humoral regulation, and autoregulation of organs, tissues, and cells. Among them, the most important is neuroregulation.

Reflex is the most basic form of neuroregulation, which includes adaptive reactions of higher mammals through the **central nervous system (CNS)** toward changes of internal or external environments. A **reflex arc** is a required structure to complete the reflex process and is composed of five components: **sensory receptor**, **afferent nerve**, **reflex center**, **efferent nerve**, and **effector**. According to classical concepts of reflex, exterior stimulation at sensory

receptors are passed through afferent nerves into reflex centers, where reaction commands are produced and delivered to effectors via efferent nerves. Once reactions of effectors are aroused, the reflex processes terminate. Thus, the reflex arc has been considered as an open loop. However, during the practical reflex process, neuroregulation may often be achieved through a closed-loop. There are specific sensory cells or sensory receptors existing at effectors to monitor effects, whose signals will be delivered back to the reflex centers through the same sensory receptors. By receiving the information about the working state of effectors, reflex centers may timely adjust outgoing neural impulses to make activities of those effectors to be more accurate and coordinated. The above process is called **feedback** in cybernetics. Feedback exists in both biological organisms and automatic control machines where effectively controlled activities are ensured. Therefore, each reflex activity actually is a chained reflex through a circuit. Effects of the prior reflex may become a new stimulation for subsequent reflex and activating secondary reflex activities will continue to extend the reflex chain.

In order to adapt to changes of the external environment, to survive, and to possess the ability of learning, most biological organisms including the human have a feedback system that is composed of internal and external feedbacks. As shown in Figure 2.1, when feedback information received by sensory receptors is from the internal environment of the body, and effectors only output information to the internal environment, it is called **internal feedback**. On the contrary, when feedback received by sensory receptors is from the external environment of the body, and effectors only output information to the external

environment, it is called **external feedback**.

For example, when a person uses a hand to grab some food from the table, the visual location of the food is the external input. It is converted to action commands of reflex centers, and then is delivered to the hand (effectors) to reach the food. The distance difference between locations of the hand and the food is continuously adjusted and decreased via the external feedback until the hand finally grabs the food. However, sometimes this task cannot be completed merely depending on the external feedback. Once some changes of external environment occur, such as turning off the light in the room, the person will be unable to reach the food due to darkness. Meanwhile, the information about effectors (the hand) locations can be inputted to the reflex center through other sensory receptors (e.g., proprioceptors) on the hand to guide the movement of hand and finally grab the food. This is the role of internal feedback.

In general, information inputted from the internal feedback originates from the sensory apparatus at effectors themselves, such as afferent impulses of muscle spindles when muscles are contracted. The information of external feedback is from certain sensory organs of the body that can sense reflex effects (e.g., the vision and equilibrium sensations

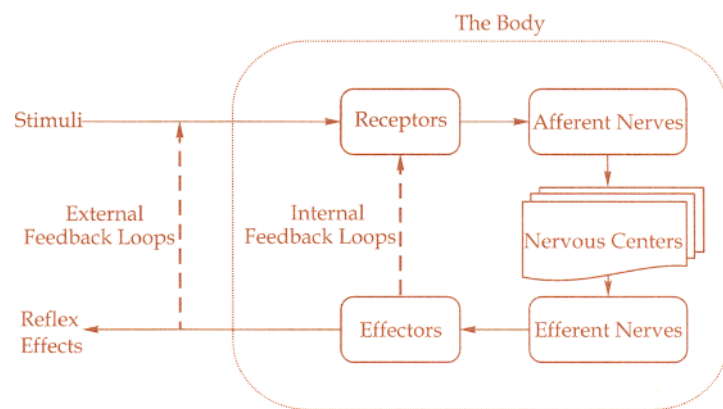


Figure 2.1 Feedback Systems in Reflexes of the Body

of the inner ear). They can continuously detect results of somatic movement and deliver afferent impulses to adjust reflex activities.

Actually, when biological organisms perform any activity or display any behavior, both internal and external feedbacks are conducted simultaneously. Association between these two feedback circuits constitutes a kind of learning machine. Learning is the basis of biological evolution. The formation of meridians or reflex zones on the body surface is the result of interactions between these two kinds of feedback circuits that will be discussed in the next chapter. Here we will emphasize on the analysis of reflex arcs activated by stimulation of acupuncture, as well as their circuits of internal and external feedbacks.

Feedback can be further categorized into negative and positive types within an automatic control system. When the acting direction of feedback information is opposed to that of the controlling information, which can attenuate the original effects, it is called **negative feedback**. The orientated somatic movement (grabbing the food) mentioned above is such an example of negative feedback. Besides, maintenance of homeostasis is achieved by the regulation of negative feedback. Regulatory functions of acupuncture on visceral activities are most likely realized via networks that promote regulations of negative feedback (refer to Section 4.2). One of the most important functions of negative feedback is to increase the stability of the system while resisting disturbances from the external environment.

The inhibition role of negative feedback also corresponds to the filtration process of signals, which is especially important for the normal functioning of nervous centers that receives numerous signals from sensory receptors. Due to the limitation of the signal processing capacity of nervous centers, if any and every external signal was able to enter without

passing through the filters, the center might become chaotic. Therefore, nervous centers have to “filter” certain less important signals through the negative feedback. An example is with the clothes we wear, the perceptual feeling for the clothes is significantly decreased, and the stimulation from the clothes on the skin wears off over time. During clinical acupuncture or acupuncture analgesia, patients could gradually experience reduced needling sensations or analgesic effects over time. These phenomena are called **sensory adaptation** in terms of physiology, whose mechanisms include **peripheral adaptation** and **central adaptation** that occur on the level of sensory receptors or sensory neurons or within nervous centers, respectively. These are some examples of the negative feedback or the feedback inhibition. For repeatable (or regular) weaker signals of stimulation, the feedback inhibition is easier to be generated within nervous centers^[60].

On the other hand, certain physiological processes within the human body, such as urination, confinement, blood clotting, are gradually strengthened and sped until the tasks are completed. In the circuits regulating these processes, the feedback information from controlled parts are used to promote and strengthen activities of the controlling parts rather than to restrict them, and it is known as the **positive feedback** or feedback magnification. It can raise the sensitivity of the receptors to external stimulation or environmental changes, and increase the efficiency of the effectors to maximize their responses more efficiently. It generally acts until the effectors generate the maximal effects. During acupuncture anesthesia or analgesia, there are such positive feedbacks for needling signals that are progressively amplified or strengthened (refer to Section 4.3).

2.2 Stimulation Signals of Acupuncture

In acupuncture therapy, the routinely used filiform needles, plum-blossom needles (seven-star needles), embedded needles, three-edged needles, as well as other types of external stimulation including acupressure, *tuina*, cupping, *guasha* and so on, all pertain to types of mechanical stimulation. Their therapeutic actions are realized through direct stimulation of mechanosensory receptors on the body surface or within points. Not only is the mechanical stimulation simple and safe, it also is more difficult to be adapted by the body, which is relevant in attaining desired therapeutic effectiveness for cases that require a lengthy stimulation duration. However, a drawback is the difficulty in reproducing the same stimulation parameters for each trial in clinical or scientific studies.

The most commonly used needling stimulation with filiform needles is mainly by pressing and squeezing, but stretching may be combined when lifting-thrusting or twisting the needle. During needling, both the tip and body of the needle may activate mechanosensory receptors or nerve branches within points. Due to the tiny stimulation area, the needle tip may cause a heavy and overwhelming force even when similar intensities of pressures are applied. Thus, most needling sensations might be induced by the stimulation of the needle tip. Nevertheless, pressing and squeezing forces on the surrounding tissues around the needle body should not be neglected, especially when the needle body is long or when the needle has been retained for a lengthy period. In addition, there are various types of needling techniques, such as lifting, trusting and twisting as well as varying speeds of needling motion, all can induce diverse forms of stimulation and activate different sensory receptors of tissue

structures, either simple or complex. Moreover, different needle sizes can also affect the strengths and results of needling stimulation.

Moxibustion belongs to thermal stimulation, which can act at points either by direct contact of the skin (**direct moxibustion**) or through some media (**indirect moxibustion**), such as a slice of ginger (**ginger moxibustion**) or air (**sparrow-pecking moxibustion**). The most common method of moxibustion is using either a moxa stick or a **moxa cone**, where it mainly stimulates thermosensory receptors located on the skin or subcutaneous layers. When burning moxa floss around the needle handle, thermal stimulation may also conduct through the needle body and activate thermosensory receptors distributed at different depths of points including those deepest portions. Because the temperature of moxibustion is somewhat difficult to control, sometimes recipients are exposed with risks such as being burnt. Moreover, release of its smokes is similar to that of cigarettes, which also may restrict its modern applications. Presently, for the sake of convenience and safety, certain simple electro-moxibustion or other thermal therapeutic apparatuses such as heating lamps with infrared radiation have often substituted above classical means of moxibustion.

With the advancing of modern science and technology, various types of stimulation on acupoints are becoming more advanced such as electrical, infrared, or ultra-violet rays, laser, and magnetic field, of which the electrical stimulation is more popular. Electrical stimulation on points includes **electroacupuncture (EA)** where electricity is connected to the inserted filiform needles or **transcutaneous electrical nerve stimulation (TENS)**, involving placing electrodes on the surface of points without needles. Actually, the former also combines mechanical stimulation. The application of EA may

be considered as one of the most significant advancement of acupuncture techniques to date. Owing to its simplicity of control, reproducibility, and continuous operation without the need for manual labor, EA is convenient for practitioners to apply and can enhance clinical effectiveness for patients. The success of acupuncture anesthesia is directly related to the application of EA.

However, EA does have certain limitations, e.g., the body can adapt to EA easily so that its therapeutic effectiveness is weakened if EA is applied at the same points for a longer duration at the same intensity or frequency. In addition, in certain cases, there is the abuse of EA. Due to the fact certain local reactions of EA, such as muscle contractions, can be induced regardless of the accuracy or appropriateness of the chosen points, a false impression could be given to the practitioner that the patients might have been stimulated effectively while in actually they have not. Furthermore, if there were no positive results observed, the practitioner may conclude that EA or acupuncture has no effects for the above-mentioned patients. Actually, only when points are located accurately, and when corresponding reflex layers within the points are punctured precisely, additional electrical stimulation may achieve the desired results.

Cupping, either current popular air cupping or classical fire cupping, utilizes the stimulation of negative pressure on points. Fire cupping has some level of thermal stimulation in conjunction with the negative pressure. For herbal cupping, effects of the herbs are added where ingredients of herbs may enter the points via the skin. The same principle applies with most Chinese herbal plasters or dressing herbs. The therapy of injecting medications into points is a method of directly injecting small doses of Chinese herbs or medications into points, of which **hydroacupuncture** (or called water acupuncture)

is frequently used. When applying hydroacupuncture, usually 5~10 mL 10% glucose solution is injected into each point. Effects of such stimulation are mainly utilizing the high osmotic pressure of the injecting solution, which have demonstrated significant results for eliminating regional tender spots caused by chronic pain-related diseases.

In short, most stimulation delivered by acupuncture as well as other related modalities belong to physical stimulation (Figure 2.2), so they may be categorized as forms of physiotherapy. Of course, there are certain stimulation combining with Chinese herbs and medications that are out of the scope of pure physiotherapy, which includes the therapy of injecting medications or solutions of Chinese herbal



Figure 2.2 Physical Stimulation Types of the Modern Acupuncture Therapies

extracts at points, as well as Chinese herbal dressing, fumigating or washing therapies. Sometimes, intense acupuncture might cause slight but inevitable lesions of local soft tissues. As a result, chemical substances such as histamine and potassium ions may be released and become a secondary stimulation to the point. Meanwhile, they have become chemical stimulation instead of mechanical stimulation. Free nerve endings resided on the skin or other tissues to sense pain have been considered as one kind of **chemosensory receptor**.

Information is known as the quantity or sequential sets of certain signals. In this book, terms such as **therapeutic information of acupuncture** or **acupuncture information**, represent the signals input with certain quantity and sequential sets when various above-mentioned stimulation are applied. Because stimulation information may vary depending on changes of sequential sets of stimulation signals, even if the same needling style is applied, different needle-manipulation techniques, such as with various speeds of lifting, trusting, and twisting the needle, one may input completely different amount or type of acupuncture information into the body. Because needling sensations with different properties are associated with needle-manipulation techniques, their therapeutic information types should be different. Likewise, stimulation of EA with different parameters (waveforms and frequencies) can input different types of therapeutic information.

2.3 Tissue Structures and Sensory Receptors of Acupoints

Acupoints are locations where therapeutic information of acupuncture is inputted into the body. During the past few decades, there have been extensive anatomical and histological studies on almost all of classical acupoints and common extraordinary acupoints^[13,15]. In addition to their definite locations, there has been a very clear understanding about their regional layers and tissue structures.

When puncturing acupoints that are located at muscular areas, the tip or body of needle may stimulate at least six layers of tissue structures. They are the skin, subcutaneous tissues, muscles, or tendons, nerve trunks or branches, blood vessels and the periosteum (bone membranes). Within superficial acupoints, there might not be any muscle tissues but all other tissues do exist. When puncturing points of the joint cavity, such as Xiyan (EX146), sacs of joints and ligaments that stabilize the joints are often stimulated. The thickness of subcutaneous tissues also relates to the body weight of patients. Generally, there is a thick layer of fat distributed in the subcutaneous tissue for obese patients. Nerves, either sensory afferent fibers or those mixed with efferent motor fibers may be stimulated. Blood vessels, either arteries in deep portions of the body or superficial veins and capillaries may be punctured. In addition, bursa, synovium or lymph tissues, as well as the bone membrane, sometimes can be hit. **Using the needle to grind the bone** is a classical needling method that emphasizes stimulation on bone membranes and is applicable for arthromyodynia of TCM (e.g., osteoarthritis and rheumatoid arthritis).

Tissues constituting the human body can be divided into four major categories: epithelial tissues, connective tissues, muscle tissues, and neural tissues,

all possessing different functions. Besides muscles, nerve trunks or branches, the surface of skin is epithelia (epithelial tissue), while all of the dermis, subcutaneous tissues (including fat), bone membranes, joint sacs, tendons and ligaments pertain to connective tissues. In the walls of blood vessels, there are elastic fibers that pertain to connective tissues and smooth muscles. Connective tissues can be further divided into dense and loose types. All of above-stated connective tissues except fat pertain to the dense type. Some loose connective tissues are distributed among muscles or around blood vessels, nerves, and joints.

Until now, no special structure has yet been found at acupoints besides the above tissues recognized by contemporary medicine. Various layers of acupoint structures pertain to these tissues without exception. Moreover, it is well known that acupuncture effects are produced by stimulation of regional sensory receptors and corresponding nerves. None of needling sensations and other effects can be induced after afferent nerves of acupoints are blocked. The morphological basis of needling sensations is mainly sensory receptors, nerve trunks and their branches distributed within acupoints.

To determine which sensory receptors or nerves are activated or played the major role, though many discrepancies or arguments remain, there have already been numerous studies done by our predecessors. One opinion supports the idea that muscle spindles are extensively existed all over the muscle. The reason is that the spindles' distribution not only coincides with locations and depths of sensitive spots within many acupoints such as Hegu (LI 4) ^[16] and that there is also a parallel relationship between needling sensations and regional myoelectric activities. Another opinion supports the idea that sensory receptors surrounding acupoints, such as Pacinian or Meissner's corpuscles are responsible

for pressure sensation. This is because in certain parts of the body (e.g., "Toothache Point" located at palmer side, 1 *cun* before metacarpo-phalangeal transverse crease and between the 3rd and 4th metacarpal bones), needling sensations, and effects still could be induced without the detection of muscle spindles. In addition, some researchers found only free nerve endings or nerve fibers within certain superficial acupoints including auricular points, such as *Anesthesia Point for Tooth Extraction* on the earlobe, but where needling sensations and effects still could be induced, so they thought free nerve endings should not be excluded ^[17]. Because these evidence-based conclusions are mostly reliable, they may indicate a common fact, i.e., sensory receptors within acupoints are multiple instead of singular.

It is known that there are various types of acupoints across the entire body: some deep while others superficial. There are also different types of acupuncture. Some stimulate the skin surface, such as seven-star needles and moxibustion. Others are deeper stimulation with filiform needles that often aims at *deqi*, namely the generation of needling sensations. Sometimes, intentional bloodletting via three-edged needles is the sole purpose of the stimulation. Moreover, needling sensations obtained at different points or different layers of the same point may be multiple, such as soreness, distension, heaviness, numbness, ache or electric-shock sensations. Obviously, to determine major needling sensory receptors within a point, a reliable and convincing way is to rely on the properties of needling sensations and correlations between its inducing conditions and locations, depths, and distribution patterns of sensory receptors found within the point.

According to sensory physiology^[6], multiple **sensory receptors** are distributed within the skin and they generate mainly four kinds of sensations: tactile-pressure, coldness, warmth, and pain.

Muscle spindles and tendon organs are two types of sensory receptors that could sense the stretch reflexes of the muscle. The former is a special kind of spindled shaped sensory apparatus that senses changes of the stretched muscle length. Each spindle is about several mm long, and its exterior layer is a sac of connective tissues. There are generally 6~12 muscle fibers called **intrafusal fibers** within the sac. Muscle fibers outside the sac are called **extrafusal fibers**. The muscle spindle is attached on the side of extrafusal fibers, and has a parallel connection with the latter. Contractive components of intrafusal fibers are located at two opposite ends of fibers while their sensory apparatuses are located in the middle. Both of them form a series connection. Therefore, if extrafusal fibers contract, stretching stimulation acting on sensory apparatus will decrease, while if intrafusal fibers contract, sensitivities of sensory apparatuses to stretching stimulation will increase. Increasing afferent impulses from the muscle spindle can generate stretched reflexes and induce contractions of the stretched muscle against stretching. If only a part of the muscle fibers contract, the entire muscle may not have any noticeable change in length, but there should be some increases of local muscle tension.

Tendons organs are distributed across collagen fibers of the tendon, and are sensory apparatuses used to sense changes of muscle tension. They are generally smaller than muscle spindles, and form a series connection with extrafusal muscles. Their afferent impulses may inhibit stretched reflexes, so their functions are opposite of muscle spindles. These two types of sensory receptors, especially muscle spindles, have already been considered as main sensory receptors within deep acupoints. In a recent study, fifty sensory receptors located at Shangyang (LI1), Shaoshang (LU11), Zhongchong (PC9), Yuji (LU10), Daling (PC7), Neiguan (PC6),

Jianshi (PC5), and Ximen (PC4) were observed and classified. The classification was dependant on their characteristics of reaction, adaptations, and receptive fields to stimuli of tactile-pressure, vibration, muscle contraction, and involuntary movements of joints. Results showed that the most ^[29] of them are stretching receptive units, which were located at fleshy acupoints, such as Neiguan (PC6) and Yuji (LU10). Twenty-six units of them were assumed as muscle spindles. Remaining were mainly pressure receptive units ^[10] located near Yuji (LU10) and Daling (PC7) as well as SA units ^[6] located within the skin, near Shangyang (LI1), Zhongchong (PC9) and Shaoshang (LU11) ^[18].

Acupoints of the whole body can be mainly divided into two categories, superficial and deep. Accordingly, needling stimulation can also be divided into superficial and deep stimulation. When puncturing an acupoint on the body surface, above sensory receptors can be stimulated either alone or in conjunction, depending on different means, locations, and depths of stimulation. They are the anatomical basis of generating various properties of needling sensations or inputting various acupuncture information. Here we will analyze primary sensory receptors within acupoints under different situations.

First, let us consider the situation where a superficial point or a superficial portion of a deep point is punctured. Meanwhile, because stimulated tissues generally are not or do not include muscle tissues, all other sensory receptors except muscle spindles and tendon organs may be stimulated. Warm stimulation of moxibustion is simpler; its target is warm thermosensory receptors distributed on or beneath the skin. On the contrary, the situation of needling is more complex than that of moxibustion. Of course, warmth or coolness induced by application of certain specific needling methods, such as heat-or

cool-producing needling techniques, also depend on the activation of those thermosensory receptors.

Superficial stimulation from seven-star needles or auricular embedded needles may activate free nerve endings on the skin surface mainly to induce pain. When the needle pierces through the skin of point, as long as the rate of insertion is swift, there should be no pain. However, at times, some pain does exist, and may even be extreme. It is mostly due to the needle tip striking a pain spot on the skin because it will disappear as long as withdraw and reinsert the needle slightly away from the previous insertion spot. This kind of piercing pain pertains to the category of fast pain. In auricular acupuncture, common needling sensations acquired are severe pain due to rather abundant free nerve endings distributed on auricular points. It may contain all of the characteristics of fast and slow pains, not only have various defense reactions such as blinking, crying, and avoiding, but also have reddish color and warm sensation on the entire ear due to local blood congestion. Obviously, effective regulation of visceral functions by auricular acupuncture may be related to its stimulation of slow pain accompanying certain emotional activities. There have been a number of experimental and clinical proofs on the relationship between emotions and **autonomic nervous system (ANS)** controlling visceral activities.

At many superficial points, however, when the needle tip strikes tissues inside them after piercing through the skin, there are actually no pains, but sensations of distension, heaviness, or mixing with a certain level of pain. Some of these points are located on the extremities, such as “Toothache Point” and Houxi (SI3) of hands, Neiting (ST44) and Yongquan (KI1) of feet, as well as Baihui (GV20) and Yintang (EX2) of the head. This suggests that there are other tactile-pressure sensory receptors at the regions activated in addition to free nerve endings.

They are generally recognized as Pacinian and Meissner’s corpuscles distributed around deep layers of skin, tendon sheath, and membranes of muscles or the periosteum. It has been observed that there are Pacinian corpuscles beneath the skin of the “Toothache Point” on both hands as well as at Neiting (ST44) on the dorsum of feet^[16, 17]. They are thought to be major sensory receptors inducing needling sensations of distension and heaviness.

Wrist-ankle acupuncture requires needles to be inserted into subcutaneous tissues beneath the skin horizontally for a certain distance (1~2 *cun*) without much needling sensations. As only few sensory receptors reside around subcutaneous tissues, it is reasonable to have subtle needling sensations over there. However, its stimulation still has great effects in treating certain diseases, which means there is still certain acupuncture information inputted into the body from the needling locations. Stimulated sensory receptors might be Pacinian corpuscles that are abundantly distributed between subcutaneous tissues and dermis, or around membranes of muscles or the periosteum. Even though there might be no needling sensations, there would still be a considerable amount of stimulation information inputted into the body because of the longer needle length within subcutaneous tissues and needle-retaining period than that of general needling methods.

Besides, for either superficial or deep points, trunks or branches of nerves as well as blood vessels distributed within them can all be directly stimulated. Once nerve trunks are stimulated, usually an electric-shock sensation emerges, while accompanied with blood vessels pierced by a filiform needle or a three-edged needle, it is common to have some sharp pain and slight bleeding following the removal of needle. On the walls of blood vessels, there are not only vasomotor fibers but also sensory

nerve endings distributed. There are especially abundant innervations on blood vessels of distal extremities. It is observed that sensory nerve endings almost surrounded the entire wall of artery within “Toothache Point” of adults. They were not only branched to form complicated denture-like terminals on the lateral layer of vessels, but also entered the middle layer of vessels^[17]. Therefore, when striking blood vessels, not only free nerve endings located on the walls of vessels can be stimulated, but also sympathetic nerve endings may be directly stimulated to induce changes of vasomotor activities. In addition, there are vagus nerve fibers distributed on the ear^[19] that can be stimulated during auricular acupuncture.

Now let us discuss situations where muscular or deeper points are punctured. When the needle body pierces through the skin, those sensory receptors distributed across tissues along the path of needle-insertion can be stimulated either alone or in combinations, thus making the situations more complicated. Meanwhile, however, because needling sensations are generated on the deep portion within points, it is almost certain that the stimulated are deep sensory receptors instead of those superficial ones within the skin or subcutaneous tissues. Then what are those types of sensory receptors?

Clinically, one might experience that one or several sensitive centers within a deep point could be stimulated. Needling sensations acquired by striking these centers could be an electric-shock sensation or regional soreness and distension. Accompanying needling sensations, certain muscle twitching could be easily observed by the naked eye, or the practitioner could feel **TDSAN (tenseness and dragging sensation around the needle)**. The former is caused by stimulation of nerve trunks or branches within deep portions of the point, while the latter is manifested from stimulation of muscle spindles.

According to anatomical studies of acupoints, there were approximately 60% of the total acupoints near nerve trunks, and more than 90% of them in which nerve trunks or branches passed within a range of radius of 0.5 cm. The probability of directly striking nerve trunks or branches was 50% or so. When motor nerve trunks were stimulated, sometimes there also could be muscle twitching but without TDSAN.

Researchers of Xi'an Jiaotong University School of Medicine, China observed three areas of significant needling sensations at Hegu (LI4), distributed across 2/5~4/5 of the thickness of the entire hand individually. Their thicknesses were within the range of the first interosseous and dorsal muscle of hand or the adductor muscle of thumb. Their areas were much larger than the sensory spots of the skin such as pain spots, but were almost consistent with the regions where muscle spindles lodged densely^[16]. Because muscle spindles exist in muscles extensively and have lengths up to several millimeters, it is possible to strike them or even those intrafusal fibers with needles at most fleshy acupoints. When the muscle spindle is stimulated, afferent impulses from its sensory apparatus increase, then subsequently induces myoelectric activities and contractions of extrafusal and intrafusal fibers. It may explain why puncturing Hegu (LI4) could induce twitching of the index finger or thumb along with significant needling sensations. The index finger abducted when the needle was inserted near the ulnar side of the point and striking the first interosseous and dorsal muscle of hand, while the thumb adducted when the needle was inserted near the radial side of the point and striking the adductor muscle of thumb. This kind of reaction could also occur even when fingers instead of needling pressed the point. Obviously, it was resulted from sudden contraction of corresponding extrafusal fibers by stimulation of regional muscle spindles. Needling seems to be just

a kind of squeezing and/or pressing stimulation that may induce transformation of sensory apparatuses in muscle spindles.

In general, reflective contractions of extrafusal fibers are contributed to muscle twitching seen by the naked eye, while contractions of intrafusal fibers as well as reflective tonus of regional extrafusal fibers are related to TDSAN feelings (refer to Section 2.5). Nevertheless, the muscle spindle usually is the receptor monitoring changes of muscle lengths; its normal discharging impulses should not induce any specific subjective sensations. So why are there intense sensations of soreness and distension upon needling?

Until now, this has been a puzzling question with several different speculations. One of them is that Pacinian corpuscles and free nerve endings were also reported to exist in the muscle layer, so needling dense areas of muscle spindles also might activate other types of sensory receptors. However, based on the close relationship between needling sensations felt by the patient and TDSAN felt by the practitioner, it was thought needling sensations were most likely generated from sensory receptors within the muscle spindle. It was also thought that besides type I and type II fibers that receive and conduct the stretching stimulation in the muscle spindle, there was also apparent distribution of type IV fibers (or type III fibers) that might conduct the soreness sensation. In other words, intense needling sensations by stimulation of the muscle spindle might be caused by a direct activation of type IV or type III fibers within the muscle spindle. In the meantime, contractions of intrafusal fibers might also strengthen the stimulation. Even though it was observed that sensations of heaviness/distension and soreness were conducted by type III and type IV fibers respectively ^[18], to date, there have been no reports on the existence of those types of fibers

within the muscle spindle. Therefore, considering the non-specificity of sensory receptors, we prefer another viewpoint: needling sensations might be most likely generated by local sensory receptors due to reflective muscle tonus activated by the muscle spindle. This situation is similar to the generation of muscle soreness when muscle was stretched involuntarily. It is also consistent with the mechanism about propagation of needling sensations when a muscular point is punctured (refer to Section 5.4).

Sensory receptors of acupoints related to tendons are thought to be tendon organs. They sense changes of the muscle tension, but do not induce specific subjective sensations when they are stimulated by stretches. However, tendon organs may generate needling sensations during acupuncture. Its mechanisms might be same as that when puncturing muscle spindles. Researchers found tendon organs of cats at the junction of gastrocnemius and Achilles tendon, which location probably corresponds to Chengshang (BL57) of the human body. Clinically, tendon organs may also be secondarily activated. For example, muscle tension raised by puncturing muscle spindles of a muscle may secondarily stimulate tendon organs in the attached tendon on the same muscle, so that the muscle tension gradually recovers to the previous state. This mechanism also could contribute to the decline of TDSAN feeling during the needle-retaining period.

When puncturing deep portions of fleshy points, blood vessels, and the periosteum can also be stimulated in addition to nerve trunks or branches, muscle spindles and tendon organs related to muscles and tendons. When puncturing deep portions of points at joints, joint capsules and ligaments that are composed of dense connective tissues can also be stimulated. All of them contain abundant free nerve endings or Pacinian corpuscles. When the periosteum, ligaments, or other tissues are

punctured, the practitioner also may feel TDSAN. Meanwhile, however, such feelings are most likely caused by higher density of tissues punctured, and are markedly different from that caused by raised local muscle tension. Clinically, it is easy to distinguish those two kinds of situations if according to depth of insertion and anatomical tissues stimulated.

In summary, main types of sensory receptors, which are responsible for efficacies of acupoints, are free nerve endings, muscle spindles, and Pacinian corpuscles. If classified by needling sensations, most acupoints of the body may be divided into two categories. The first is those have a superficial receptor system (mainly free nerve endings), which can be activated to induce sensations of pain-temperature. Second are those with a deep receptor system (muscle spindles, Pacinian corpuscles and others for deep pressure) that can be activated to induce sensations of soreness, distension, and heaviness. Of course, there are other points where nerve trunks or branches may be directly punctured to induce electric-shock and numbness sensations, or where several types of sensory receptors are

mixed to induce two or three types of needling sensations simultaneously, such as distension mixed with pain, soreness with numbness and heaviness. Generally, in points with the deep receptor system, muscle spindles are primary sensory receptors of fleshy points, while Pacinian corpuscles are the primary in those points related to tendons, muscle membranes, or the periosteum. Table 2.1 has summarized various tissue structures and sensory receptors of points.

It must be noted that free nerve endings are not only primary structures of the superficial receptor system, but also are extensively distributed throughout deep tissues. Moreover, they receive not just pain, but other senses as well, such as pressure. In addition, different receptor systems located on different layers of points may be activated by different stimulation means of acupuncture. For example, seven-star needles and auricular embedded needles may only activate the superior receptor systems, while filiform needles may stimulate either superior or deep receptor systems depending on their depth of insertion, superficial or deep.

Table 2.1 Tissue Structures and Sensory Receptors of Acupoints

Structures of Tissues	Sensory Receptors
Skin	Free nerve endings for pain; Temperature corpuscles; Meissner's corpuscles or Pacinian corpuscles for tactile-pressure
Subcutaneous tissues	Branches of cutaneous nerves
Muscles (Tendons)	Muscle spindle (Tendon organs); Pacinian corpuscle; Free nerve endings
Tendon sheath; Membranes of muscles; the Periosteum; Ligaments; Articular sacs	Pacinian corpuscles; Free nerve endings
Blood vessels	Free nerve endings
Nerve trunks and branches	Sensory or motor nerves include sympathetic fibers that control vasomotor activities, as well as vagus fibers distributed on auricular points

When EA is applied, due to spreading electric currents, it may stimulate sensory receptors or nerve fibers that are far away from the needle tip. Based on main responses and sensations of EA, it seems to activate motoneurons mainly. There is muscle twitching at stimulated sites, and which frequency is same as that of electrical stimulation. However, when the stimulation frequency is increased to a certain level, subsequent excitation of the stimulated muscles will fall into their refractory period and the muscle twitching will no longer appear. Of course, if there are no muscles distributed on stimulated points, there should not be any noticeable muscle twitching. Sensations of EA are closely related to needling sensations before electrical stimulation. If there are no preexisting generations of needling sensations, an ongoing electric current usually may only produce certain electric-shock sensations, which intensity is correlated to the intensity and frequency of electrical stimulation. If there are preexisting sensations such as soreness and distension, then these sensations may be strengthened with the ongoing current, mixing either with or without the electric-shock sensation concurrently.

2.4 Afferent Pathways of Needling Sensations

In the preceding text, various possible sensory receptors activated by stimulation on acupoints have been analyzed. Here we will discuss their afferent nerves and two possible afferent pathways to induce needling sensations.

Numerous experimental results showed that needling sensations would be weakened or subsided if the neural pathways governing stimulated sites

were blocked, sectioned off, or damaged by anesthetics. For example, needling sensations could subside after injecting anesthetics into the region of the stimulated acupoint. No needling sensations were observed after afferent fibers were blocked by anesthetics or sectioned off completely. Once the spinal cord was sectioned transversely or blocked by anesthetics, puncturing acupoints below the senseless level could no longer generate any needling sensations. For hemiplegic patients with sensory defects, needling sensations on the limbs of the affected side decreased significantly, while that on the healthy side showed no changes.

Different afferent signals generated by various sensory receptors are input through corresponding afferent fibers. According to physiology, afferent fibers are categorized into four types: I, II, III, and IV. Type I are afferent fibers of muscle spindles and Golgi tendon organs. Types II are afferent fibers of mechanosensory receptors of the skin (perceptual tactile-pressure and vibration). Types III are afferent fibers of nociceptors and temperature (coldness) receptors of the skin, and proprioceptors and barosensory receptors within muscles (perceptual proprioception and deep pressure). Types IV are afferent fibers of non-myelinated nociceptors, temperature (warmness) receptors, and mechanosensory receptors [6].

Needling sensations with different intensities might be induced through different afferent fibers. In a study of relationship between various needle-manipulation techniques and types of neuromuscular fibers activated, Dong *et al.* found that the alteration of synthetic potentials evoked by acupuncture varied with needling styles. Both needle-twisting and finger pressure usually could induce the activation of the above four types of nerve fibers. The probability to activate those fibers through lifting, thrusting, and shaking the needle was merely

50%. When scraping or tapping the needle, or applying the seven-star needles, only types I, II and IV were involved in the conveying of needling signals. Accordingly, the authors thought that weaker needling sensations could be mainly induced by type III fibers, while stronger needling sensations might be related to the activities of type IV fibers more closely [20, 21].

The most significant characteristic for the majority of acupoints is tenderness. Intensity of needling sensations is not only related to needling methods but also in direct proportion with the degree of original tenderness of acupoints. In physiology, sensory receptors for tactile-pressure are categorized as the same type. When the tactile-pressure stimulation reaches a certain degree, they become pain. Free nerve endings sense both pain and pressure. Thus, free nerve endings and Pacinian corpuscles extensively distributed on acupoints might be primary sensory receptors in the generation of needling sensations. If considering needling sensations as an indicator of acupuncture information, afferent pathways for those sensory receptors might be primary afferent pathways for acupuncture information. Regional muscular tensions raised by activating muscle spindles might play a role of maintaining and strengthening needling sensations or acupuncture information inputted into the body.

According to sensory physiology, there are two pathways in transmitting somatic sensory information from the spinal cord to the primary sensory cortex: the pathway for superficial sensations (pain-temperature and crude-tactile) and the pathway for deep sensations (proprioception and deep-pressure). The conducting pathway for fine-tactile is the same as that for deep sensations. Proprioceptions are those about positions of joints, tension of tendons and ligaments, as well as the states of muscular contraction. Fine-tactile are senses that can help to

distinguish the distance between two points on the skin and provide detailed information about the source of stimulation, including the precise location, shape, size, texture and so on.

Afferent fibers of superficial sensations from limbs, the trunk, and neck first enter the spinal cord and relay across within posterior horns. Secondary neurons ascend via anterior and lateral spinothalamic tracts at the opposite side. These tracts extend until the ventral posterolateral nuclei of thalamus. Afferent fibers from the head and face, which carry superficial sensations, originate from the trigeminal ganglion and extend until the primary nuclei of trigeminal nerve of pons and the nuclei of spinal tract. Secondary neurons from those two nucleus cross over to the opposite side to form trigeminal lemniscus, which ascends along with spinothalamic tracts extending until the ventral posteromedial nuclei of thalamus.

Afferent fibers that carry deep sensations and fine-tactile ascend via the ipsilateral, posterior column pathway, and reach the inferior portion of medulla oblongata. They relay at the nucleus gracilis and the nucleus cutaneous of medulla oblongata. The post-synaptic neurons then cross to the opposite side, and ascend via the medial lemniscus to arrive at the ventral posterolateral nuclei of thalamus. When passing the brainstem, secondary neurons from spinal cord also issue their collateral branches that relay for multiple times within the reticular structure and finally reach the intralaminar nuclei of thalamus near the midline of thalamus.

Thalamus is the secondary station of relay for sensory neurons and only conducts rough analysis and synthesis of sensations. Specific projection fibers from the ventral posterolateral nuclei and geniculate bodies of thalamus reach the primary sensory cortex to induce specific sensations while non-specific projection fibers from the intralaminar nuclei of

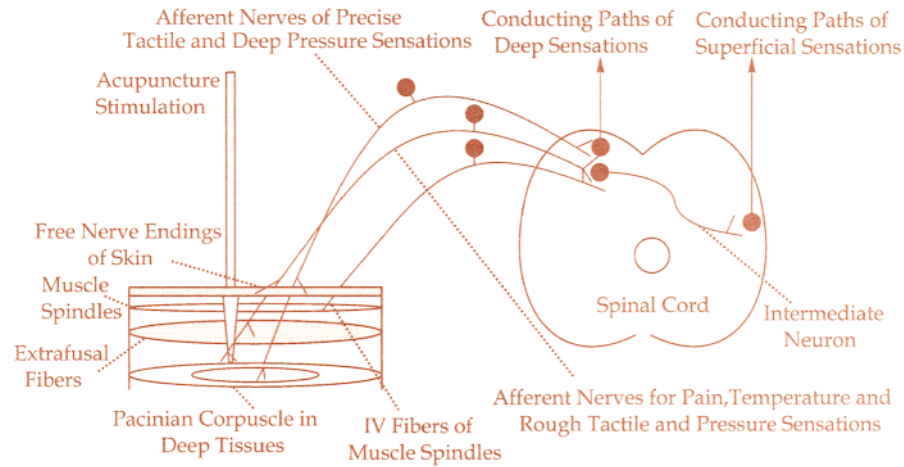


Figure 2.3 Afferent Paths of Needling Sensations at Deep Points

thalamus reach other extensive areas of the cerebral cortex diffusely to maintain or change excitation states of the cortex.

Figure 2.3 shows those afferent pathways of needling sensations entering the spinal cord when puncturing deep acupoints. Pathways of superficial or deep sensations do not correspond to superficial or deep sensory receptors. For example, afferent fibers from certain free nerve endings that pertain to deep sensory receptors may be types IV or III. They enter nervous centers to arouse needling sensations via the superficial sensation pathway, namely the lateral spinothalamic tract. When sensory receptors for fine-tactile that pertain to the superficial sensory receptors are activated, their afferent impulses may also enter nervous centers to induce needling sensations via the deep sensation pathway, namely the posterior spinothalamic tract. Therefore, no matter what depth the needle is inserted, the above two afferent pathways may be involved alone or together in generation of needling sensations and in conveying acupuncture information. Generally, when applying acupuncture at superficial acupoints (such as seven-star needles, moxibustion, auricular acupuncture or superficial needling), pain-temperature information are inputted through

afferent pathways of superficial sensations. When needling deep acupoints, especially those points at muscular areas, it not only induces needling sensations, but also maintains or strengthens needling sensations through the stretch reflex, which does not cause needling sensations by itself.

2.5 Stretch Reflex and Reactions around Needles

Clinically, when certain acupoints at muscular areas are punctured, such as Hegu (LI4) or Zusanli (ST36), there are two types of reactions around the needle seen or perceived by the practitioner. The first is the muscle twitching that can be seen by the naked eye, the second is TDSAN (tenseness and dragging sensation around the needle) that may be gradually strengthened or suddenly occurred. During such reactions, the needle seems to be stuck within surrounding tissues (needle grasp). In the meantime, the patient may also perceive intense needling sensations such as soreness, distension, or heaviness. Ancestral Chinese referred those

reactions as *deqi* phenomena (the generation of needling sensations).

In 2001, Langevin *et al.* of USA reported that *deqi* could be measured by biomechanical means. They inserted, manipulated, withdrew needles by using a computer-controlled needling instrument, and compared differences of withdraw force after either bi-directional needle rotation (BI), unidirectional rotation (UNI) or no rotation (NO) methods at eight acupoints and eight control points in 60 human subjects. Results were that 167 and 52% increased in mean withdraw force with UNI and BI, respectively, compared with NO (repeated-measures ANOVA, $P < 0.001$) method that differences were very significant. Withdraw force was on average 18% greater at acupoints than at control points ($P < 0.001$)^[23]. A mechanism on the needle grasp was considered due to winding of tissue fibers around the needle within acupoints. Langevin *et al.* assumed that was due to mechanical coupling between the needle and connective tissues with winding of tissue around the needle during needle rotation^[24]. Of course, the mechanical coupling is definitely a reason to increase the withdraw force, especially after unidirectional rotation of the needle. It is not, however, the primary mechanism of *deqi* reaction that includes the needle grasp phenomenon because *deqi* occurs when not only twisting the needle, but also when lifting or thrusting needle, even without any manipulations after inserting the needle. Moreover, if carefully compare the time when needling sensations occurs, one can find needling sensations are generated before needle grasp. Of course, the needle grasp may be also able to further strengthening the needling sensations.

Primary mechanisms about reactions around the needle may be explained via tendon reflexes and muscle tonus, which are two types of stretch reflexes. Knee reflex is a well-known diagnostic procedure in neurological examinations. It shows that the

quadriceps muscle of thigh contracts one time immediately when its tendon located on the knee joint is knocked (stretched). This is tendon reflex. Muscle tonus is another stretch reflex that occurs when tendons are stretched slowly and persistently. Reflex arcs for those two types of stretches are similar, where sensory receptors are muscle spindles. Afferent fibers are types I and II that have thicker diameters (12~20 μm) and faster conducting velocities (over 90 m/s), Effectors are extrafusal fibers of the same muscle and basic reflex centers are at the spinal cord.

Within anterior horns of spinal cord, there are enormous motoneurons (α and γ motoneurons). Their axons exited from the spinal cord via the anterior root to innervate extrafusal and intrafusal fibers of muscles, respectively. Terminals of α motoneurons may be divided into many tiny branches, each of which innervates an extrafusal fiber of muscles. The functional unit that consists of a α motoneuron and all muscle fibers innervated by it is called a **motor unit**. Sizes of α motoneurons may vary. Larger ones innervate muscle fibers with fast contractions, while smaller ones innervate fibers with slow contraction. α motoneurons receive either external information from the skin, muscles, and joints, or descending information from higher centers, such as the brainstem or cerebral cortex, and then induce certain reflective activities. Thus, the motor unit is called the “final highway” of spinal motor reflexes.

Some γ motoneurons are smaller and scattered among α motoneurons. Axons of γ motoneurons that innervate intrafusal fibers of skeletal muscles also exited from the spinal cord via the anterior root. While resting, even if α motoneurons do not discharge impulse, some γ motoneurons still may discharge persistently. Once activities of α motoneurons increase, γ motoneurons also increase their

activities correspondingly. Meanwhile, intrafusal fibers contract to increase the sensitivity of intrafusal sensory apparatus to stretch stimulation.

Tendon reflex is a reflex with single synapse, namely, its afferent fibers directly synapse with α motoneurons within the anterior horn after entering the gray matter of spinal cord through the posterior root. Its efferent impulses mainly govern muscle fibers with fast contraction. During stretch reflex, due to knocking on the tendon, a bundle of muscle spindles within the muscle is stretched simultaneously, so that a number of motor units contract almost synchronously, which display a great strength along with a significant motion. Muscle tonus might be a reflex with multiple synapses, where its afferent fibers might connect with α motoneurons through interneurons within the anterior horn. Its efferent impulses mainly govern muscle fibers with slow contraction. Meanwhile, because of alternative contractions of various motor units within the muscle instead of synchronistic contractions, its reflective contraction strength is not strong enough to show significant movement. Muscle tonus can only induce certain muscular resistance to the stretch.

Both tendon reflex and muscle tonus are closely related to reactions around the needle during acupuncture. It was proposed that there are five possible origins for myoelectric activities within an acupoint during *deqi*:

- (1) Muscle contraction caused by direct stimulation of the muscle.
- (2) Muscle contraction caused by stimulation of the motor nerve.
- (3) Spontaneous myoelectric activities.
- (4) Muscle tonus induced by stress.
- (5) Reflective muscle tonus that requires involvement of CNS.

Since the regional muscle twitching around the

needle is neither caused by spontaneous myoelectric activities nor by stress, now only three possibilities remain. First, the instant contraction of entire muscle might be due to needle tip striking **motor points** of neuromuscular attachments. A neuromuscular attachment is where a motor nerve enters the muscle mass. This is not always the actual neuromuscular synapse, which may occur a few centimeters further along the nerve and after it has divided into smaller branches. The pathophysiological significance of this neuromuscular attachment is unknown ^[25]. Such muscle contraction caused by stimulation of the motor nerve or the motor point only remained for a very short time, and had no subsequent muscle tonus or myoelectric activities, or needling sensations. Meanwhile, the frequency of afferent impulses from muscle spindles decreased. Second, the muscle contraction might be caused by direct stimulation at extrafusal fibers of muscles. However, due to the small size of filiform needles, those muscle fibers directly stimulated were definitely not in bundle, so that it should be difficult to induce contraction of the entire motor unit. Third, it might be due to the contraction of intrafusal fibers when a needle was inserted near or inside muscle spindles, which were deformed by the squeezing force. Their consequence is the contraction of the entire muscle, accompanied with intense needling sensations. Meanwhile, the frequency of afferent impulses from muscle spindles might increase, which in turn could induce a positive feedback process through the spinal cord, so that regional muscle tonus or electromyographic discharges remained for certain duration after the muscle contraction. Clinically, along with the muscle twitching, there are intense needling sensations felt by the patient as well as TDSAN felt by the practitioner. Such phenomena might be explained by the reflective muscle tonus that requires the involvement of CNS, namely, it is a kind of regional

muscle tonus by stretch reflex due to needling.

In apoplexy/hemiplegic patients, we once observed that twitching of the index finger or thumb could not be induced by needling Hegu (LI4) on the paralyzed side with flaccid paralysis during spinal shock, but could be induced by that on the healthy side. However, after spinal shock, when the flaccid paralysis has been transformed into rigid paralysis, the same needling on the paralyzed side could also induce such twitching. It indicates that reaction of muscle twitching around the needle indeed is a reflective activity through centers of spinal cord instead of the muscular contraction caused by directly stimulation of motoneuron or muscle itself. Otherwise, such reactions should not change with the occurrence and recovery of spinal shock. On the other hand, if EA of Hegu (LI4) on the side with flaccid paralysis was applied during the period of spinal shock, while the electric intensity increased to a certain level, muscle twitching still could be induced. Moreover, the twitching frequency was in accordance with that of the electrical stimulation.

Meanwhile, the reaction of muscle twitching was obviously due to direct stimulation of motoneurons at or around the affected area, or to the activation of more extrafusal fibers of muscles by the propagating electric current.

Muscle twitching by manual needling has a short inducing time. It often occurs instantly when the needle strikes the sensitive spot. From this fact, the muscle twitching by needling seems like a kind of tendon reflex, i.e., the center of spinal cord delivers its efferent impulses through only a single synapse, which results in the contraction of fast muscle fibers. The difference between the muscle twitching by needling and the regular tendon reflex is that they have different initial stimulation. As shown in Figure 2.4, the regular tendon reflex (e.g., knee reflex or Achilles tendon reflex) by knocking tendons is initiated by a tendon stretch reflex due to activation of almost all muscle spindles within the muscle. Because numerous motor units have synchronistic contraction, they are often forceful and with obvious movement. While only one or few muscle spindles

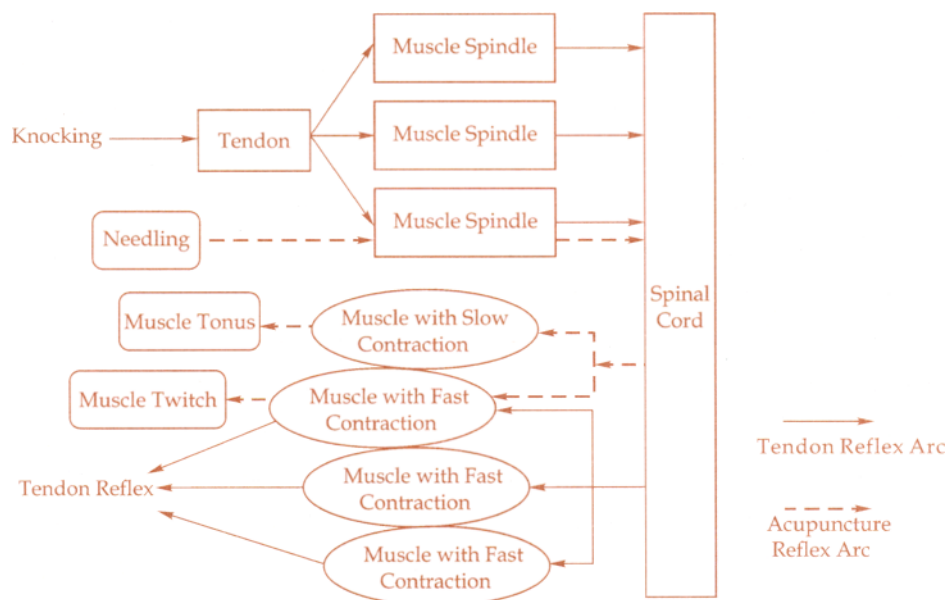


Figure 2.4 Relationship between Tendon Reflex Arc and Muscle Twitch or Tonus Evoked by Acupuncture

are activated by needling, motor units activated by the stretch reflex are also fewer, thus, needling twitching seen by the naked eye only occur at those smaller and superficial muscles. An example is the twitching index finger or thumb when puncturing Hegu (LI4) in the aforementioned cases.

When only a single muscle spindle within deeper and larger muscles is punctured, the induced contraction of single motor unit is usually not strong enough to display significant muscle movement. Instead, only regional muscle tensions are increased. Even though muscle twitching does occur, it is not visible on the body surface. This may explain why muscle twitching induced by needling mostly occurred at acupoints located at superficial and smaller muscles, while it was not visible at those deeper and larger muscles. Moreover, even at smaller muscles, as long as the muscles were relaxed before needling, the muscle twitching could still occur, which was similar to the inducing of tendon reflexes. This kind of muscle twitching may be called **tendon reflex by needling**. Clinically, those points that can induce muscle twitching seen by the naked eye, or limb leaping reactions are called **pulsating points** (refer to Section 12.5).

As shown in the above cases with hemiplegia, occurrence of the tendon reflex by needling Hegu (LI4) on the paralyzed limb is related to intact spinal reflex arcs, and is subjected to facilitation from higher centers. Sensitivity of muscle spindles usually receives facilitation roles descending from higher centers via γ neurons. Once this kind of facilitation role is interrupted, such as the decreasing sensitivity of muscle spindles during the spinal shock, the regional muscle twitching can no longer be induced by needling.

As for the inducing time required for the generation of TDSAN, there are two different situations. The first is a sudden “Needle Stuck” feeling, which

occurs when the needle tip is moved to a certain location within a point. It was called *as if a fish is swallowing the bait* by ancestral Chinese, and it may be caused by suddenly raised regional tension of extrafusal fibers discussed earlier. It might also be resulted from direct contractions of intrafusal fibers when they are punctured. The second is the slowly increasing TDSAN with needle-manipulation. It is obviously a reflective activity of muscle tonus by stimulation of muscle spindles, which might be caused by slow contractions of extrafusal fibers governed by efferent impulses delivered from the spinal center via multiple synapses.

Figure 2.5 illustrates spinal reflex pathways that allow induction of reactions around the needle or strengthening needling sensations when a muscle spindle within a point is punctured. The dotted lines represent pathways in acquiring needling sensations, while solid lines represent reflective paths in inducing reactions around the needle, such as muscle twitching and tenseness and dragging sensation around the needle (TDSAN). Simply put, when puncturing points with dense muscle spindles, afferent impulses from sensory receptors related to tactile-pressure can travel via two pathways conveying superficial and deep senses in the spinal cord and ascend to the cerebral cortex to generate needling sensations, such as soreness, distension, heaviness and numbness. At the same time, via interneurons at the spinal cord, these afferent impulses are sent to corresponding α and γ motoneurons to evoke stretch reflexes. Reflective activations of α fibers make muscle twitching or tonus around the needle, while correspondingly increasing activities of γ fibers result in contraction of intrafusal fibers, which can further increase the sensitivity of intrafusal sensory apparatus and enhance afferent activities of activated stretch reflexes. It not only shows the rising of regional muscle tonus, but also

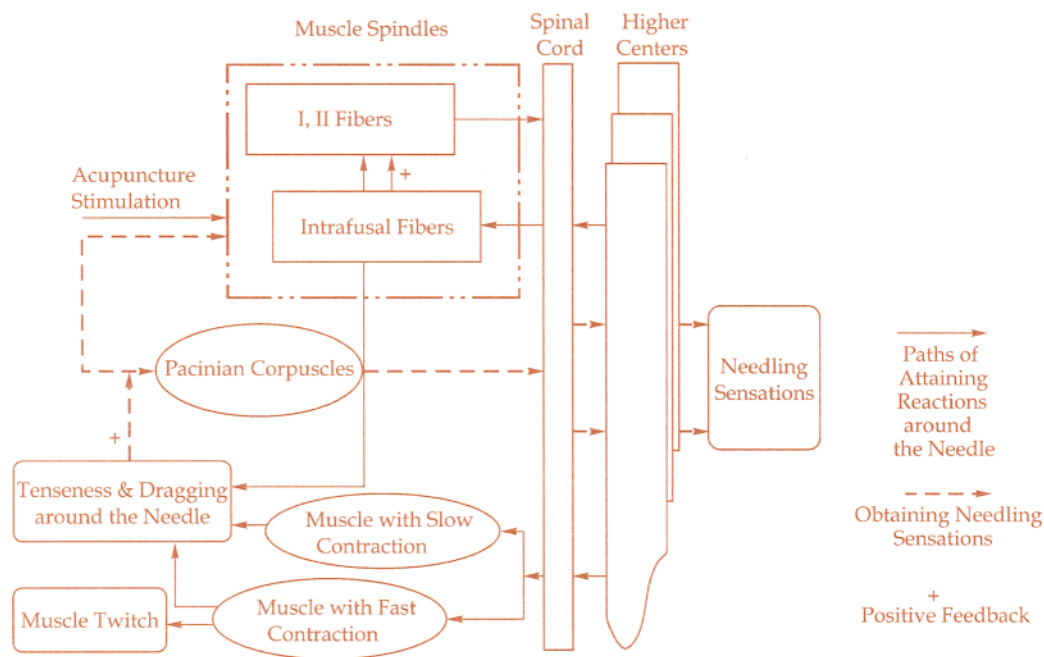


Figure 2.5 Reactions around the Needle by Stimulating Muscle Spindles to Sustain and Strengthen Needling Sensations

be able to observe the sustaining electromyographic discharges via EMG. The raised muscle tonus and contraction of intrafusal fibers around the needle can increase stimulation on regional tactile-pressure receptors, raise their afferent impulses, produce more significant and sustaining needling sensations of soreness, distension, and heaviness. This positive feedback process can be simplified as Figure 2.6.

When afferent impulses of the stretch reflex enter the spinal cord, they also ascend to higher centers via pathways conveying deep senses, i.e., the posterior spinal tract. Higher centers can also regulate the stretch reflex via their controls on α and motor γ neurons. These activities are omitted in Figure 2.6.

Within the deep portion of acupoints, there are either free nerve endings that may induce needling sensations via the spinal lateral tract, or sensory receptors such as muscle spindles, which may

evoke stretch reflexes of muscle tonus via the posterior spinal tract. This may result in the separation of needling sensations from electromyographic discharges, which occurs under certain experimental or pathological conditions. For example, when there was selective section of the lateral spinal tract, needling effects no longer appeared, but electromyographic discharges

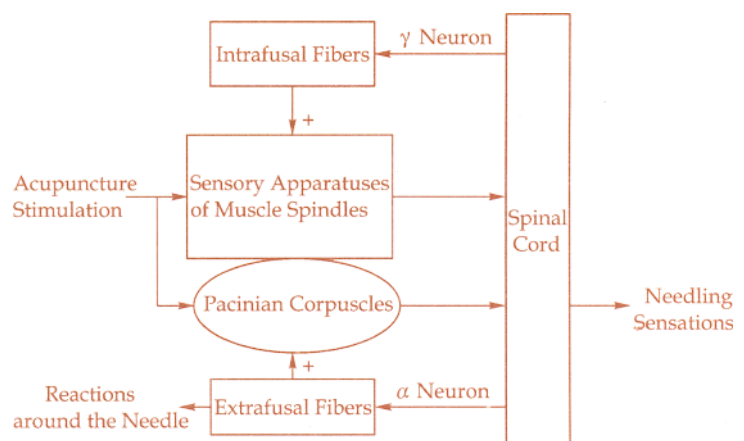


Figure 2.6 Positive Feedback Circuits Activated by Stimulation of Muscle Spindle

remained. Similar results were observed when applying needling certain body areas of patients where there was a pain defect. On the other hand, for patients with an area of deep sensory defects, the needling sensations still could be generated but not sustained. This indicates that the sustainability of needling sensations depends on the existence of deep senses inputted via the posterior spinal tract.

In short, when puncturing acupoints in muscular areas with regular sized filiform needles, either twitching of the entire slip of muscle or regional muscle tonus are results from the stretch reflex through the activation of muscle spindles. Because muscle spindles do not reside in the entire muscle, the muscle twitching and regional muscle tonus cannot occur unless they are stricken or approached by the needle tip. The closer the needle is to the muscle spindle, the stronger is the stretch reflex. Moreover, it is possible to puncture intrafusal fibers directly to induce their direct contractions. The reflective muscle tonus of extrafusal fibers and the contraction of intrafusal fibers are either the causes for practitioner's TDSAN feelings, or the primary factor to sustain and enhance needling sensations when retaining or continuously manipulating the needle. It is also an important key to facilitate propagation of needling sensations (refer to Section 5.1). In addition, the stretch reflex induced muscle tonus is closely related to mechanisms of certain reflective reactions on the body surface under certain pathological conditions, such as formation of subcutaneous hard nodules at reflex zones (refer to Section 3.6).

2.6 Input Locations of Acupuncture Stimulations

Under normal conditions, reflex activities are generally realized through intact reflex arcs. Sensory receptors, afferent nerves, nervous centers, efferent nerves, and effectors are five basic components of a reflex arc, every single one of them is important in its own regard. However, in reflexes induced by acupuncture stimulation, certain components may be omitted. Direct needling of the nerve trunk is one such example.

Clinically, for commonly used pointstimulation methods, acupuncture information is mostly inputted through activating sensory receptors or free nerve endings on the body surface. However, there is a higher probability for reactions induced by directly stimulating afferent or efferent nerve trunks or branches, even effectors. In an anatomical study on more than 500 acupoints through autopsy, it was found that 58% of them were located at the dense areas of nerve endings, while 42% of those were on the nerve trunks or larger nerve branches. Among 111 newly discovered points since 1967, 98 are close to nerve trunks or larger nerve branches. The nerve-stimulation method, developed in the 1970s, applies direct needling on nerve trunks (branches) related to diseased regions of the body (refer to Section 12.4). It has been demonstrated through animal experiments and clinical practices of over 10 000 patient visits that nerve trunks can be stimulated by various methods, such as needling, plucking, injection of medications, catgut-embedding and electrical stimulation, at proper stimulation intensity. Except for certain momentary electric-shock sensations during the stimulation, no serious side effects occurred [22].

Peripheral nerve trunks are mostly mixed, namely they often contain both sensory afferent and motor

efferent fibers, sometime autonomic nerve fibers. They are the main connective pathways either for sensory impulses ascending to nervous centers or for motor impulses descending to effectors from nervous centers. Thus, stimulation of nerve trunks may have impacts on cerebral activities through sensory impulses and muscular activities through motor impulses as well as visceral activities through indirect connections between peripheral nerves and visceral autonomic nerves, which indicating the nerve-stimulation method should be applicable for central, somatic, and visceral diseases.

Electric-shock sensation is the primary sensation acquired when puncturing or plucking mixed nerve trunks. Its generation may be due to the activation of nerve endings on the outer or inner membrane of nerve trunks, similar to pain-pressure sensory receptors. Electric-shock sensation can radiate towards the corresponding area innervated by the stimulated nerve trunk.

Are there any differences when stimulating only motor or sensory fibers? When motor fibers are stimulated, their innervating muscles (effectors) may have contractions without the electric-shock sensation. On the other hand, if only sensory afferent fibers are stimulated, the electric-shock sensation may occur without accompanying muscle movements. For example, stimulation on the facial nerve point might cause only twitching of facial muscles, while stimulation on branches of the trigeminal nerve could generate electric-shock sensation radiated to its governing area. When both of them are stimulated concurrently, either electric-shock sensations or muscle movements could occur. Moreover, the extent of muscle contractions was related to the size of stimulated nerve trunks. The larger the nerve trunk stimulated, the stronger the induced contractions. This is due to more motor units or innervating muscle groups activated concurrently. For example,

when deeply puncturing the sciatic nerve trunk (mixed nerves) located at Huantiao (GB30), there was often a jerking of entire lower limb along with an intense electric-shock sensation.

When nerve trunks have been stimulated or pinched for a while, there is also numbness at the governing area. For example, sitting on the toilet bowl too long could cause numbness of the lower limb due to oppression on the sciatic nerve. Sometimes, when sleeping on one side too long, pressure on the ulna nerve at the elbow could cause numbness of the corresponding forearm and fingers. However, if those pressures were relieved, the numbness symptoms could often subside completely in just a few minutes. Clinically, chronic numbness of the hand or foot caused by radiculopathy may need medical interventions of surgery or acupuncture. Note that if only tiny branches of sensory afferent fibers are punctured, electric-shock sensation might not be generated, instead, other various needling sensations, such as soreness, distension, heaviness or numbness might appear according to the stimulation intensity (refer to Section 8.5).

Spinal cord is the fundamental reflex center. Nerve-stimulation therapy is occasionally targeted on certain spots of the spinal cord, such as interspinal points between the second lumbar vertebrae and lower cervical vertebrae. However, due to certain risks and difficulties of controlling proper stimulation intensity, now, only a few experienced practitioners are willing and able to perform those procedures. Instead, an increasing number of practitioners choose to apply indirect electrical stimulation through either epidural EA on Huatuojiagi (EX102) points at the corresponding vertebrae ^[27].

Clinical practices have demonstrated that there are intense needling sensations and good results when acupoints distributed on nerve trunks or larger branches are stimulated. Stimulation on nerve trunks

such as **nerve trunk needling method (NTNM)** also has good results for somatic pains, motor disease, as well as visceral disorders (refer to Section 12.4), because this method may shorten reflex arcs (without the component of sensory receptors) and input stronger stimulation information. Of course, before or after striking nerve trunks, the needle may also stimulate other sensory receptors within adjacent tissues. However, regular acupuncture on acupoints cannot be substituted by the **nerve-stimulation method (NSM)** because acupoints located at areas innervated by the same nerve trunks may have miscellaneous functions. Moreover, under pathological conditions, many reflex points (tender spots or hard nodules) that appear at areas innervated by the same nerve trunks may also have shortcuts to diseased regions. Inputs of acupuncture information with specific needling sensations through those reflex points or regular acupoints often have unique effectiveness.

Efferent nerves innervate both extrafusal fibers, which are main components of the skeletal muscle, and intrafusal fibers within muscle spindles, so they are one of major effectors that form the neural reflex. Both of them can be activated when needling is applied at commonly used acupoints of muscular areas. From above, it is observed that stretches of extrafusal fibers can induce the stretch reflex of muscle spindles, while contraction of intrafusal fibers may raise the sensitivity of muscle spindles and enhance the stretch reflex. In addition, visceral or vascular smooth muscles are also one of effectors for the neural reflex. When deep puncturing at abdominal acupoints slowly, due to gastrointestinal peristalsis, needles are mostly unable to prick visceral smooth muscles. However, when puncturing acupoints of trunk, limbs, and the head, blood vessels located inside acupoints might be pricked. In the meantime, sympathetic fibers that control

vasomotions and smooth muscles on the blood vessel walls might be concurrently stimulated. Furthermore, classical pricking blood method is used specifically to prick the superficial vein of acupoints and let-out a slight amount of blood.

Reactions of vascular smooth muscles upon needling are related to their preexisting states. The previously constricted blood vessels may dilate, while those previously dilated may constrict. For example, patients with migraine headache often have constricted blood vessels on the painful temples. Pricking the vessel on Taiyang (EX4) may relieve the headache immediately. Its mechanisms may be related to the direct stimulation of vascular smooth muscles. Whether they are the skeletal muscles or smooth muscles, they contain sensory receptors and effectors. When effectors are stimulated, sensory receptors are also activated. Moreover, reactions of the effectors can further become a new stimulation to the sensory receptors. Thus, it is difficult to identify where the effects come from.

In summary, acupuncture information can be inputted through any one of sensory receptors on the body surface, afferent or efferent nerves within nerve trunks, reflective centers, and effectors (Figure 2.7).

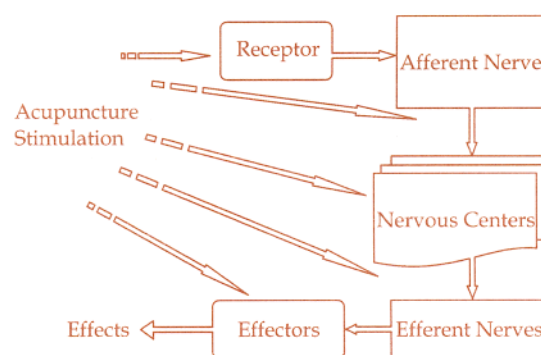


Figure 2.7 Acupuncture Stimulation at Components of Reflex Arcs

2.7 Reflex Centers and Autonomic Efferent Paths of Acupuncture

Numerous practices have demonstrated that the effects of acupuncture depend on intact neural reflex arcs. When any part of the reflex arc is disconnected, such as the blockage of sensory afferent or motor efferent nerves by local anesthesia or pressure interventions, or lesion of the reflex centers, all needling sensations and acupuncture effects will be lost. In the preceding section, various locations where acupuncture information may be inputted were analyzed. In this section, we discuss reflex centers in regulating visceral activities as well as autonomic efferent effects induced by acupuncture.

Reflex centers of acupuncture can be assumed by the generation of needling sensations and various effects of acupuncture. Acupuncture stimulation can either induce needling sensations through the specific sensory projection system, or activate nervous centers through the non-specific sensory projection system. Moreover, acupuncture effects contain analgesia and regulations of various functions (somatic, visceral, endocrinal, and immunological). Obviously, **reflex centers** of acupuncture are very complex, including almost all cerebral structures from the spinal cord, brainstem, limbic system and the cerebral cortex.

For example, reflex centers for regulation of visceral functions are mainly in the **spinal cord**. Experiments have demonstrated that effects of acupuncture on functions of the bladder, rectum, and uterus still exist in spinal animals. However, some acupuncture effects such as those on blood pressure and cardiac functions are realized through reticular structures of the brainstem. Medulla oblongata is considered as the primary center for effects of puncturing Gongsun (SP4) to enhance intestinal

movements because they could occur in dogs with intact medulla oblongata. Some acupuncture effects such as the regulation of immunity and body temperature may be through **hypothalamus**, which plays a relevant role in regulatory actions of acupuncture on the body. It is where the higher autonomic nervous center located and links with the endocrine system.

However, the **cerebral cortex** cannot be excluded from any regulatory effects of acupuncture on various organs. This is evident from three aspects. First, effects of acupuncture are closely related to the generation of needling sensations and the intensity of these sensations. Needling sensations themselves are subjective feelings from the cerebral cortex. Second, all regulatory activities of acupuncture on organs can form **conditioned reflexes**. For example, when puncturing ST36 (Zusanli) in dogs, a conditioned reflex of saliva secretion could be formed after repeated combinations of needling signals and foods. Once these reflexes formed, they could become a generalized feature of acupoints along the meridian, namely puncturing other acupoints of the same meridian could also evoke saliva secretion even though they were not associated with feeding. Moreover, in healthy dogs, puncturing SP4 (Gongsun) repeatedly could cause reflective enhancement of intestinal movements. Sometimes, even the behavior of needling itself could induce certain effects that are contributed to conditioned reflexes^[13]. Third, when the cerebral cortex was removed by surgery or inhibited by anesthesia, acupuncture effects still remained but were mostly weakened or became instable^[29]. Thus, the cerebral cortex is obviously the higher center for those reflective effects.

Efferent nerves for acupuncture reflexes include motoneurons innervating skeletal muscles, and autonomic nerves governing visceral activities. The former is primary when acupuncture is used to treat somatic and central disorders, and has been

discussed in the preceding sections. This section will focus on the latter.

According to the knowledge of neural anatomy, the origin of autonomic center is different from that of somatic nerves. **Sympathetic fibers** start from lateral horns of spinal cord at thoracic and lumbar segments, exit through the anterior horns, and then relay at sympathetic ganglions via postganglionic fibers to innervate effectors. As for **parasympathetic fibers**, their origins are more dispersed, where one of its portions originates from the corresponding parasympathetic nucleus in the brainstem, others originate from the spinal cord at the sacral area that is equivalent to lateral horns. The distribution of sympathetic nerves on the entire body is very extensive, innervating almost all viscera. However, the distribution of parasympathetic fibers are more localized and some organs are not innervated by it. For example, only sympathetic nerves innervate blood vessels within the skin and muscles, sweat gland, erector muscle of hair, and adrenal medulla.

For organs innervated by both sympathetic and parasympathetic nerves, their roles are usually reversed. For instance, **vagus nerve** inhibits the heart, while sympathetic nerve excites the heart. Movement of smooth muscles in the small intestine can be enhanced by the vagus nerve and inhibited by the sympathetic nerve, which effects are just contrary to that on the heart. This kind of antagonism enables the autonomic nerves to regulate visceral activities from opposite directions. This is also the basis of acupuncture having regulatory effects on visceral activities.

Ample animal experiments have demonstrated that autonomic nerves are efferent nerves for acupuncture to regulate visceral functions^[13]. For example, once the vagus was sectioned off or the parasympathetic nerve was blocked through injections of atropine, those effects such as enhanced

movements of small intestine in rabbits by puncturing Neiting (ST44) or increased heart rate of dogs by puncturing Zusanli (ST36) were completely weakened or subsided. Once effects of the sympathetic nerve was blocked, the nose analgesia resulting from puncturing Neiting (ST44) subsided, the increasing blood pressure resulting from puncturing Shuigou (GV26) under the shock state no longer occurred. Once the sympathetic ganglions and trunk between T5~T12 were sectioned off in advance, therapeutic effectiveness of needling Quchi (LI11) and Appendix Point (EX150) for experimental appendicitis subsided. By summarizing the above results, it is generally considered that the above effects of acupuncture are realized through vagus and sympathetic nerves, as well as involving humoral factors.

Generally, activities of sympathetic and parasympathetic centers are opposite of each other, namely when sympathetic activities are relatively enhanced, parasympathetic activities are relatively weakened so that their peripheral performance seems to be coordinated. Of course, under certain conditions, both sympathetic and parasympathetic activities will increase or decrease concurrently, though one of them must predominate. For some peripheral effectors, their effects on the saliva glands are identical, e.g., both of them promote saliva secretion, but there are differences in their roles: sympathetic innervations of saliva glands produce thick saliva, while parasympathetic innervations produce thin saliva. Indeed, because of these characteristics of autonomic functions, the effects of acupuncture on visceral functions may vary greatly.

By using power spectral analysis, the low and high frequency components of heart rate variability can be calculated to reflect the sympathetic and parasympathetic activities. Recently, by using this method in healthy subjects, Haker *et al.* of Sweden

observed that puncturing an auricular point *Lungs* could induce a significant increase in the parasympathetic activity during the stimulation period of 25 min and during the post-stimulation period of 60 min. No significant changes were observed in the sympathetic activity, blood pressure, or heart rate. Puncturing thenar muscle in Hegu (LI4) resulted in a significant increase in sympathetic and parasympathetic activities during the stimulation and post-stimulation period. A significant decrease in the heart rate at the end of the post-stimulation period was also demonstrated. As a control, a superficial needle-insertion into the skin overlaying the right thenar muscle caused a balanced increase in both sympathetic and parasympathetic activities during the post stimulation period, while no changes were observed during the stimulation period. This study indicated that sensory stimulation (acupuncture) in healthy people is associated with changed activities in the sympathetic and parasympathetic nervous system depending on the site of stimulation and period of observation ^[31].

Besides, peripheral effects of autonomic nerves are related to preexisting states of effectors. For example, stimulation on sympathetic nerves could inhibit the movement of unfertilized uterus, while it could enhance that of fertilized uterus. Stimulation on the vagus could dilate the pylorus that was in the contracted state, while it could contract the pylorus that was in the dilated state. Today, it is known that regulatory directions of acupuncture are related to preexisting functional states of the body, i.e., when the body is under the hyperactive state, acupuncture can reduce them, and vice versa (refer to Section 4.2). Obviously, this regulatory characteristic of acupuncture is mostly based on similar characteristics of **autonomic nervous system (ANS)** mentioned above.

2.8 Long Reflexes of Nerve-Humoral Regulation

To conclude that the basis of acupuncture therapy is neural reflex does not exclude the involvement of **humoral factors** in the efferent components of reflex arcs.

Activities of nervous centers may act on effectors either directly through nerve fibers, or sometimes indirectly through humoral paths that act on the endocrine regulation. The latter reflex process may be conducted like this: sensory receptor → afferent nerve → nervous center → efferent nerve → endocrine glands → hormone transportation in the blood → target effectors. With the involvement of endocrine glands, the reflex effects usually appear slowly, extensively, and persistently.

Release and actions of humoral factors have been demonstrated as one of mechanisms of acupuncture in relieving pain and treating chronic diseases (refer to Section 4.3). The most convincing fact is the experiment on **cross-circulation** in animals by a group of acupuncture anesthesia researchers from Medical Academia Sinica, China. They observed that once a cross-circulation in two animals was established, and EA was applied on one of them at a certain intensity and duration, certain changes of humoral factors could be induced and acted on the other animal through circulation, resulting in both animals showing inhibitions of induced cerebral potentials by stimulation of the greater splanchnic nerve ^[28]. This is a typical example of the long reflex arc induced by acupuncture.

Actually, all effects of acupuncture on endocrinal glands and immunological reactions are resulted from the regulation of nerve-humoral long reflexes. Their impact and action paths on the endocrinal functions are probably as follows ^[13].

(1) Effects on the hypophysis-adrenal cortex

system

Acupuncture can strengthen functional activities of adrenal cortex in patients or animals that were under pathological states, while having no distinct influence on normal people. As verified in animal experiments, this action was realized through the activation of the anterior portion of hypophysis that release corticotrophin to affect functions of the adrenal cortex.

(2) Effects on the sympathetic-adrenal medulla system

Acupuncture can strengthen functional activities of sympathetic-adrenal medulla, such as promoting the release of epinephrine to raise the blood sugar level. In the mean time, levels of lactate and acetone acid in the blood are markedly increased, while amounts of glycogen in the liver and muscles reduce accordingly. This action has been demonstrated as being realized through the entire neural reflex arc. When local anesthesia was applied on needling locations to block nerve conduction, or lumbar sympathetic nerves chain were removed in addition to sectioning off the bilateral sciatic nerves and femoral nerves, or merely bilateral splanchnic nerves were sectioned off, the effect of epinephrine released by acupuncture completely disappeared.

(3) Effects on the vagus-insular system

Reduction of blood sugar often serves as an indirect indicator of acupuncture effects on insulin secretion, which has been demonstrated to be intermediated by the action of vagus nerve in animal experiments. It was found that although acupuncture did not reduce normal blood sugar level of normal people or animals, it did markedly reduce the blood sugar level in people who took a great deal of sugar or in animals who received injections of epinephrine.

(4) Effects on the hypophysis-thyroid system

There are different conclusions from various studies on effects of acupuncture on thyroid

functions: inhibiting or strengthening, or a regulatory action. Some experiments suggested that effects of acupuncture on thyroid functions might be related to sympathetic nerves in addition to the hypophysis-thyroid way.

(5) Effects on the hypophysis-gonad system

Acupuncture can enhance the secretion of prolactin. It can also be used to treat infertility and secondary menostasis, and help recover normal ovulation and menstrual cycles in female patients.

(6) Effects on the posterior portion of the hypophysis

Both manual acupuncture and EA can induce the formation and release of antidiuretic hormone (vasopressin) from the posterior portion of hypophysis that can reduce urine volume or raise blood pressure of animals or patients. Acupuncture can also increase oxytocin in the cerebrospinal fluid, so that contractions of uterus are strengthened in gravida or animals. It has been demonstrated in animal experiments that this action of acupuncture is realized through afferent stimulation inputted from the sciatic nerve, which arrive at the posterior portion of hypophysis through the hypothalamus or cervical sympathetic ganglion.

In short, acupuncture has enhancement actions on functional activities of hypophysis and endocrine glands, but it mainly provides a regulatory action. In addition, there are also ample experimental results on enhancing effects of acupuncture on immunological reactions of the body, including cell-mediated immunity and humoral immunity. Accordingly, acupuncture can be used to treat not only endocrine disorders, but also certain infectious diseases.

Although effects of acupuncture on endocrine glands and immune responses are very extensive and complicated, it seems to be generally accepted as one kind of long reflex through nerve-humoral

paths. Afferent stimulation of acupuncture is first inputted into the cerebral limbic system and hypothalamus through the specific and non-specific projecting systems. Then the hypophysis can be activated to secrete certain hormones and hormone-stimulating hormones (e.g., TSH, FSH), which further act on their target glands and effectors. In addition, certain endocrine glands may be activated directly through ANS. These humoral factors play crucial roles in regulating functions of various tissues or organs to achieve balances between the internal and external environments of the body.

Figure 2.8 illustrates reflex arcs activated by acupuncture: long, short, and supershort reflexes. Short reflexes include a reciprocal connection between different layers of regional tissues. An example of a supershort reflex is axonal reflex, such as the phenomenon of **skin redness around the needle** during needle-retaining period, which may be resulted from the histamine release of irritated regional blood vessels. In addition to the above mentioned nerve-humoral reflexes, long reflexes may include conditioned reflexes through the cerebral cortex or segmental reflexes of the spinal cord involved in the viscera-body surface correlation. We have summarized varied reflex pathways responsible for regulatory actions of acupuncture in Section 4.2.

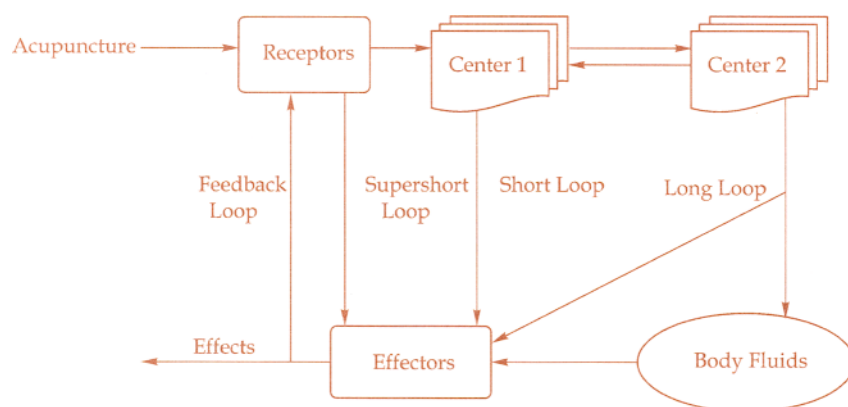


Figure 2.8 Reflex Arcs Activated by Acupuncture

2.9 Therapeutic Functions of Acupuncture

As acupuncture becomes more prevalent in the world, an increasing number of patients begin to understand acupuncture can treat certain diseases. So, what are the exact indications of acupuncture? In other words, what are the main curative effects of acupuncture? These are not easy questions to answer precisely and clearly, sometimes, even for an acupuncture practitioner.

The primary curative effects of acupuncture therapy can be summarized into three main areas: regulatory effects, analgesic effects and rehabilitation effects.

Regulatory effects are the most significant characteristics of acupuncture in treating visceral diseases ^[29]. For example, Neiguan (PC6) can be punctured for either tachycardia or bradycardia. Needling or moxibustion at ST36 (Zusanli) can be used for either diarrhea or constipation. In 2001, Chang *et al.* of Taiwan, China reported that electrical stimulation at ST36 (Zusanli) could increase the percentage of normal electrogastrography frequency and decrease the percentage of tachygastric frequency in diabetic patients. Their data indicate that acu-puncture may enhance the regularity of gastric

myoelectrical activity in diabetic patients ^[30]. Regulatory effects of acupuncture on visceral activities have been attributed to its modulation on ANS.

In addition, cumulative evidence suggests acupuncture has marked effects in modulating immunological functions. According to a study of Mori *et al.*, when EA was applied in young volunteers, it tended to normalize

the pattern of leukocytes. With the application of acupuncture, the status of subjects with relatively low levels of granulocytes and high levels of lymphocytes shifted to granulocytosis and lymphocytopenia, whereas that of subjects with high levels of granulocytes and low levels of lymphocytes shifted to granulocytopenia and lymphocytosis^[32].

There are many such examples in clinical acupuncture. It shows that acupuncture stimulation is merely a type of intervening signal to the automatic control system of the human body. Effects of acupuncture are realized through the activation of the self-regulatory system in the body. Directions of effects are not only related to the inputting information of acupuncture, but more importantly, to the preexisting functional state of the body.

When the preexisting functional state of the body is hyperactive, acupuncture may inhibit that function, and vice versa. Due to this kind of regulatory role, acupuncture therapy often has certain advantages over medications. For instance, when a patient suffered from alternative onsets of tachycardia and bradycardia, a physician or even a cardiologist often finds it difficult in prescribing medications. In that case, administering acupuncture would be a safe and wise choice, as it has no side effects, and one needs not to worry about its over effects.

In the theory of TCM, it is emphasized that the “balance of *yin* and *yang*” represents the normal functional state of body, and the notion that acupuncture may balance the body and promote health actually is a primitive expression about the regulatory actions of acupuncture.

Analgesia is the most remarkable effect of acupuncture when applied for somatic pain caused by acute injuries, surgeries, chronic inflammations or pinching nerves. In 101 healthy consenting women undergoing lower abdominal procedures, Wang *et*

al. of Univ. of Texas, Southwestern Medical Center at Dallas, USA observed that **transcutaneous acupoint electrical stimulation (TAES)** could decrease the requirement of hydromorphone (HM). TAES skin electrodes were placed at Hegu (LI4) on the nondominant hand and on both sides of the surgical incision. Results were that High-TAES (9~12 mA) decreased the HM requirement by 65% and reduced the duration of **patient-controlled analgesia (PCA)** therapy, as well as the incidence of nausea, dizziness, and pruritus. Low-TAES (4~5 mA) produced a 34% decrease in the HM requirement compared with only 23% in the sham TAES group. Accordingly, they concluded that high-TAES produced a significant decrease in the PCA opioid requirement and opioid-related side effects after low intra-abdominal surgery^[33]. Nayak *et al.* of New Jersey Medical School, USA reported that in 22 people with spinal cord injuries who experienced moderate to severe pain for at least six months after the injury, about 50% of the study sample reported substantial pain relief after acupuncture^[34].

Among cases of acupuncture, a high percentage of them are chronic cases with pain caused by pinched nerves due to inflammation. Analgesia effects for those cases are realized by improving circulation, promoting secretion of higher level of cortisone to eliminate inflammation while increasing levels of endorphin and other analgesic substances. In addition, when treating somatic pain, acupuncture that could directly stimulate the affected area has better results than orally taking medications, all without the side effects of medications. Even when compared with epidural shots of cortisone, acupuncture may often achieve a better overall effect in reducing pain. This is because not only natural endorphins released by acupuncture have fewer side effects than that of exogenous steroids, but also acupuncture effects are culminated from multiple

factors mentioned above.

Rehabilitation is also one of the main efficacies of acupuncture. It has been well documented that acupuncture can be used to treat and help rehabilitate to a certain degree various types of paralyses, induced by either peripheral or central diseases. Some typical indications of such are Bell's palsy, apoplexy/hemiplegia caused by brain stroke, and multiple scoliosis. In fact, not only could acupuncture promote the recovery of somatic motor ability, but also aid the rehabilitation of speech, hearing, vision, and so on.

If the concept of rehabilitation is to be further expanded, or combined with its regulatory role, one of acupuncture's efficacies may be expressed as the activation of body defense systems. It influences both

moxibustion have been used to treat intractable diseases such as AIDS and cancers (refer to Sections 25.4 and 25.5).

The above are the three main functions of acupuncture. However, it must be noted that they complement each other to achieve the optimal outcome. For example, Tsibuliak *et al.* of Russia observed through comparisons that narcotic analgesics provided adequate analgesia in 75% to 79% of 229 patients, electrical stimulation in 61% to 64% of 91 patients, acupuncture in 50% of 1 000 patients. Acupuncture, though less effective than narcotic analgesics, helped arrest or noticeably alleviate the severity of such postoperative complications as reflex retention of urine, impairment of drainage function of bronchi,

2.10 Acupuncture Anesthesia

Successful clinical trials of acupuncture anesthesia serve as best examples for inhibition of acute pain by acupuncture. Truly, if it were not for the dramatic results of acupuncture anesthesia, classic acupuncture therapy probably would not be so quickly spread to USA and other Western countries since the 1970s.

To date, hundreds of thousands of surgeries have been successfully completed under acupuncture anesthesia in China. From 1965–1978, 1 048 cases of lung resections were performed under acupuncture anesthesia with excellent or good results (74.8%~85.7%) at Beijing Tuberculosis Research Institute [41]. During the same period, 3 535 cases of cesarean sections were done under acupuncture anesthesia in Beijing Hospital for Obstetrics and Gynecology, China. One thousand cases of them were analyzed and the successful rate was 98.4% and the combined rate of Grades I and II was 75.8% [42]. Chinese Academy of Medical Science completed 141 cases of subtotal gastrectomies under acupuncture anesthesia, 122 (86.5%) cases had excellent anesthetic results (Grade I), 17 (12%) classified as good results (Grade II), and 2 (1.4%) were poor (Grade III) [43].

From 1972–1978, 230 cases of intracardiac surgeries with the extracorporeal circulation had been performed at the Third People's Hospital of Shanghai Jiao Tong University, China. Among those cases, 112 cases were for direct suture or patch for ventricular septal defects. According to the national unified standard, effects of acupuncture anesthesia were graded as excellent in 42 cases (18.3%), good in 117 cases (50.9%), fair in 52 cases (22.7%), and poor in 19 cases (8.2%), with a favorable effect rate of 69.2% [44].

From 1970–1978, Huang *et al.* of Shanghai, China performed 430 cases of total laryngectomies under

acupuncture anesthesia for carcinoma of the larynx. Regarding to anesthesia 73.5% cases succeeded. Among them, 174 cases were excellent (40.5%), 142 cases merely satisfactory (33%), 66 cases fair (15.3%) and 48 cases failure (11.2%) [45].

According to a survey at ten large hospitals in Beijing, Shanghai and Guiyang, China in 2001, acupuncture anesthesia was not as popular as back in 1970s and less frequently used for clinical anesthesia ranging 0 to 10% [46], but it is still applied selectively. At present, most frequent types and most valuable cases of acupuncture anesthesia are done in neurosurgeries. Because patients are operated under a conscious state, they can response to surgeons' neurological check-ups during operations so that surgeons can make adjustments immediately to raise the successful rate of surgeries.

Chen *et al.* of Shanghai, China reported 4 466 patients undergoing craniocerebral operations under acupuncture anesthesia. There were 2 837 lesions located in the cerebral hemisphere, 662 of the sellar region, and 566 at the cerebellopontine angle, and 441 in the cerebellum. Tumors included glioma, pituitary tumor, meningioma, neurofibroma, and others. The success rate of acupuncture anesthesia was greater than 90%. Though there were some shortcomings including incomplete scalp analgesia, meninges and diaphragm sellae reactions to the stimulation of acupuncture anesthesia, as well as intracranial hypotensive reactions, acupuncture anesthesia was effective against pain, shock, and infection while seldom accompanying complications. Acupuncture anesthesia was particularly suited for elderly patients and those in poor health or in shock state [47]. Zhang *et al.* of the Second Affiliated Hospital, Zhejiang Univ., China, reported that 72 cases of front fossa and temporo-parieto-occipital region lesions were operated under acupuncture anesthesia with new modified acupoints

and adjuvant from 1993 to 1998. One hundred percent successful rate was achieved ^[48].

The following sequence was generated when comparing the relationship between success rates of acupuncture anesthesia and surgical locations:

Head > Neck > Chest > Abdomen > Lower Limbs > Upper Limbs

From the above, we can clearly see the highest success rate is for craniocerebral surgeries, the second highest is for cervical (e.g., the thyroidectomy) and thoracic surgeries, and then abdominal surgeries. The lowest is for the lower and upper limbs. Another study also revealed the same sequence for the pain threshold raised by acupuncture in the entire body except the head, namely under the same stimulation intensity, the increased pain threshold is most remarkable at the skin of the neck ^[109].

It must be noted that the processes of acupuncture

anesthesia and acupuncture therapy are not identical. For instance, there are time differences of inputting stimulation signals for each. In regular acupuncture therapy, needling is applied after the patient has suffered with a disease or symptoms (e.g., pain), while in acupuncture anesthesia, needling is applied just prior to surgery (i.e., the surgical pain) and sustains during the entire process of surgery to ensure anesthetic effects. In other words, the subsequent surgical pain is inhibited by acupuncture signals inputted before (through an inductive period) and during surgery. Nevertheless, the efficacy of acupuncture anesthesia is also realized through the stimulation of sensory receptors on the body surface and the activation of reflex arcs like that of acupuncture therapy in spite of their time differences of stimulation signals inputted to the body.

Reflex Zones: Essence of the Meridians

Since the ancient times, acupuncture therapy has been practiced under the guidance of the meridian theory. However, with clearer understanding of their therapeutic mechanisms and numerous contemporary studies on the essence of meridians along with the discovery of many new points, the meridian theory begins to show certain signs of scientific deficiencies. In order to modernize acupuncture therapy, the meridian theory must be revolutionized. To facilitate this revolution, we have applied perspectives of cybernetics and contemporary reflex theory to clarify the meridian system and proposed the concept of **whole body reflex zones (WBRZ)** to substitute the meridians. The essence of meridians is merely connection pathways between upper and lower, left and right, internal and external portions of the body that reciprocally reflect on each other. Acupoints are either outputting areas (reflex points) of internal information onto the body surface, or inputting areas of therapeutic acupuncture information into the body. The WBRZ composed of merging reflex points or acupoints with similar functions may be categorized into three major types of reflex zones: somatic, visceral, and central, all have their unique distribution patterns and characteristics, and may even overlap at certain portions on the body surface. The above contents have been defined as a novel theory titled **acu-reflexology** resulted from the

inheritance and development of the meridian theory. It can be used to substitute the meridian theory and to guide the entire process of acupuncture therapy scientifically.

3.1 Contemporary Studies of the Meridian Phenomena

Over the half century, although a great deal of clinical and experimental studies have been conducted on the meridian phenomena, resulting in a much clearer understanding including characteristics of **propagating needling sensations along the meridians (PNSAM)**. Until now, not a single specific anatomical structure of meridians could be detected.

The phenomena of meridians can be manifested mainly in two aspects. The first is PNSAM, a kind of subjective propagating sensation spontaneously induced or activated by needling, moxibustion, or other methods of stimulation. Depending on means of stimulation and individual differences, PNSAM may vary, including soreness, numbness, heaviness, coldness, warmth, or other sensations like worm crawling, water flowing, pulsing, and so on. The

second is the external appearance of objective changes either along or near the meridian course on the body surface. They mainly include the color (red or white) of the flesh, papule, and vesicula that are visible with the naked eye and reduction of electric resistance of the skin. These two kinds of meridian phenomena may occur either alone or in combination. Actually, observing the meridian phenomena is an approach to study the traveling courses of the meridian system, and serves as an evidence to verify the existence of the meridians.

Before the 1970s, there were only some scattered reports of PNSAM in China. However, since then, studies on PNSAM grew at a much faster rate. According to a consistent method and standard, a nationwide survey was conducted among more than 20 000 Chinese people with different ethnicities, ages, genders, and residential locations. Results showed that there were more than 3 000 people with PNSAM. Among them, over 500 people had sensitive meridians and PNSAM. However, the no differences of PNSAM were observed between various residential locations, ethnicities, or genders. Some Western researchers also surveyed with a similar method and found PNSAM existed in both Caucasians and African Americans.

From the above survey, it was observed that traveling courses of propagating needling sensations were almost consistent with traveling courses of meridians, especially on the limbs. However, there were few variations such as extending or shortening of traveling courses, trespassing to other meridians or elsewhere, which usually occurred in trunks, especially on the head and face. The propagating needling sensation shapes are mostly lines, zones, or slices. Their widths varied dependant on the individual person, meridian, and the body part, namely narrower in portions of limbs and wider in portions of the trunk. Generally, the width is between

0.5~5 cm or greater. When PNSAM is in zone-shape, there is a more distinct central line within it. When the sensations traveled through the chest, abdomen, head, or face, there could be a greater diffusing area. Some sensations traveled superficially on the body surface, while others were deeply rooted in the body cavity. In short, description about traveling courses of the 14 meridians in the meridian system is mostly accurate and reliable, though there is a great amount of variations. Furthermore, most of their distributions across the body surface are in either zone-shape or slices rather than in line-shape.

In some people with sensitive meridians phenomena or called **meridian-sensitive subjects**, **papuloid zones** along the meridians could be observed. For example, during a 2-week period in 1972, a male volunteer received six times of pulsate electrical stimulation with low frequency. It included five times of stimulation on Jing (well) points with surface electrodes and one time on Ganshu (BL18) with EA, with total 18 meridians stimulated. Except once each for SI, PC and GB, all other 15 meridians showed some degree of papuloid zones along the meridian 13~16 hours after the stimulation. Among them, appearance of papuloid zones at six meridians of LI, HT, PC, SJ, SP, and ST were relatively intact. Observers took photos of them that time ^[49]. Those papuloid zones were well above the skin surface but still within the skin. They were harder than surrounding tissues but no cord-like objects could be felt beneath the skin. They looked similar to those cutaneous reactions when suffering from urticaria. Their widths were about 0.5~0.6 cm. Each time just before they appeared, a hot flush was throughout the entire body. Their traveling courses completely matched the described propagating sensations and were almost consistent with the meridian courses recorded in ancient texts. Papuloid zones usually lasted for about one or two hours then subsided.

Although this kind of phenomenon is rare, and its mechanism is still relative unknown, at least it provides a visible basis for the presence of meridians. Other meridian phenomena visible directly include skin disorders along the meridians. Except few such case reports in Japan, former Soviet Union, Germany, and Hungary, there were over 200 meridian-sensitive subjects reported in China [50]. It was also observed in the clinic that some spontaneous band-shaped abnormal sensations appeared along the meridians under certain pathological conditions, which commonly were numbness and tenderness, or a combination of multiple sensations.

Regarding other indirect objective indicators of the meridian phenomena, the earliest and most reported studies were on characteristics of low electric resistance or high potential at acupoints (refer to Section 7.4). Since 1980s, biophysics studies of the meridian obtained a series of new advancements in China. For instance, it was found that areas along the meridian courses had characteristics of projecting a stronger fluorescent light than those outside of the meridian courses. When using a **infrared thermograph** to display changes of temperature in the process of PNSAM, the screen could display higher or moderate temperature bands that coincided with traveling courses of propagating sensations [51,52]. Moreover, tissues at the meridian courses not only had a specific ability of sound conduction, but also could deliver specific, high vibrating sound when vibrated mechanically. The latter could be measured for almost everyone, and the locations were relatively fixed [53].

Recently, there has been much progress using the infrared thermal imaging technology to study the meridian phenomena. Under natural condition without any external interference, an **infrared radiant tracking along the meridians (IRRTM)** could be observed. Its course almost completely

coincided with the classic meridian courses. The longest one could cross over multiple body regions, and traveled almost through the entire length of meridians. Its appearance in healthy subjects is about 30%, but it varies in different meridians. In a survey of 113 volunteers, its incidence of IRRTM along GV over the back was about 77.9%, in which the long distance traveling from Dazhui (GV14) to Yaoyangguan (GV3) was 30.9% and the half distance was 35.4%. Its incidence along CV over the chest and abdomen was 26.6%, in which the long distance traveling from Tian-tu (CV22) to Zhongji (CV3) was 5.3% and the half distance was 13.3%. The incidence of IRRTM along three-*yang* and three-*yin* meridians of hands in 52 volunteers was about 30%, in which the incidence along lung meridian was the highest, over 50%. The occurrence of such coincidence was high among patients and might bear some relation to the affected viscera.

Through the preliminary study, it is certain that IRRTM is not related to large blood vessels running in subcutaneous or deeper tissues, and may not be simply explained with the law of conduction of thermal energy in thermodynamics. IRRTM is actually a particular living phenomenon under natural conditions. During the process of heating acupoints or non-acupoint spots along the meridians, the response of increasing skin temperature could extend along the meridians bi-directionally. Incidence of IRRTM markedly increased under such conditions. Results of cooling tests in 30 cases suggested that the thermal source of IRRTM might be located in tissues beneath the skin at a definite depth. As for the underlying mechanism in the formation of IRRTM, it remains an unsolved mystery. Preliminary results of such experiments showed that oxygen metabolism was more active in those sites, which indicated an intensive energy metabolism in related tissues or microcirculation state of the skin

along the meridian course might be an important factor resulting in its formation ^[54-56].

On the other hand, numerous clinical practices of acupuncture have proven that the significance of PNSAM is highly and directly correlated with needling effects ($P < 0.01$). Moreover, propagating distance of needling sensations to the diseased region is related to the therapeutic effectiveness, which means the closer the distance, the better the results, and vice versa. This provided a direct proof for the statement **effects upon *deqi***, often experienced by acupuncture practitioners.

From the meridian phenomena of the body and the close relationship between them and acupuncture effectiveness, one may conclude that there is indeed a connection pathway between certain portions of the body and specific organs. This connection pathway can be either felt, observed, or even activated to work insensibly. Chinese ancestors called them meridians, and described their traveling courses using the format of the 14 meridians to near-perfection.

As for the essence of meridians, many studies have been done via modern anatomical or chemical tracing methods. However, to date, there still have not been any particular structures of meridians found within acupoints and at the traveling courses of the meridians. All one could see are the well-known tissues, such as the skin, peripheral nerves, blood vessels, lymph vessels, muscles, tendons, subcutaneous fat, and other connective tissues. Among them, peripheral nerves have the closest relationship with the meridians and acupoints, while blood vessels come in second. Of course, other tissues of the body may also have certain relationships with them. In fact, blood vessels and other related tissues are mostly surrounded or distributed by dense nerve fibers. Therefore, these tissues, especially peripheral nerves, are the material bases

of meridians on the body surface. Ancient literature about the meridians as well as most modern observed meridian phenomena could be considered as a kind of functional expressions of above tissues at various body parts through neuralhumoral regulation governed by nervous centers.

However, the role of those tissues besides peripheral nerves, such as muscles, skin, or subcutaneous connective tissues should not be overlooked in realizing certain meridian phenomena. During recent years, researchers discovered that the meridian courses had characteristics of low electric resistance and high vibrating sound, and sometimes even remained on the amputated limbs. It implies that these characteristics of meridians might be only related to structures of skin or subcutaneous tissues, and were independent from CNS and the circulatory system ^[53].

Prof. Yuan, Lin and his colleagues, Southern Medical Univ. of China, proposed a reticular formation frame of whole body's fascia and connective tissues by means of digital human technology and compared thick spots of connective tissues in this frame with 361 classical acupoints ^[57-59]. They found that when the majority of acupoints were punctured, the loose connective tissues of intramuscular septum could be stimulated, while the remained acupoints were punctured, dermal dense connective tissues, subcutaneous or other loose connective tissues, such as that around neurovascular tract or hilus of visceral organ could be stimulated. These results indicate that the fascia network, which is constituted by connective tissues, may also be one anatomical basis for the meridian. Actually, the importance of connective tissues in the generation of needling sensation within acupoints has been stressed ^[23,24]. In this book, these factors have been fully considered when proposing the simplified model of the meridian (refer to Section 3.11) and analyzing the mechanism of PNSAM (refer

to Section 5.1).

So, to recap, contemporary studies have demonstrated that the meridian phenomena do exist objectively, and they possess a series of biophysical and physiological characteristics. However, they are mostly functional phenomena based on neural reflexes. Various tissue structures known by anatomy are certainly involved in the essence of meridians.

3.2 Referred Pain and Viscera-Body Surface Correlation

If the Chinese first discovered the meridian phenomena as a type of description reflecting reciprocal relations between internal and external portions of the body, then the Westerners discovered similar phenomena independently. As early as a century ago, a Western medical doctor named as Dr. Head observed that when some viscera become disordered, spontaneous pain or raised skin sensitivity could be observed at specific areas on the body surface. This pain is called **referred pain**, and the area where the referred pain often occurs is named after its discoverer as **Head's zones**.

For instance, when suffering from cardiac ischemia, the pain may occur in the anterior chest, left shoulder and the ulnar side of left upper arm. When suffering from cholecystitis or cholelithiasis, the pain may emerge at the right scapular area. In the early stage of appendicitis, the pain may first appear in the upper abdomen or naval area. Cardiac disorders may cause hypersensitive skin of the shoulder. Gastric or pancreatic disorders may cause referred pain at the left upper abdomen and the area between bilateral scapulas. The pain from the diaphragm may

be referred to the shoulder area, while the colic resulted from the kidney stone may emerge at the groin area. The expansion of the ureter may cause pain referred to the testicle area, and so on. Table 3.1 and Color Figure 1 (at the end of this book) show most locations of visceral referred pain ^[6,60~62]. The referred pain sometimes is also called **indicating pain** that has a certain value to support the diagnosis of diseases in contemporary medicine.

Visceral pain usually can be caused by stimulation of internal tension and stretches, though viscera are not sensitive to incision, pressure, or burning. Sensory afferent nerves from most viscera are the afferent fibers of the sympathetic nerves, which ascend through the dorsal roots of spinal cord. However, those from the esophagus and bronchus enter the centers through afferent fibers of vagus nerves. Those from pelvic viscera, such as the rectum, bladder, prostate, and the cervix enter the sacral cord through the pelvic nerves. Why does visceral referred pain show up on various regions of body surface rather than just the adjacent body surface of affected viscera? Regarding the mechanisms involved in the generation of visceral referred pain, there have already been two types of explanations below (Figure 3.1) ^[61].

First is the **convergence hypothesis**. Afferent nerve fibers from both the diseased viscera and referred somatic areas enter the spinal cord through the same dorsal roots. They converge on the same neuron of the spinal-thalamus tract, and then ascend. Moreover, because the somatic sensory inputs usually predominate in higher centers, converged neural impulses are thought to be from the stimulation at the somatic region. Therefore, when there are inputting pain impulse from viscera, they are also thought to be from the somatic region. This might explain the generation of referred pain.

Second is the **facilitation hypothesis**. After

Table 3.1 Common Locations of Visceral Referred Pain and Tenderness

Viscera	Causes	Locations of Referred Pain and Tenderness
Heart	Angina pectoris	Front chest, left shoulder, ulnar side of left upper limb
Stomach	Gastritis, peptic ulcer	Left upper abdomen, area between both scapulas
Pylorus	Pyloral inflammation or dilative stimulus	Shoulder
Esophagus	Esophagitis	Sternum, left front shoulder
Diaphragm	Persistent spasm or oppressive stimulus	Shoulder
Pancreas	Pancritis, pancreas cancer	Left upper abdomen, area between both scapulas, and posterior waist
Liver, gallbladder	Liver cancer, cholecystitis, cholelithiasis,	Right upper abdomen, right scapula
Kidney	Kidney stone	Lower abdomen, groin, lower back
Ureter	Tubal colic or dilative stimulus	Groin, testicle area
Appendix	Appendicitis	Upper abdomen or around navel
Colon	Colitis	Lower abdomen
Small intestine	Enteritis	Upper abdomen or around navel
Cervix, bladder, prostate, urethra, testicle, gone cyst	Enlarging volume or dilative stimulus due to corresponding diseases or pregnancy	From sacral region to medial thigh, or lower anterolateral thigh

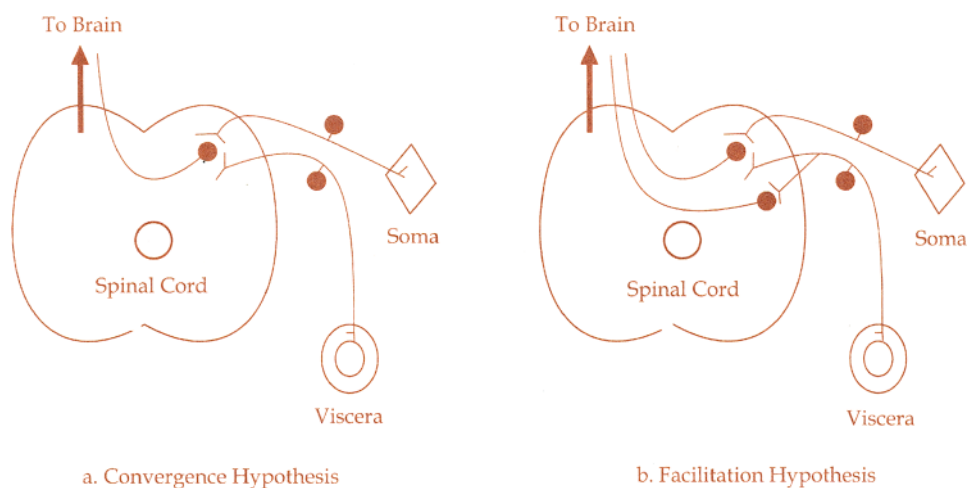


Figure 3.1 Mechanisms of Referred Pain

reaching the same region of spinal centers, afferent nerve fibers from the diseased viscera and referred somatic area do not converge but are in proximity to each other. Impulses of the former may lower the excitation threshold of neurons in the spinal-thalamic tract that receives inputs from the soma and a weak stimulation from the soma may induce pain sensed by the brain. This might explain the cause of hypersensitivity at certain regions of the body surface.

Referred pain often occurs on the limbs that come from the same somite or innervated by the same dermatomal segment as that of the viscera, called **dermatomal rules**. According to these rules, the same somite delivers its nerve branches to either the body surface or viscera so that a specific connection is established between certain areas on body surface and corresponding viscera. However, note that segmental distributions of peripheral nerves are mainly manifested on the skin, i.e., the dermatomal segment, while they are not significant for muscles. All muscles of the neck and trunk are derived from muscular segments. During the early stage of embryos, each single spinal nerve corresponds to a single muscular segment that has distinct segmental characteristics. However, during the consequent development process, spinal nerves transfer with the shifting, dividing layers, splitting longitude and merging of muscular segments. Accordingly, the segmental characteristics of muscles on the neck and trunk are no longer significant. Likewise, it is insignificant for the segmental innervating of muscles on the limbs. Therefore, cutaneous nerves instead of muscular nerves are mainly involved in areas where the referred pain occurs.

Sometimes, referred pain may occur at somewhere that pertains to a completely unrelated neural segment. It may be due to a facilitation action from that area where there might be certain regional

somatic diseases. For example, referred pain from angina pectoris could occur at the cervical area when the patient suffers from cervical spondylopathy [62]. Moreover, segmental characteristics of visceral nerves are not always identical despite the rules in existence. Occurrence of the referred pain has individual differences. The pain might or might not show up, or even though they occur, their locations may vary in different patients.

Because referred pain and its mechanism are well understood in Western medicine, it may be easier accepted by medical doctors and may be used to explain regulatory effects of acupuncture on visceral functions. The referred pain phenomena can be considered as a type of information that reflects the viscera condition onto the body surface through reflex centers. It indicates there are certain connecting pathways between specific regions of the body surface and viscera. When applying external stimulation, such as needling, moxibustion, massage, or electrical stimulation at these specific regions, the stimulation information will return to the viscera through the same pathways. Accordingly, corresponding visceral activities may be affected.

A typical example is the referred pain at the right scapular area caused by cholecystitis or cholelithiasis. For a medical doctor who only knows the meaning of referred pain, the pain in the right scapular area or hypersensitivity of skin is only an accessory sign in diagnosing gallbladder diseases. However, for an acupuncture practitioner or a massage therapist who has practical knowledge of reflexotherapy, the pain or hypersensitive zone in the right scapular area could be selected as one of master points. In general, a tender spot may be found near right Tianzong (SI11). Once acupuncture or massages are applied to stimulate this spot, the referred pain may be relieved instantly. After certain sessions of treatment, symptoms of cholecystitis and

gallbladder stones may be reduced and even cured. If some practitioners have troubles understanding mechanisms of acupuncture in treating gallbladder diseases, they are advised to brush-up basic concepts of reflex arc about the referred pain from gallbladder.

Obviously, reciprocal reflexes between viscera and specific locations of the body surface can explain various phenomena of visceral referred pain and mechanisms for acupuncture to treat visceral diseases through acupoints. To clarify this kind of reciprocal connections, a new term **viscera-body surface correlation** has been often used.

Among the known Head's zones, there is a sensitive zone for the referred pain from the heart that matches courses of HT and PC in 12 regular meridians. Clinically, this pain mainly occurs at the ulnar side of left arm, but sometimes also at the right arm, even the neck. These areas are indeed locations of HT and PC that were thought to be connected to the heart in TCM. A great deal of practices and experiments demonstrated that when stimulating some acupoints from these meridians, such as Neiguan (PC6) and Shaohai (HT3), there were certain effects in improving cardiac ischemia or arrhythmias. This type of coincidence serves as an important clue to both Western medicine and TCM.

For medical doctors, it may be important to acknowledge the rich expertise concerning the correlation of viscera and body surface that has accumulated on the meridian system and acupuncture therapy through thousands of years of practice. Furthermore, it is beneficial to develop clinical applications of Head's zones, and integrate it with various modalities. For TCM practitioners, one needs to consider the similarities between Head's zone and the meridian phenomena to understand the formation of the meridian system as well as the essence of meridians better. This would help integrate TCM into the mainstream of contemporary medicine sooner.

During the past few decades, there are a series of important advancement in studies of **viscera-body surface correlation**. Many studies applied the labeling technology of **Horseradish Peroxidase (HRP)**, which was injected in a micro-quantity into some viscera and corresponded acupoints on the body surface and the origins of corresponding innervations were traced. Although these results were not completely consistent, the convergence or overlapping of afferent nerves from viscera and clinical master acupoints could be found at certain spinal segments ^[63~70].

For instance, afferent nerves from the heart and Neiguan (PC6) were converged at dorsal root ganglions between C5~T2. Similarly, afferent nerves from the heart could be converged with that from Shenmen (HT7) at T1 and T2, or with that from Shaohai (HT3) at C8 and T2. Those from the liver and Taichong (LR3) were converged at dorsal root ganglions of T9~S2. Those from the stomach or caecum and Zusanli (ST36) were converged at dorsal root ganglions of T4~L3 and T12~S2, respectively. There were 5~7 overlapped spinal segments received those afferent nerves from gallbladder and any of Ganshu (BL18), Danshu (BL19), Liangmen (ST21), or Qimen (LR14), as well as for those from ductus choledochus ampulla and either Riyue (GB24) or Qimen (LR14).

In the above experiments, conclusions were made based on different animals after labeling materials were injected individually at acupoints or corresponding viscera. However, results obtained from the same animals were similar. When two different types of fluorescent labeling materials were injected into Liangmen (ST21) and stomach in the same animal, double-labeled neurons were found in the dorsal root ganglia between T7~T11. In addition, using intracellular recording and intracellular labeling methods, there was a single neuron in the solitary

nucleus, which responded to both stomach tenseness and electrical stimulation of Sibai (ST2) ^[70]. These researches provide direct anatomical evidences for the meridian system, which has characteristics of viscera-body surface correlation. In addition, they imply that the dorsal root ganglion in the spinal cord and the solitary nucleus in medulla might be the primary center for the viscera-body surface correlation.

Above studies indicate that the functional connection between the body surface and viscera have a morphological basis. However, note that Head's zones are distributed over limited regions, such as the trunk. However, unlike the meridian, they do not cover the entire body surface including the extremities. Thus, the recognition about the viscera-body surface correlation in the meridian system is much broader than Head's zones. Moreover, at most, the Head's zones are the description merely for the viscera-body surface correlation. The meridians, however, represents multi-form connections such as **body surface-body surface correlation** (refer to Sections 3.3 and 3.7) in addition to the viscera-body surface correlation. Besides, the dermatomal rules are only applicable for areas innervated by cutaneous nerves. They cannot completely explain the 14 meridians distributed throughout the entire body. For example, most of acupoints mentioned above are located in muscles and their sensory afferents are obviously not cutaneous nerves.

We believe that the most crucial implication given by the visceral referred pain or Head's zones to the study of the meridian is the importance of applying the concept of reflex whenever possible.

3.3 Radiating Pain and Body Surface-Body Surface Correlation

Clinically, another type of reflex phenomenon that is even more common than visceral referred pain is the somatic radiating pain, which includes lumbosacral pain or sciatica radiated to the leg or foot along a certain course at the lateral or posterior side of the lower limb. Moreover, it includes pain of the neck and shoulder radiated to the hand along the lateral side of the upper limb, posterior cervical pain radiated to the vertex and even the forehead, trigeminal neuralgia radiated to the face.

The mechanism of somatic radiating pain is usually thought to be induced by pathological changes in conducting pathways of sensations, namely, which is thought to be resulted from corresponding distal portions of the body innervated by the affected nerve. A common pathological change is myeloradiculopathy. When a tumor or a disc hernia pinches the radicle of spinal nerve, pain radiates to dermatomal or muscular segments that correspond to the root of spinal nerve. For other pathological changes, such as neuroma due to damage of peripheral nerve, its pain may radiate to the dominative area of the sensory nerve. This kind of radiating pain can also appear when the posterior funiculus is damaged by dorsal tabes or when substantia gelatinosa is destroyed by syringomyelia ^[62].

It should be particularly noted that the inflammatory swelling of soft tissues surrounding spinal radicle or nerve branches could also be a cause of radiating pain via pinching the nerve. Clinically, this is commonly seen where patients diagnosed with intervertebral disc hernia or vertebrae degeneration, or neck pain manifested symptoms of chronic sciatica, lumbago, or leg pain, or those diagnosed

with degenerated cervical vertebrae manifested symptoms of radiating pain in upper limbs. Through various conservative treatments including acupuncture or local steroid injections, their pain could be effectively eased, sometimes even eliminated. However, changes of intervertebral discs or vertebrae hyperplasia in affected portions of the body remained after symptoms had been subsided. This suggests that the cause of oppressing or stimulating the spinal radicle in inducing regional and radiating pain is mostly inflammation of surrounding soft tissues in the radicle (refer to Section 13.14). The regional anatomical abnormality, such as the existing herniated discs or chronic vertebrae degeneration was merely the basis of making their surrounding soft tissues susceptible to inflammation. For the mechanism of acupuncture in eliminating inflammation and pain, refer to Section 4.3. Certainly, for patients with myeloradiculopathy and with tumor or a disc hernia pinching radicle of spinal nerve, active therapies such as surgeries might need to be applied to eliminate the cause of oppressing nerve for pain relief. Those patients usually have extreme radiating pain without obvious therapeutic effectiveness after acupuncture or other conservative therapies. Accordingly, we propose that acupuncture may be used as a testing therapy for somatic radiating pains, namely, its effectiveness can be used to identify whether the nerve radicle is oppressed substantially or only by inflammation of its surrounding soft tissues.

When peripheral nervous diseases occur, in addition to radiating pain to distal portions innervated by the nerve, there could also be pain propagating to proximal portions of the nerve, or areas innervated by other nerves, even by adjacent segmental nerves. For example, in some patients with carpal tunnel syndrome, due to the median nerve pinched in the carpal tunnel, they not only

had radiating pain and numbness on fingers, but also brachial neuralgia in the upper limb. Some patients, who had injuries in distal sensory nerves, had pain moving upward to the neck. This kind of somatic pain is called **propagating pain**, and its occurrence was considered mostly related to the convergence of pain impulse at nervous centers and multiple-synaptic transmission ^[62].

Somatic radiating pain or propagating pain has different distribution characteristics from that of visceral referred pain. The latter such as Head's zones is mostly located at dorsal and ventral sides of body surface that are adjacent to the corresponding viscera. They are usually distributed as zones or slices, which might manifest segmental characteristics. Somatic radiating pain or propagating pain is distributed continuously on the body surface, starting from the point of pinched nerve and traveling to innervated areas along the nerve and its branches. The radiating pain travels to distal portions of the extremities while the propagating pain travels to proximal portions. Certainly, pain or other symptoms may "hop" around, such as numbness of fingers existing in certain patients of cervical spondylosis, or pain in the lateral leg coexisting with lumbago in certain patients, but these two areas of pain are not connected.

It was found clinically that pathways of somatic radiating or propagating pain are mostly in accordance with some traveling courses of *yang* meridians on the body surface. Applying acupuncture stimulation on selected **tender spots** or **sensitive points** along these pathways usually can achieve good analgesia effects (refer to Sections 13.2 and 13.14). Of course, a few of these pathways are also in accordance with some traveling courses of *yin* meridians. Both the somatic radiating or propagating pain and the acupuncture treatment process for

somatic diseases belong to **soma-soma reflex**. To correspond with the viscera-body surface correlation, we proposed a new term **body surface-body surface correlation**, which can be used to describe reciprocal reflexes between different portions of the soma.

Somatic reflexes described by the body surface-body surface correlation have various types. Somatic radiating pain is only one type, namely the reflex from the diseased region to its adjacent or distal portions on the body surface. In addition, there are reflexes from the diseased side to the healthy side of the body; the reciprocal reflex between upper and lower limbs or between corresponding locations of upper and lower parts of the soma; the reciprocal reflex among tissues located across different depths but at the same location on the body surface (refer to Section 3.7).

Reciprocal connection between bilateral limbs or upper and lower limbs can be explained from their coordination activities. Motor instructions from the cerebrum are usually transmitted through bilateral sides of the body or upper and lower limbs simultaneously. Such controls are often visible in patients of apoplexy/hemiplegia. When the patient is instructed to move a paralyzed limb voluntarily, its symmetrical portion on the contralateral limb or corresponding portion of the other healthy limb may move simultaneously, even though the paralyzed limb may not move at all. This also indicates that the patient has a reduced coordination of the limb mobility, as this phenomenon is not visible in healthy persons. However, when a healthy person is walking quickly or running, it still needs coordinated forward and back swing motions of the upper limbs. Otherwise, the lower limbs cannot move quickly. According to this principle, during the rehabilitation of hemiplegia patients, when voluntary motions of the paralyzed limbs are completely lost, active

exercises of healthy limbs are crucial. This is helpful in the formation of functional compensatory areas in the healthy side of the cerebrum, or dredging the blockage of descending neural impulses to promote recovery of motor functions on the paralyzed limbs (refer to Section 14.9).

Reciprocal reflexes among tissues of different depths at the same location of the body surface are common in various somatic pains. For example, swelling of local soft tissues and the skin redness or warmth in arthritis patients may be the consequences of this type of reflexes (refer to Section 13.6). There is a kind of chronic regional pain syndrome called **reflex sympathetic dystrophy (RSD)**, is also an example of this type of reflex. Usually induced by a trauma of soft tissues on the body surface, RSD results in the dilation of regional blood vessels through sympathetic nerve actions, manifesting symptoms of severe causalgia, tactile hyperesthesia, excessive perspiration, and pathologic changes of the bone, skin, and muscle at trauma region or area innervated by the same nerve (refer to Section 14.4).

When applying acupuncture to treat various somatic pain, there is a method that punctures points at the opposite side of the body, known to ancestral Chinese as *Juci* or *Miuci*, namely **opposite needling method (ONM)**, literally meaning acupoints of the right side were punctured for diseases on the left side, and vice versa. In clinical acupuncture, there are also many stimulation methods of corresponding acupoints on ipsilateral sides but across different limbs, such as stimulate the wrist for ankle pain, stimulate the ankle for wrist pain, stimulate the elbow for knee pain, stimulate the hip for shoulder pain, and so on^[71]. We named this method **puncturing different limbs**, namely puncturing the upper limb for diseases of the lower limb, and vice versa (refer to Sections 11.7). Reciprocal reflexes between bilateral sides of the body or both upper and lower

limbs are the basis of this needling method.

There is another principle of point association in the clinic, i.e., when the pathological reflex points appear at different layers of a single reflex zone of the body surface, concurrent stimulation of them can raise the curative effects obviously. Reciprocal reflexes among various tissues at different depths on the same body surface location are the basis of this needling method.

Concerning the meridian theory, a frequently asked question is how were the traveling courses of meridians discovered or determined. From the aforementioned phenomena on viscera-body surface correlation and body surface-body surface correlation, we have furthered recognition about this question. We believe that the meridians are probably related to the following experiences or observations of ancestral Chinese.

(1) Phenomena of propagating sensations induced by stimulation of needling, moxibustion, or other primitive tools, such as *bianzhen* (flint needle) on the body surface.

(2) Subjective sensations when practicing *qigong*.

(3) Spontaneous meridian phenomena, such as papuloid zones or red lines on the body surface.

(4) Radiating pain, propagating pain, and phenomena of body surface-body surface correlation during the occurrence of somatic diseases.

(5) Various referred pain and phenomena of viscera-body surface correlation during the occurrence of visceral diseases.

Among these factors, observations on the somatic radiating or propagating pain might be relevant in determining the traveling courses of meridians, particularly for courses of certain *yang* meridians, such as BL, GB, and TE on the limbs. Observation on the visceral referred pain might play a major role in determining visceral correspondence and the names of meridians, particularly certain *yin*

meridians, such as HT and PC.

Obviously, classical proposal on the meridian system synthetically represents both correlations of the viscera-body surface and the body surface-body surface. Thus, its contents are much richer and more complicated than Head's zones that only reflect visceral diseases or the somatic radiating pain that only reflects somatic diseases. Accordingly, the distribution differences between the 14 meridians and Head's zones are present. Locations of Head's zones may only result from the reflective output of visceral pathological information on particular areas of the body surface. Descriptions on the 14 meridians may also represent certain stimulation effects of acupuncture, such as various meridian phenomena including PNSAM, in addition to the consideration of visceral and somatic reflective outputs. There were different methods of study and different objects of observation applied in the conclusions of these two phenomena. It may explain the great differences on distributions of the 14 meridians and Head's zones.

However, those recognitions on Head's zone or the visceral referred pain and somatic radiating pain are helpful in analyzing constituents of the meridian system, especially distribution rules of portions correlated to viscera. For example, Head's zones generally are regional, may display without continuation, and may have overlaps of different reflex zones. Somatic radiating or propagating pain also distributes in a band shape. These imply that the meridians might be distributed in a band shape rather than in a line shape. As mentioned in Section 3.1, in recent studies on PNSAM, it was observed that propagating needling sensations were usually in shapes of lines, zones, or slices. Their width is smaller on the extremities, but greater on the trunk. When the propagation of needling sensations reached the chest, abdomen, head, and face area, it expanded toward a larger area. Besides, the portions

of the meridians directly correlated to the viscera might be separated and partially overlapped. The outlook of meridian courses traveling on the body surface is continuous, which might be resulted from the representation of somatic reflexes instead of visceral reflexes. These facts and assumptions about the meridian system have been fully considered in the distribution rules of whole body reflex zones proposed in Sections 3.7 and 3.9.

3.4 Revolutionize the Meridian Theory

The meridian theory is the core of acupuncture therapy, as well as an important portion of fundamental TCM theories. It summarizes the ancient understandings about the reciprocal relationship between the extremities and internal organs, and forms a system that provides a network for communication that connects the upper and the lower, the left and the right as well as the interior and exterior parts of the body. Because it is a valuable experience accumulated in the practice of acupuncture over time, using it to direct clinical treatments certainly has a wide range of effectiveness. From the idea of meridian theory, many novel medical therapies are also derived and developed. However, the meridian theory was gradually formed based on the discovery and applications of acupuncture points. With increasingly newly discovered points and extensive clinical applications, as well as the recent recognition about the essence of meridians, the following limitations in applying the meridian theory have been explored.

3.4.1 The meridian system is insufficient to encompass substantial newly discovered acupuncture points

In classical publications of TCM, acupoints are normally called *Shuxue*, which are the locations on the body surface where *qi* (vital force or energy flow) and blood from viscera or the meridians are outputted, as well as the locations where acupuncture therapies are applied. In general, they can be classified into acupoints of classical 14 meridians, extraordinary points, and *Ashi* points. The 14 meridians are the 12 regular meridians plus CV and GV, and have 361 acupoints in total. Extraordinary points refer to those that were discovered gradually over time and named with their locations defined, but have not yet been categorized into the 14 meridians. *Ashi* points are also called *Tianyingxue* or **indefinite points**. Alternatively, they could also be referred as tender spots or sensitive points. Since most of these *Ashi* points are near the locations where tenderness or other reactions may appear, they do not have particular names or definite locations ^[72,73].

As we revisit the history of the acupoints discovery, the above three categories of points are different but closely associated, and even could be transformed from one to another. First, tenderness or other local reactions are not exclusive to *Ashi* points. Clinical manifestations of *Ashi* points are mainly local tenderness and pain, but it also may include soreness, distension or a subcutaneous hard nodule than can be detected. However, these are not exclusive to *Ashi* points as many acupoints or extraordinary points may have similar manifestations. For examples, Shenshu (BL23) recorded in classical TCM literature, as well as Appendix Point (EX150) and Gallbladder Point (EX152), these two new extraordinary points, all are identified by their local tenderness. Substantial acupuncture practices in the modern age have further demonstrated the

importance of selecting tender spots or sensitive points to improve the clinical effectiveness. Moreover, they mostly appear at or near the locations of classical acupoints or extraordinary points, thus in this case, all three categories of points are the same.

Second, extraordinary points are gradually discovered and developed based on *Ashi* points. They were named as “extraordinary” because most of them were found to have special effects for particular diseases with fixed locations through repeated clinical trials. According to the *Atlas of Extraordinary Acupoints* published in 1963, 588 total extraordinary points were discovered in the past several thousands years. In 1974, however, *Atlas II of Extraordinary Acupoints* described other 1 007 new extraordinary points mainly discovered and verified since 1966. Through verifications, the author added them into the list of extraordinary points and updated their total numbers to 1 595. Actually, due to the limitation of references collected in that publication, many newly discovered points are still missing. These newly discovered or added extraordinary points reflect the accomplishment of modern clinical acupuncture, and they are resulted from an increasing knowledge of anatomical locations of acupoints as well as the development of acupuncture devices.

Third, although most extraordinary points or new points are located outside the courses of classical 14 meridians, some of them are still distributed along the courses but excluded from the system of 14 meridians. For examples, Yintang (EX2) is not included in GV, Taiyang (EX4) is not included in TE, Appendix Point (EX150) is not included in ST, and Gallbladder Point (EX152) is not included in GB, and so on. Moreover, although some are named as extraordinary points, they are really just acupoints. For examples, Sihua (four flowers) points are composed of bilateral Geshu (BL17) and Danshu

(BL19). Huangmen (BL51) is actually Xinshu (BL15). According to ancient records, the reason for many extraordinary points being converted to acupoints of the 14 meridians is due to their distinct locations and significant therapeutic effectiveness. For example, Gaohuang (BL43) originated as an extraordinary point for moxibustion, but due to its special effects for the syndrome of deficiency and fatigue, it was officially enlisted into the 361 classical acupoints during the *Tang* dynasty.

These kinds of derivations could also be shown from an increasing number of acupoints through dynasties. Although the TCM bible *Yellow Emperor's Internal Classic* proposed that the human body has 361 classical acupoints, it actually only recorded 160 acupoint names in total. On this basis, another book *A-B Classic of Acupuncture* recorded 349 acupoint names and in details described their pertaining meridians and portions of the body. Later in the *Song* dynasty, the book *Illustrated Manual of the Bronze Figure* added five more acupoint names: Yangguan (GV3), Lintai (GV10), Gaohuang (BL43), Jueyinshu (BL14), Qinglin (HT2), and reached a total number of 354 acupoint names. In *Ming* Dynasty, other five acupoints: Meichong (BL3), Dushu (BL16), Qihai (CV6), Guanyuanshu (BL26), and Fengshi (GB31) were added in the book of *Great Compendium of Acupuncture* that brought the number of acupoints to 359. Later, the book *Golden Mirror of Medicine* added two more acupoints: Zhongshu (GV7) and Jimai (LR12), and finally reached 361 acupoints as we know today^[74].

Through analyzing the close relationship among three categories of points and the increase of their number, a trend of their derivations may be concluded as below. No matter where the location of the body surface might be, as long as the location was related to certain disease and could receive acupuncture or other external stimulation to treat

the disease, this location was just a point. At the beginning, the point might be a nameless *Ashi* point without a fixed location. However, after its repeated applications and appearances at a fixed location, it was named as a new point. If the location did not lie on the courses of the 14 meridians, then it became only a new extraordinary point. Otherwise, it was enlisted as a new acupoint and was added to the number of original acupoints.

At the present, the total number of extraordinary or new points has grown much larger (at least 1 595) than the number of acupoints (361). Even though, the original courses of the 14 meridians have not altered due to the inclusion of some new points into these courses. On the other hand, because most of these newly added extraordinary or new points do not lie on the courses of the 14 meridians, they are not categorized into classical acupoints. Occasionally, an extraordinary point is composed from several points, such as Shixuan (EX128), Baxie (EX132), Bafeng (EX163), and Huatuojiayi (EX102), of which some may pertain to different meridians. Besides, those points or zones applied in various micro acupuncture therapies, such as auricular acupuncture, hand acupuncture, foot acupuncture, facial acupuncture, nose acupuncture, eye acupuncture, scalp acupuncture, tongue acupuncture, and wrist-ankle acupuncture, are out of the meridian system. Accordingly, the meridian system is no longer able to explain and encompass the dramatically increasing new or extraordinary points anymore.

3.4.2 Classical description about efficacies of acupoints are primitive and the categorization appears preliminary

Theoretically, each name of the 14 meridians, especially the 12 regular meridians should reflect each kind of systemic efficacy of their acupoints. This means they can be used for diseases in the

corresponding viscera or along their traveling courses on the body surface. However, with increasing clinical applications, it is observed that notion is not always true. First, some acupoints located along the same meridian can be used to treat diseases related to other meridians. For example, Neiguan (PC6) located on PC can be used to treat pulmonary and gastric diseases besides heart diseases. Second, some acupoints can achieve similar efficacies, though they are located at different meridians. An example of this is Tinggong (SI19), Tinghui (GB2), and Ermen (TE21), all of which are located in front of the ear, and can be served as master points to treat ear disorders despite being on three different meridians: SI, GB, and TE.

Actually, even if acupoints at a single meridian may only be used for diseases of corresponding viscera or body parts, their main efficacies may still vary. This is especially true for meridians with more acupoints and longer traveling courses, such as ST, GB, and BL. Their acupoints located at distal parts of the body often have multiple efficacies. Only those located at the proximal parts of the body may have fewer efficacies. From the modern textbooks of acupuncture, it is observed that a trend of differentiation or segmentation of efficacies in a group of acupoints of the same meridian but at different parts of the body. Some acupoints, besides being used to treat illnesses of their own meridian, may also be used to treat illnesses of other meridians, thus having efficacies that are more diverse. Accordingly, hypotheses of *heterotherapy with homomerkidian* and *homotherapy with heteromerkidian* were born from the meridian theory to serve as the theoretical basis for the diversification of acupoint efficacies.

The hypotheses of *heterotherapy with homomerkidian* and *homotherapy with heteromerkidian* are based from *zangfu* theory of TCM, primarily from the paired relationship between interior-exterior portions of the

body. However, those primitive dialectical thoughts cannot clarify the efficacies of acupoints. The consequences of such explanation may further complicate the efficacies of meridians or acupoints, even to the extent of omnipotence. Meanwhile, the original names of the 12 regular meridians would lose their value in reflecting the corresponding systemic efficacy.

In TCM, besides the hypothesis of *heterotherapy with homomeridian* multiple efficacies of some acupoints have been also explained with the crossing of several meridians. Those locations are called **meeting points**. Sanyinjiao (SP6) located at the intersection of LR, KI and SP is a typical example. However, acupoints with multiple efficacies are not scattered, instead, there seems to be a trend that they reside very closely, so they still cannot be simply elucidated by the meeting points.

3.4.3 The naming scheme of some meridians or the description about their traveling courses is improper

Ample modern clinical trials of acupuncture have demonstrated that the relationship between certain meridians and their corresponding viscera is somewhat irrational. For example, the notion that parts of SI and LI courses are distributed on the upper limb is incorrect. We believe that they should all travel through the lower limb instead of the upper limb (refer to Section 3.7). The reason behind this mistake might be due to ancient practitioners strictly obeying the *zangfu* theory of TCM, of which the paired relationships between the lungs and large intestine or between the heart and small intestine. Because LU and HT, which connect to the lungs and the heart respectively, are located on the medial side of the upper limb, their correlated meridians, LI and SI, which connect to the large intestine and small intestine respectively, was accordingly considered

to lodge on the lateral side of the upper limb. The *zangfu* theory of TCM on the paired relationships between the interior-exterior may be correct due to its numerous clinical evidences. Nevertheless, the meridians that connect the large intestine and small intestine may not be distributed on the upper limb. Many clinical trials since ancient times have demonstrated that most acupoints used for intestinal diseases are located in the lower limb. Although there are few acupoints of LI and SI used for intestinal diseases, usually they are not master points, and their effectiveness is much less than acupoints on the lower limb. Thus, these two meridians should not named SI and LI.

Besides, there is no physical organ named as **Sanjiao (triple energizer)** in anatomy, though it has been given various modern explanations. For instance, Sanjiao could represent the entire digestive system. The chest and abdomen area could be divided into the **upper, middle, and lower jiao**, respectively. From this, the definition of **Sanjiao meridian (TE)** in the meridian system seems not as clear as the other 11 meridians.

In summary, the meridian theory encounters various challenges from contemporary advancements of acupuncture therapy. When inheriting and revolutionizing the meridian theory, we have to apply knowledge and methods of modern science by eliminating the false and retaining the truth. Only through this way, the meridian theory can be developed into a new height.

3.5 Reflex Zone: A Substitutable Concept for the Meridian

Modern revolutions of the meridian theory are

initiated from breaking the mold of classical thoughts, in which the meridian was regarded as a line and the acupoint was regarded as a spot. It has been observed in the modern age that not only some newly discovered points near an important acupoint have similar efficacies, but also tend to cluster or merge into the same areas or zones.

For example, there are several new points surrounding Zusanli (ST36) that have similar efficacies and are close lodged to each other. They are Lishang (1 *cun* superior to ST36), Zuerliban (0.5 *cun* superior to ST36), Wanli (0.5 *cun* inferior to ST36), and Liwai (1 *cun* lateral to ST36), respectively ^[73]. Actually, as long as the mold of classical thoughts where the meridians are lines and acupoints are spots are broken, we could clearly realize that the four points are only variations of Zusanli (ST36) location. In other words, Zusanli (ST36) is a single zone with a certain area that includes all four new points. Moreover, when several zones with similar efficacies are clustered together, they may form a larger zone on the body surface. For instance, puncturing Zusanli (ST36) is effective for abdominal pain, but puncturing some acupoints near Zusanli (ST36), such as Shangjuxu (ST37), Xiajuxu (ST39), Tiaokou (ST38), or Yanglingquan (GB34), could have similar effects like Zusanli (ST36). In that case, they all can be categorized into the same zone for treating abdominal pain.

Another example is Yifeng (TE17). We observed that a reflective hard nodule could appear around its classical location in patients suffering from toothache, tinnitus, deafness, or Bell's palsy. However, the nodule has a certain degree of position from patient to patient. Some are located a little bit higher, equivalent to the new point Shangyifeng (0.5 *cun* superior to TE17), while some are located a little bit lower, equivalent to the new point Xiayifeng (0.2 *cun* inferior to TE17). Some have a broader hardened area

that includes all three above points. Thus, Shangyifeng, Xiayifeng, and Yifeng (TE17) may in fact become a single large point with a certain area ^[74]. Accordingly, we named it **Yifeng zone**.

Obviously, if an acupoint (e.g., ST36) of a meridian (e.g., ST) is not a spot, this meridian will not be a line, but a zone. This coincides with modern findings about the meridians phenomena as well as PNSAM (propagation of needling sensations along the meridian), which also has revealed the zoning characteristics that meridian courses possess.

During past few decades, a series of new terms have been proposed to describe the zoning characteristics of acupoint distribution. One of the most influential is the concept of **point zoning** proposed by researchers at Shanxi Medical Univ., China, in 1974 ^[76]. Through investigating pathological sensitive spots on the body surface and analyzing efficacies of points, thirty-five point zonings, which are distributed across the entire body, were summarized. They were used to direct clinical acupuncture successfully, and made great contributions to the modernization of acupuncture therapy. However, the proposal of point zonings has distinct weaknesses. First, the classification of point zonings is not superior to that of the meridian system because it does not discover ultimate distribution rules in sorting efficacies of acupoints or new points. Second, the concept of point zonings only describes the property of the meridians being band-shaped, but does not reveal any essence of the meridians. Third, it is disassociated from the meridian theory. Therefore, it is merely a summary of practical experience at best, but unable to be advanced into a new theory to inherit and develop the meridian theory completely.

Until now, despite substantial efforts in anatomic studies of the meridians, there is no special tissue structure of the meridians recognized by

contemporary medicine. Accordingly, most researchers believe that the meridians are only a functional relationship among various parts of the body, or between viscera and the body surface. In terms of cybernetics, the meridians are **information pathways** that connect the left with the right, the upper with the lower, as well as the interior with the exterior portions of the body ^[8]. In 1976, we proposed the concept of **information zones** to substitute the meridians by creating their simplified model, and illustrated an atlas about three main types of information zones (somatic, visceral, and central) of the human body. Meanwhile, we also analyzed the relationship between information zones and the meridian system, and discussed in detail regarding the process of acupuncture therapy, the regulatory mechanism of acupuncture, the analgesia mechanism of acupuncture anesthesia as well as how to solve related challenges ^[1].

As a complete automatic control system, the human body is composed of multiple levels of neural networks that transmit various types of internal and external information. When certain organs or tissues become disordered, information of the disorders may be outputted onto a specified area of body surface, and manifest as a form of **reflex point** (zone). Conversely, stimulating the reflex point (zone) with acupuncture may input controlling information into the human body and treat this disorder through functions of the automatic control system. Acupoint or reflex point is actually the location on the body surface outputting internal information and inputting treatment information from acupuncture. We called these regions of body surface as **information zones**. Those acupoints or reflex points, which reflect activities of a certain organ and have similar efficacies, frequently reside in the same information zones. The atlas about the three main types of information zones was derived from the meridian

system through summaries, reorganizations, and categorizations of miscellaneous efficacies of acupoints.

In the above theory of information zones, the perspective about reflex points and their band-shaped distribution coincides with the experience of point zonings. However, the proposed distribution pattern about three main types of information zones can conclude all efficacies of acupoints, extraordinary points, or new points clearly and scientifically. The concept of information zone also encompasses the meanings of the meridians. Traveling courses of the meridians on the body surface that are constructed with a series of specific acupoints are merely a close resemblance of certain information zones. Information zones are constructed with a series of specific reflex points within band-shaped areas, including pathological and physiological reflex points. These reflex points may just lodge at the locations of acupoints or extraordinary points, or out of the meridians completely. The locations of reflex points may not be fixed, which may depend on changes of diseased conditions or individual differences of patients.

Because the theory of information zones is based on the meridian theory, and it has withstood substantial trials of acupuncture in the past three decades, its truthfulness remains strong and its clinical applications become increasingly extensive. However, in order to comply with the international standard and easily to integrate it into the mainstream of contemporary medicine, since 1998, we have adopted the term of **reflex**, commonly recognized and applied in physiology, to rename the information zone as **reflex zone**. Meanwhile, a color atlas of whole body reflex zones was illustrated to replace the preliminary atlas of information zones ^[2].

Therefore, the reflex zones are just the information zones. However, the proposal of reflex zones has

more vividly and popularly defined and expressed the essence of meridians, which serve as reflective and functional connections. Those regions of the body surface, where reflex points or acupoints with similar efficacies lodge, or where referred pains and other reflex phenomena appear frequently, are named as reflex zones. Those acupoints or reflex points, which make up the reflex zones, are the locations of either outputting internal information from the body or inputting therapeutic information of acupuncture into the body.

We have proposed the term **whole body reflex zones** (or **macro reflex zones**) to describe reflex zones distributed on the entire body surface. It contains all acupoints within classical 14 meridians, extraordinary points, and most newly discovered points, but do not include reflex points or zones used by various micro acupuncture therapies (e.g., auricular acupuncture, hand acupuncture, foot acupuncture, facial acupuncture, nose acupuncture, eye acupuncture, scalp acupuncture, tongue acupuncture, and wrist-ankle acupuncture). The latter is usually called **micro reflex zones**. These two types of zones can complement each other from the whole to the local, and have constructed a complete description about reflex zones across the entire body. Thus, do not confuse the concept of whole body reflex zones proposed in this book with the concept of micro reflex zones proposed by other texts, where those zones only lodge at certain small regions of the body, such as the hands, feet, and ears.

The adoption of the term reflex zones instead of the meridians has many advantages in at least the following aspects.

(1) It may rationally categorize and clarify main efficacies of acupoints located on the entire body surface, and simplify the complex meridian system. Distribution of reflex zones is regular and easily identified, as well as corresponds to the anatomical

terms in contemporary medicine. Thus, it is more convenient for learning and clinical applications.

(2) It develops concepts that an acupoint is not a spot but an area and that a meridian is not a line but a zone. In addition, it provides an approximate range in locating reflex points quickly. Clinical trials have shown that there are shortcuts between reflex points or reflex zones and the diseased regions. Proper stimulation on reflex points would enhance the effectiveness and shorten the treatment course.

(3) It may demystify the hypothesis of *homotherapy with heteromeridian* and *heterotherapy with homomeridian*. In the examples of Tinggong (SI19), Tinghui (GB2), and Ermen (TE21) mentioned earlier, if we extract them from their original meridians and categorize them into a reflex zone, it may be one of the auricular reflex zones. This is definitely easier to comprehend than using classical hypothesis of *homotherapy with heteromeridian*. Similarly, the hypothesis of *heterotherapy with homomeridian* or the term of meeting points may be explained via overlapping of different reflex zones.

(4) It discards certain fictions of the meridian theory. For example, the notion that LI and SI distributed on the upper limb in the meridian system are obviously mistaken because reflex zones for both large and small intestines are distributed on the lower limb instead of the upper limb.

3.6 Formation of Reflex Zones or the Meridians

Before discussing distribution rules of reflex zones, we need to understand the formation process of reflex zones first, namely the formation process of the meridians. This will answer several important

questions: Why can certain regions on the body surface act as reflex zones correlated to other portions or organs of the body? Why do reflex zones or the meridians distributed on the body surface have certain territories?

Currently, the more accepted view is that the meridians or reflex zones are formed within the period of evolution of animals, because not only in humans, but also in many other mammals, such as dogs, cats, horse, ox, and monkeys, similar meridian phenomena or reflex zones have been discovered at their body surface. If so, how are they formed?

From the perspective of close kinship, during the long process of evolution into humans, the primitives had to battle dangerous creatures on the earth and become accustomed to the ever-changing external environment. If there were no sets of complete regulatory systems within their bodies to adjust internal functional changes to adapt to the external environment, they simply would not survive. Instead, they would eventually follow the paths of those organisms in nature that have been extinct. Neural and humoral regulations are known to be two of the most important regulatory systems within the body. They have their own distinct reaction characteristics when encountering internal and external stimuli. The **neural regulation** occurs quickly, and its effects are precise but not persistent. The **humoral regulation** occurs slowly in comparison, but its effects are more extensive and sustain. However, besides these two highly developed mechanisms, there might be the third primitive regulatory mechanism associated with them within the body.

Structures of the body surface include the skin, subcutaneous tissues, muscles, and various sensory organs. They are the main parts of the body that keep in contact with the external environment and receive most external stimuli. The meridians or reflex zones distributed across the body surface and their

pathways connected internal parts of the body may pertain to the third regulatory mechanism, which acts as the a shield against external stimulation. Its regulatory role is achieved mainly through the mechanism of altering thresholds of related pathways, which could minimize the amount of external nociceptive stimulation entering the body.

This kind of regulatory mechanism could be explained as follows. First, let us start with the simplest. Suppose there are two **neural networks** composed of neurons with the same **threshold (h)** shown in Figure 3.2a, and their non-activated state is the normal state. For these kinds of networks, there are two feedback circuits. As long as a neuron in either network receives just a single external inputting signal, even if it is removed immediately after stimulation, the entire network will be engaged and gradually reach a stabilized activated state. Because the latter state has steered off from the normal state, it becomes the disordered state. Similarly, such situation could also occur in more complex neural network systems composed of two networks A and B (Figure 3.2b). As long as either A or B receives just a single excessive intense stimulation, this system will fall into the stabilized activated state. Once it occurs, both A and B will lose their original functions, and therefore influence path characteristics or thresholds of the entire network system, i.e., this network system become “diseased”. Of course, the alteration of thresholds within small networks A or B may also induce such stabilized activation.

Because the organism is a very complex neural network system, it definitely has many such network structures. Therefore, when networks connected to certain organs have received a single excessively intense stimulation, they have the possibility of falling into such stabilized activated state. This situation will definitely occur often if the organism has contacted external environment for a lengthy

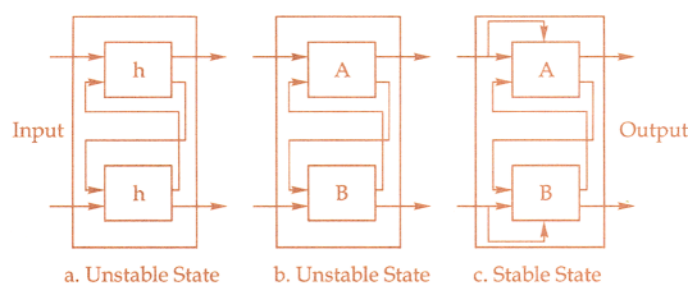


Figure 3.2 The Formation of Reflex Zones or the Meridians

period. Obviously, to prevent the network from falling into the stabilized activated state (diseased state) so easily, A and B have to alter their original thresholds with stimulation (e.g., repeated weak stimulation) by learning. An example is that their previously lower thresholds could be raised. Thus, there must be a mechanism of self-altering thresholds for A and B networks within the organism (represented by the dotted lines in Figure 3.2c). Actually, because neural network system possesses this kind of mechanism, organisms have the ability of self-defense or learning, which helps them avoid falling into the diseased state by accommodating to changes of the environment. In other words, organisms can have a certain level of **self-healing** ability when diseases are not yet deeply rooted in the body.

During the process of receiving external stimulation and reflecting internal activities, not every part of the body surface is influenced in the same way. Instead, some regions are easier to receive external hits or other impacts than others. Accordingly, with a long process of evolution, average thresholds of networks connecting to certain regions on the body surface might have increased, while those connecting to other regions might have decreased, which presents certain patterns of changes. On the other hand, there are corresponding relations between different regions on the body surface and different motor organs, viscera, and nervous centers

(refer to Section 3.7). Accordingly, changes of internal functional activities could influence thresholds of correlated body surface regions. Under actions of both internal and external stimulation, thresholds of the entire body surface could become zoned differentially, forming specific territories that possess different thresholds and distribution ranges. The level of thresholds could often represent the

closeness of reciprocal reflexes or connections between these regions and their correlated organs or tissues. This may be the mechanism for the formation of body reflex zones or the meridians.

The concept of threshold mentioned here is generalized to represent various thresholds of network pathways between two portions of the body that have reciprocal reflexes. Some examples are the skin pain-inducing threshold, pain-tolerance threshold and so on. The levels of these thresholds may influence appearances of referred pain or the meridian phenomena at a specified reflex zone of the body, as well as may determine sensitivity levels on different body surface or reflex zones towards external stimulation including acupuncture.

If the above hypothesis is correct, namely if the formation of reflex zones is the result of the body adapting to nature during the long process of evolution, it may conclude that not only do humans have reflex zones, but other animals may also have reflex zones. This actually has been proven by numerous practices in veterinary acupuncture. Like in the human body, in many mammals, acupuncture at specified areas on the body surface can be used to treat diseases effectively. Moreover, through many laboratory studies in animals like rabbits, dogs, cats, and monkeys, especially the success of acupuncture anesthesia for livestock, a number of invaluable resources for studying the meridian system or reflex zones of mammals has been accumulated.

However, ever since humans began to stand on their feet, their nervous system has been completely developed, including the sophisticated cerebral cortex. Therefore, reflex zones of humans are more exquisite than that of animals. On the human body surface, the distribution rules of reflex zones must possess characteristics different from animals.

Some researchers considered the meridians as the third regulatory system within the human body, which is primitive and latent in comparison with neural and humoral regulations. In fact, this kind of regulatory function still relies mainly on the reflex mechanism of neural-humoral regulations though some local tissues on the body surface like the skin, muscles and some connective tissues may be involved. Therefore, the meridian system should still be a part of the neural-humoral regulatory system, though their reflex pathways are not completely clear.

3.7 Classification and Distribution Rules of Reflex Zones

Reflex zones can be categorized as macro and micro reflex zones. The **macro reflex zones**, i.e., the whole body reflex zones apply the entire body surface as a whole for holographic reflexes, whereas **micro reflex zones** apply certain small parts of the body to achieve the holographic reflexes. The traveling courses of classical 14 meridians on the body surface are actually such phenomena of whole body reflexes. Various micro acupuncture therapies such as auricular acupuncture, nose acupuncture, eye acupuncture, hand acupuncture, foot acupuncture, all use micro reflex zones as the target of stimulation. This

section focuses on analyzing the whole body reflex zones. As for the distribution of micro reflex zones, refer to related literatures.

Based on modern studies in embryogeny, at the early stage of embryo in higher mammals and humans, every somite is composed of three parts: the somatic portion, the visceral portion, and the nervous segment. These three portions will be finally developed to the extremities and trunk (the skin, muscle and tendon), viscera (hollow and solid organs), as well as the nervous system, respectively. Within a somite, the nervous segment delivers somatic and visceral nerves to the other two portions through reciprocal connections, and forms a functional unit. As the organism grows and differentiates, the nervous segment gradually evolves into the suprasegmental higher centers, as well as the spinal cord and brainstem that maintain the segmental shape or segment-like traces. No matter what distance the somatic portion extends to (similar to sprouting), and how the visceral portion transforms (to the sac, tube or solid organs), the original segmental innervations still remain. Moreover, nerve fibers from these two portions have direct or indirect synapse-like connections in corresponding neural segments, and together accomplish regional activities of the exterior-interior correlations under the unified regulation of higher centers (e.g., the diencephalons and cerebral cortex) ^[13].

Above studies of embryogeny provide may help to explain many phenomena on the viscera-body surface correlation within the same segment, which was observed in the clinical acupuncture, as well as to explain Head's zones, i.e., the referred pain of viscera emerges mainly in the same segment (refer to Section 3.2). Moreover, their studies indicate that macro reflex zones emerging at the whole body surface can be categorized as three main types that represent the soma, viscera, and nerve system, thus

we named them somatic reflex zones, visceral reflex zones, and central reflex zones, respectively^[14].

To elucidate distribution rules of these three types of reflex zones on the body surface, let us first introduce the concept of *yin-yang* sides on the body surface.

Animals or primates prior to humans were mostly crawling using their extremities instead of standing on the feet. At that time, in their general position, the back was towards the sun while the abdomen faced the ground. This posture may determine certain differences between different portions of the body surface that are susceptible to stimulation from the external environment. The back and the lateral sides of limbs (the anterolateral side of forelimbs, the posterolateral side of hind limbs) are exposed outward, so they are more easily subjected to external stimuli such as direct sunlight, changes of climate, or other environmental factors, as well as to injuries such as accidental bumps or attacks from rivals in nature. These sides on the body surface pertain to the *yang* side in the ancient *yin-yang* theory. On the contrary, abdomen, the posteromedial side of forelimbs, and the anteromedial side of hind limbs are “hidden” on the medial side, and are less susceptible to external stimuli, so they pertain to the *yin* side. *Yin-yang* sides of the animal body surface are illustrated in Figure 3.3.

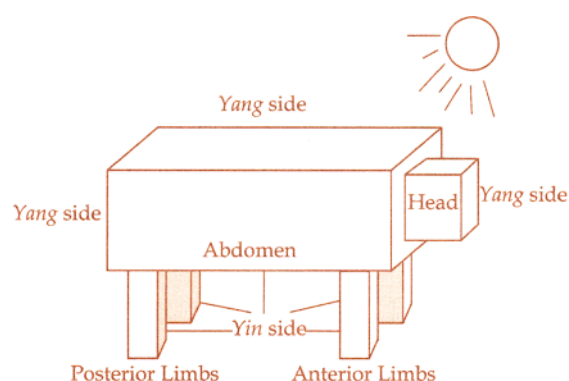


Figure 3.3 Yin and Yang Sides of Animal Body Surface

From the mechanism about the formation of reflex zones in the preceding section, we can understand that sensory thresholds at the *yang* side of the animal soma, which is susceptible to external stimulation, have to be raised for their survival. Meanwhile, sensory thresholds at the *yin* side of the animal soma, which are less susceptible to external stimulation, may become relatively lower. In other words, the *yang* side of the body becomes less sensitive during the process of evolution, it plays a more important role in defense functions of the body, and its connection with viscera have to be relatively weaker. Otherwise, even an accidental stimulus from the environment might trigger disturbance of normal visceral functions. Imagine that if this could happen, how dangerous it would be! Therefore, to survive in a complex external environment, the animal body gradually establishes a series of protective mechanisms, which may include the raised sensory thresholds of *yang* side and the visceral reflexes “hidden” at the *yin* side of the body in addition to the general homeostasis mechanism.

For human body, these distribution patterns of *yin-yang* sides and their characteristics formed in the long process of evolution have not been changed. For instance, the skin of *yang* side is usually thicker than that of the *yin* side, and is more insensitive or hairy. However, because of the standing position, the fore and hind limbs of animals became the upper and lower limbs of humans, respectively, and the anterior side of the lower limb of animals that pertained to the *yin* side became the *yang* side in the human body.

Therefore, we have proposed that the *yang* side of the body is the primary somatic reflex zone, though which can be distributed at every side of the body. As for the distribution of visceral reflex zones that may have a shortcut with the viscera, they may reside mainly at the *yin* side of the body except for

certain adjacent areas of the back.

Now, where should the reflex zones for nervous centers distributed on the body surface? Nervous centers are located within the head and the spine that are at the midlines of the body. Obviously, the middle position enables them to have a shortest connection to both left and right sides of the body. Moreover, nervous centers are responsible for controlling and regulating functions of both the soma and viscera simultaneously, accordingly their reflex zones must be very close. We proposed that central reflex zones for nervous centers are mainly distributed on the head, the midlines of the trunk (especially the back), as well as the boundaries of ventral and dorsal sides (the *yin-yang* sides) of the trunk and the extremities (Figure 3.4).

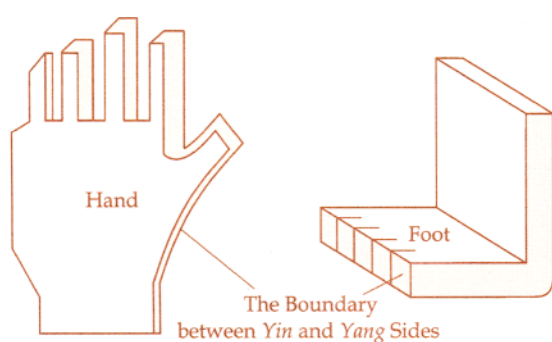


Figure 3.4 Intersecting Borders between Yin and Yang Sides of the Hand and Foot

Actually, names of the meridian system have already embodied the relationship between the meridians and *yin-yang* sides of the body as stated above. In the meridian system, only the 12 regular meridians as well as CV and GV have existing names of acupoints. The 12 regular meridians are divided into six *yang* and six *yin* meridians. Regions that they pass through on the body surface are obviously at either *yang* or *yin* side, respectively. The six *yin* meridians are distributed on the core portions of corresponding visceral reflex zones, while

distribution ranges of six *yang* meridians are consistent with principal somatic reflex zones. Besides, CV and GV that govern *yin* and *yang* of the entire body are located on the midlines of the head and the trunk that are consistent with principal central reflex zones. Therefore, the notion of dividing body reflex zones into those three types is consistent to the original intention of naming the *yin-yang* meridians as well as both CV and GV. Of course, there are some remarkable differences between the distribution rules on reflex zones and the meridian system (refer to Section 3.8). Here we emphasize and introduce the distribution patterns on those three types of reflex zones. As for details on the range of each reflex zone, see Appendix A and Color Figures 2~4 at the end of the book.

3.7.1 Distribution of somatic reflex zones

Generally, somatic reflexes of disorders can be divided into these five forms:

- (1) Reflexes from deep portions to superficial portions.
- (2) Reflexes from the affected region to adjacent or proximal portions.
- (3) Reflexes from the affected side to the healthy side.
- (4) Reciprocal reflexes between upper and lower limbs or between symmetric areas of upper and lower parts of the body.
- (5) Reflexes of the whole body on smaller sensitive regions such as the ears, nose, hands, and feet, i.e., micro holographic reflexes.

Reflexes of disorders from deep portions to superficial portions on the body surface are the basis of manifesting somatic symptoms including skin temperature changes (rise or fall), swelling, pain, or hypersensitivity occurring at affected regions. It also is the basis of *Ashi* points emerging at affected regions and can be used to treat somatic disorders

located at deep portions. For example, when suffering from acute arthritis, some positive reactions such as raised skin temperature, local swelling, pain, or tenderness emerging on the joint surface are caused by this kind of reflexes.

Reflexes of disorders from the affected region to the adjacent or proximal portion of body surface mainly manifest as somatic radiating pain (refer to Section 3.3). It is a basis of describing traveling courses of the meridians on the body surface and is related to the formation of classical meridian system. A typical example of this kind of reflexes is sciatica. Sciatic pain often starts from the lumbosacral area, runs along traveling routes of GB or BL meridians, and radiates down to the foot. Obviously, because these reflexes can be reciprocal, stimulation on reflex points of adjacent or distal areas may reversely treat disorders at the affected region. Clinical manifestations of somatic radiating pain and the therapeutic effects of acupuncture have demonstrated the continuity of somatic reflex zones, as well as the approximate territories of somatic zones distributed on the upper and lower limbs. That is, distal somatic reflex zone of the neck is distributed on the upper limb, while that of the lumbosacral region is distributed on the lower limb. As for the chest between the neck and the lower back, its somatic reflex zone is probably located on both upper and lower limbs: the reflex zone of upper chest is distributed on the upper limb, while that of lower chest is distributed on the lower limb. Such distribution rules of distal somatic reflex zones are similar to that of visceral reflex zones on the limbs, which are separated by the diaphragm. However, due to the continuity of somatic reflex zones, different responsibility of somatic reflex zones on the upper and lower limb become somewhat vague. Certain points of the upper limb can also be used for lumbosacral pains, while certain points of the lower limb can be used

for cervical diseases.

Somatic reflex zones are continuously distributed on the entire surface of the body. Each zone is composed of three sub-zones: the anterior, posterior, and lateral zones (Color Figure 5). They can be further divided into the **meridian regions** on the limbs with names corresponding to specific meridians (see Table 3.3). All courses of the meridian system traveling on the body surface are included. Borderlines between the anterior and lateral zones, as well as between the anterior and posterior zones, actually are the locations of central reflex zones that will be described in the subsequent text. The location of borderline between the lateral and posterior zones is along the postaxillary line on the trunk and along the posterior edge of GB on the upper limb. In addition, it is distributed along the posterior edge of TE on the head, shoulders, and upper limbs.

Generally, the lateral and posterior zones of somatic reflex zones located at the *yang* side are the most important. Reflexes of most somatic diseases appear within these two zones, and when they are stimulated, they often yield greater effectiveness in treating somatic diseases. For example, many common diseases or injuries of motor organs, such as lumbago, sciatica, frozen shoulder, soft tissue injury, neuropathy, and paralysis usually occur at the *yang* side of body. Master points used in treating these diseases also are mostly located at *yang* meridians, such as Yanglingquan (GB34), Xuanzhong (GB39), Weizhong (BL40), Chengshan (BL57), Yinmen (BL37), Huantiao (GB30), Shenshu (BL23), Jianyu (LI15), Quchi (LI11), and Waiguan (TE5).

Continuously distributed three sub-zones of somatic reflex zones have much similarity with six longitudinal zones in the **wrist-ankle acupuncture**, which was developed in the early 1970s. According to its basic method, the whole body is divided into six longitudinal zones from front to back at bilateral

sides of the body, and then select points within corresponding zones and apply superficial needling to treat diseases occurring at the same zones. There are total six stimulation points in the wrist, which are located at the circle about two finger-breadth proximal to the transverse crease of the wrist, and are, in order, termed upper 1~6 from the ulnar side to the radial side of the palmar surface and then from the radial side to the ulnar side of the dorsal surface. There are also six stimulation points in the ankle. They are located at the circle about three

fingerbreadths proximal to the highest points of the medial and lateral condyles, and are termed lower 1~6 in the order circling the ankle from the medial side of the Achilles tendon to the lateral side of the Achilles tendon (Figure 3.5)^[80,81]. Clinically, there are good results using wrist-ankle acupuncture to treat somatic disorders. Its 12 stimulation points can be used as the distal stimulation points within somatic reflex zones.

The relationship between somatic reflex zones and 12 stimulation points of wrist-ankle acupuncture is

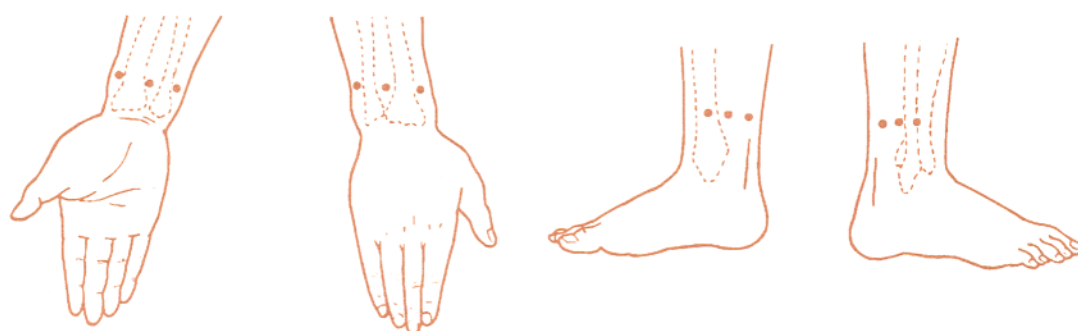


Figure 3.5 Distributions of 12 Stimulation Points for Wrist-Ankle Acupuncture

shown in Table 3.2.

Besides, disorders at one side of the body may be reflected to the contralateral side, especially those symmetric parts, thus stimulation on the latter often could effectively alter the sensitivity or motor functions of the former. Accordingly, the **opposite needling method (ONM)** has been developed since

ancient times, and its effectiveness has been proven by numerous clinical practices. Clinically, acupoints from bilateral meridians with the same name or symmetrical locations on the body surface are selected most frequently (refer to Section 11.7).

Similarly, there are reciprocal reflexes between the upper and lower limbs (Figure 3.6), or between corresponding upper and lower portions of the body, such as hand vs. foot; wrist vs. ankle; upper arm and forearm vs. thigh and leg; shoulder vs. hip; and scapular regions vs. buttocks. Clinically, these reflexes may manifest as the correspondence between certain acupoints of upper and lower limbs, such as Tianzong (SI11) vs. Huantiao (GB30), Jianjing (GB21) vs. Juliao (GB29), Quchi (LI11) vs. Yanglingquan (GB34), Shousanli (LI10) vs. Zusanli (ST36), and Hegu (LI4) vs. Taichong (LR3). Moreover, other

Table 3.2 Relationship between Somatic Reflex Zones and 12 Stimulation Points in Wrist-Ankle Acupuncture

Somatic Reflex Zones	12 Stimulation Points of Wrist-Ankle Acupuncture
Anterior Zone	Upper 1, 2, 3; Lower 1, 2, 3
Lateral Zone	Upper 4, 5; Lower 4, 5
Posterior Zone	Upper 6; Lower 6

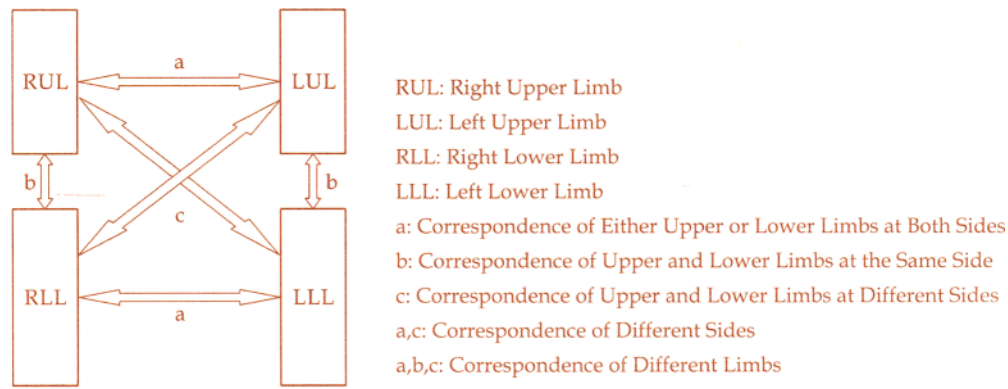


Figure 3.6 Corresponding Body Reflexes of Different Sides or Limbs

upper portions of the trunk also may correspond to certain lower portions (Color Figure 6 at the end of this book). However, these reflexes may not be as important as those that are between bilateral symmetrical portions.

3.7.2 Distribution of visceral reflex zones

Visceral reflex zones may be distributed at the chest, abdomen, and the back, as well as the extremities, but mainly on the *yin* side of the extremities. It is easy to identify *yin-yang* sides on the upper limb, of which the medial side pertains to *yin* side. However, it is somewhat difficult to determine *yin-yang* sides on the lower limb because the leg is cone-shaped, and the anterior side of the lower limb has possessed certain characteristics of *yang* side as discussed in the above text. In the meridian system, portions of three-hand-*yin* meridians, three-foot-*yin* meridians on the extremities are distributed at the *yin* side. The portion of the foot-*yangming* stomach meridian (ST) that traverses on the anterior area of lower limb actually pertains to the *yin* side. However, it was named as *yang* meridian by ancestral Chinese, which perhaps had referred to the standing characteristic of the human body.

Based on the categories of acupoints efficacies, visceral reflex zones can be further classified into six sub-zones. They are lung zones, intestinal zones,

heart zones, urogenital zones, stomach zones, liver, gallbladder, spleen, and pancreas zones (Color Figures 2~4). Because functions of the liver, gallbladder, spleen, and pancreas often being closely associated, as well as acupoints or reflex points used to treat these four visceral disorders are difficult to be distinguished, their visceral reflex zones are categorized into a single one without subtypes. Besides, the integration of urinary and genital reflex zones is from the similar consideration.

For the distribution of visceral reflex zones on the extremities, there is a striking feature, i.e., the diaphragm seems the borderline. Reflex zones of those viscera above the diaphragm (mainly the heart, lungs, esophagus, and a small portion of stomach) are distributed at the upper limb, while those for viscera below the diaphragm (large portion of the stomach, intestines, liver, gallbladder, spleen, pancreas, and urogenital organs) are distributed at the lower limbs. Because the stomach passes through diaphragm and most of it is below the diaphragm, its main reflex zone is located on the lower limb. However, a small portion of the stomach is above the diaphragm, so there is a small reflex zone of stomach on the upper limb. Esophagus is located above the diaphragm that connects upper parts of the stomach, so its reflex zone may reside on the upper limb instead of the lower limb.

Besides, the position of a viscus within the trunk, whether it is at the middle, tilting toward the left or right, may also influence its reflection on the body surface. For example, the location of stomach is approximately in the middle, and lungs or kidneys have one at both the left and right sides respectively, so their reflex zones are almost symmetrical on both sides. The position of heart leans toward left, so its reflex zone on the left upper limb should be the primary one, though it also has a reflex zone at the right upper limb. Similarly, reflex zones for the liver, gallbladder are tilted toward right, and are distributed mainly at the right upper abdomen, right side of the back and the right lower limb. Reflex zones for the spleen and pancreas that are tilted toward left, are distributed mainly at the left upper abdomen, left side of the back and the left lower limb. Because intestine may refer to all of the small intestine, ascending, descending and transverse colons, as well as rectum at various locations, their reflex zones are distributed on both sides generally. However, the principal reflex points of intestines may emerge only at the corresponding one side. “The Gallbladder Point” (EX152) and “Appendix Point” (EX150) are well-known examples of reflex points for the gallbladder and the appendix, respectively. Clinical observation has shown that their reflexes often have the greatest tenderness at the right side. Obviously, they are influenced by internal positions of these viscera.

Are there reflex zones for visceral diseases in the head or facial regions? The answer is affirmative. In general, the head where covered by the hair pertains to the *yang* side. The other portions of the head without hair like the forehead, face, ears, eyes, and nose pertain to the *yin* side. Reflex zones of the viscera located on the head mainly reside at these areas in the *yin* side. This may explain why there are many acupoints or micro reflex zones in these

areas of the head, and yielding greater therapeutic results for visceral diseases, such as Yintang (EX2) for nausea and vomiting, Yifeng (TE17) for thoracic diseases or surgeries (acupuncture anesthesia).

3.7.3 Distribution of central reflex zones

There is a notion that nervous centers cannot achieve effective control and coordination to the left and right halves of the body unless they reside at the midline of the body. Obviously, the brain and spinal cord are indeed distributed like such. Moreover, as the controlling structure for somatic and visceral portions, nervous centers must have shortest pathways connecting both of them. Accordingly, central reflex zones should lodge on the midlines of the body near the brain and spinal cord, as well as at areas between somatic and visceral reflex zones or their boundaries. Besides, in order to increase the flexibility and efficiency of the control, the controlling structure should be as close as possible to sensory organs to facilitate feedback regulations. The examples are those sensory organs (the ears, nose, eyes, tongue, and so on) all lodge on the head area, which are in close proximity to the brain. Therefore, central reflex zones may be adjacent to or overlap with these reflex zones of sensory organs as well.

Accordingly, there are two distribution rules for central reflex zones. First, they are distributed at the nearest locations to the brain and spinal cord, mainly on the head, midlines of the dorsal and ventral sides of trunk. The examples are Shuigou (GV26), Baihui (GV20), Yamen (GV15), Dazhui (GV14), Taodao (GV13), Shenzhu (GV12), Mingmen (GV4), and Yaoyangguan (GV3) of GV, as well as Jiuwei (CV15), Juque (CV14), Zhongwan (CV12), and Qihai (CV6) of CV. All of the above points can be used to treat central disorders. The course of GV at the back is approximately the principal reflex zone of spinal cord. **Scalp acupuncture** is a kind of therapy that

stimulates lines or zones of the scalp surface that are completely corresponded to functional orientations of the cerebral cortex [78,79,81,82]. Those primary lines or zones proposed (Color Figure 7 at the end of this book) are typically local central reflex zones of the brain. They approximately correspond to functional orientations of the cerebral cortex, including the *Motor area, Sensory area, Chorea-trembling controlled area, Vertigo-auditory area, Second speech area, Speech area, Usage area, Foot motor sensory area, Optic area, Balance area, Gastric area, Thoracic area, and the Reproduction area* (refer to Appendix A).

Secondly, central reflex zones are located at the boundaries (called **border zones**) of dorsal and ventral sides of trunk and *yin-yang* sides of the extremities, especially those portions below elbows and knees (Figure 3.4). Because the hands and feet including fingers and toes are the most sensitive parts, central reflex zones at their surface are the most important among all distal central reflex zones. When suffering from central disorders, reflex points may emerge in these zones and can be used to treat central disorders. Shixuan (EX131), Houxi (SI3), Shenmen (HT7), Yanggu (SI5), Bafeng (EX163), Baxie (EX135), Zutonggu (BL66), Shugu (BL65), Jinmen (BL63), Taixi (KI3), and Gongsun (SP4) are distributed densely within these reflex zones.

Note that distal central reflex zone on the hands may be more significant than that of feet or other parts of the body because the hand has a larger representative area in the cerebral sensory cortex than that of other parts. This is the consequence of human hands engaging in labor since they have been released from supporting the body weight along with feet. Therefore, the primary distal central reflex zones in human should be distributed on the hands.

As stated above, we have analyzed basic distribution rules on the three main categories of body reflex zones and their subzones. A summarization

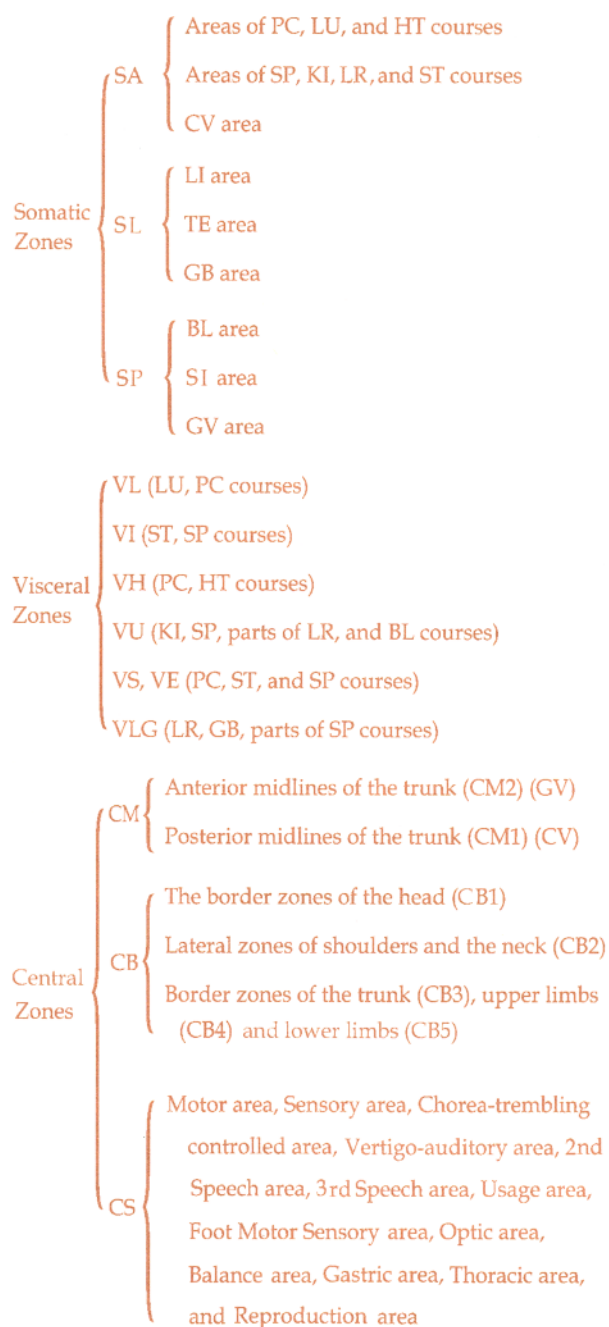


Figure 3.7 Classifications of Whole Body Reflex Zones

of them is provided in Figure 3.7.

3.7.4 Distribution of eye, ear, nose, mouth and throat reflex zones

Are there specific reflex zones for the sensory organs (the eyes, ears, nose, mouth, and so on) located on the head or face? If yes, what is the relationship between them and three categories of body reflex

zones? Based on TCM literatures and clinical experiences, it is known they do have specific reflex zones on the body surface. In addition to the adjacent regions, their distal reflex zones are distributed on the extremities (refer to Appendix A), which are rather closely related to central and somatic reflex zones.

It is known that these sensory organs serve as important “antennas” of nervous centers to receive exterior stimuli from vision, hearing, smelling, and tasting. They cooperate and compensate with other sensory receptors located the body surface, especially on the hands and feet. Therefore, their distal reflex zones should be located generally near or overlap central reflex zones on the extremities. Similar to central reflex zones, their primary zones are distributed on the portions below elbows and knees, especially the boundaries of “*yin-yang* sides” on the hands and feet.

On the other hand, these sensory organs in animals or humans have similar characteristics of serving as motor organs besides sensory organs. For humans, eyes, mouth, tongue, and nose can move, while ears are mostly motionless. However, ears of mammals can move like a motor organ before they evolved into humans. Actually, certain people are able to move their ears at will, which may indicate some humans preserved the characteristic of mammals. Therefore, these organs may also pertain to the soma so that their distal reflex zones should be within corresponding somatic zones. Ears are located on the lateral sides of the body, so their reflex zones on the extremities should be within the territories of lateral somatic zones. For examples, TE and GB points located on the extremities and used to treat auricular disorders, such as Tianjing (TE10), Sidu (TE9), Sanyangluo (TE8), Waiguan (TE5), Yangchi (TE4), Zhongzhu (TE3), Yanglingquan (GB34), Feilong (EX153), Lingxia (EX156), Feitouxia (EX158), Zuyicong (EX159) are obviously primary

components of distal reflex zones for ears. The nose, mouth, throat, and eyes are located on the anterior side of the body, so their reflex zones on the extremities should be within territories of anterior somatic zones, such as Zusanli (ST36), Wanli (EX149), and Xingjian (LR2) on the lower limb and Lieque (LU7) on the upper limb. Because the mouth and throat are closely connected, their reflex zones are categorized as a single zone.

In summary, to determine reflex zones of sensory organs on the extremities, the above two characteristics should be considered synthetically, namely they may be near or overlap with central reflex zones, and they are consistent with corresponding somatic reflex zones. For example, the nose reflex zone on the hands includes Lieque (LU7), Hegu (LI4), and others. Lieque (LU7) is located in the anterior somatic reflex zone and central reflex zones. Though Hegu (LI4) pertains to the lateral somatic zone, it is also one of primary acupoints of central reflex zones, so it becomes a master point for nose disorders. Eye reflex zones on the lower limb are the same. Guangming (GB37) pertains to the lateral somatic zone, also is in central reflex zones, so it is a master point for visual disorders.

Perhaps some people may ask, “Why are there so many important reflex points or commonly used acupoints distributed on the extremities below elbows and knees?” Actually, in the process of forming reflex zones or the meridians, learning mechanisms through altering thresholds of neural networks are also related to the mobility and sensory sensitivity of local tissues, which is the reason why thresholds of neural networks connecting to certain areas, such as hand or foot are susceptible to alterations. Higher incidence of reflex points or important acupoints emerging below elbows and knees is obviously due to the higher mobility of muscles and joints at distal portions of the extremities, as well as

related to the higher sensitivity of the skin on portions affected by the exterior stimuli. If comparing the hand with the foot, because the hand is more flexible and sensitive than the foot, there are more important acupoints on the hand. If comparing different portions on the same limb, the most sensitive acupoints or reflex points lodge at areas near joints, such as the wrist, ankle, elbow, knee, shoulder, hip, and other smaller joints on the hand and foot. Therefore, locations emerging reflex points or zones are directly linked to the mobility and sensitivity of the body portions. This should be a general characteristic for all types of reflex zones of the body.

3.8 Relationships between Reflex Zones and the Meridians

The whole body reflex zones are summarized from the main efficacies of acupoints and extraordinary points, and they have fully inherited the core of classical meridian system. However, as they encompass many newly discovered points or reflex points in clarifying some confusing theories such as hypotheses of *heterotherapy with homomeridian* and *homotherapy with heteromeridian*, they have broken new ground from the meridian system and made a series of innovations. The following are some similarities and differences between three main types of whole body reflex zones and the meridian system.

3.8.1 Relationships between somatic reflex zones and the meridian system

The anterior, posterior, and lateral somatic reflex zones include the traveling courses of the entire

meridian system on the body surface, such as the 12 regular meridians, the 8 extraordinary meridians, the 12 muscle regions, the 12 cutaneous regions, and the 15 collaterals. The anterior somatic zones include traveling courses of the three-foot-*yin* meridians, three-hand-*yin* meridians, and ST on the body surface, as well as their attached muscle regions, cutaneous regions and collaterals. It also contain CV, Chongmei (**penetrating vessel**), and anterior parts of Daimai (**belt or girdle vessel**), Yinweimei (**yin link vessel**), Yinqiaomai (**yin heel vessel**), and *Bie* collateral of CV.

The lateral somatic zone includes parts of GB, TE, LI on the body surface, as well as their muscle regions, cutaneous regions and collaterals, and traveling courses of Yangqiaomai (**yang heel vessel**), Yangweimai (**yang link vessel**), and the major collateral of spleen. The posterior somatic zone includes parts of BL and LI, as well as their muscle regions, cutaneous regions, and collaterals, and parts of GV and *Daimai* on the posterior side of the body, and *Bie* collateral of GV. For the relationship between the 14 meridians and somatic reflex zones in the trunk and limbs, refer to Table 3.3. On the head and face, due to the crossing of many meridians, the anterior somatic zone also includes parts of LI, SI, GB, BL, and GV, while the lateral somatic zone also includes parts of ST and SI.

The somatic reflex zones are continuously distributed across the entire body surface, which is identical with the traveling characteristic of the meridian system on the body surface. Frequently

Table 3.3 Relationships of the 14 Meridians and Somatic Reflex Zones in Trunk and Limbs

Somatic Reflex Zones	The 14 Meridians
Anterior zones	LU, PC, HT, SP, LR, KI, ST, CV
Lateral zones	TE, LI, GB
Posterior zones	SI, BL, GV

seen phenomena of PNSAM (propagation of needling sensations along the meridian) are the best evidence for this kind of continuation. In other words, the existence of continuous distribution of somatic reflex zones is the main peripheral foundation for PNSAM phenomena (refer to Section 5.3).

In the meridian theory, multiple forms of connections between the bilateral meridians are used to express reciprocal somatic reflexes between symmetrical or corresponding portions on both sides of the body. There are four common forms of connections. First, each of the 12 regular meridians has two traveling courses with the same name distributed on the left and right sides of the body symmetrically, but they are connected to the same viscera. Second, through GV and CV, the three-hand-*yang* meridians and the three-foot-*yang* meridians meet in Dazhui (GV14), and the three-foot-*yin* meridians meet at Guanyuan (CV4) and Zhongji (CV3). All bilateral meridians of the same name meet through GV and CV reciprocally. Third, through other crossed networks of bilateral meridians with the same names, bilateral portions of the body connect as a whole. For example, bilateral LI meridians meet at Shuigou (GV26). Fourth, through Daimai (belt or girdle vessel) that encircles the abdomen, the longitudinally traveling three-foot-*yang* meridians and three-foot-*yin* meridians across the body connect bilaterally. The commonly used ONM (opposite needling method) is based on above networks of the meridians. In this book, we describe these networks in terms of contemporary medicine, namely, the somatic reflexes at bilateral sides of the body, and summarize them as therapeutic principles of selecting corresponding bilateral points (refer to Sections 11.7).

3.8.2 Relationship between visceral reflex zones and the meridian system

From distribution patterns of the 12 regular meridians across the extremities, HT, PC, and LU pass through the upper limb, while ST, SP, LR, GB, KI, and BL pass through the lower limb, which is concluded from a long-term observation and numerous clinical trials. They mostly coincide with distribution rules of visceral reflex zones on the limbs described above, except for the following differences. The meridian theory believes LI and SI are used to treat intestinal disorders and are traveling on the upper limb instead of the lower limb. In addition, ST, as the meridian most commonly used in treating stomach diseases, travels on the lower limb instead of the upper limb. On the contrary, according to distribution rules of visceral reflex zones, intestinal reflex zones may be located on the lower limb instead of the upper limb, while stomach reflex zone may either be located on the lower or upper limb. These are two main differences between the meridian system and the visceral reflex zones proposed in this book. Although the recognition of viscera (*zangfu*) in TCM is not identical with those physical internal organs in Western medicine, the depiction of large intestine, small intestine and stomach in both schools of medicine are not too far apart.

As for the recognition that intestinal reflex zones are located on the lower limb instead of the upper limb, it first gained supports with various clinical experiences since ancient times^[83-88], and is in accordance with most literatures about acupoint efficacies. For example, master points used to treat intestinal diseases are usually located at the lower limb, such as Zusanli (ST36), Shangjuxu (ST37), Yinlingquan (SP9), Diji (SP8), and Sanyinjiao (SP6), all of which having excellent results in treating diarrhea, abdominal pain, gas or dysentery. However, when treating intestinal disorders, most acupoints

of LI or SI are not used as master points and their efficacies are not as great as those above-mentioned points in the lower limb, though there were scattered reports on using Quchi (LI11), Shousanli (LI10), Shanglian (LI9), or Xialian (LI8) to treat abdominal pain or diarrhea.

How can we explain classical description about parts of LI and SI traveled on the upper limb? There are probably two reasons. First, according to classical *zangfu* theory of TCM, the six *yin* organs are paired with the six *yang* organs. Specifically, there are an exterior-interior correlation between the lung and the large intestine or between the heart and the small intestine. Ancestral Chinese might accordingly consider LI and SI meridians should lodge on the upper limb along with LU and HT, respectively. Actually, though the exterior-interior correlations between the lung and the large intestine or between the heart and the small intestine have had tremendous clinical evidences, it does not mean that their visceral reflex zones or meridians with correspondences must be distributed at the same limb. Second, some acupoints of LI or SI, such as Quchi (LI11), Shousanli (LI10), Shanglian (LI9), Xialian (LI8), and Hegu (LI4) may have certain efficacies in treating intestinal disorders, but these effects might be realized by an indirect impact on corresponding viscera between these points and the motor organs in the back, abdomen, or the lower limb.

From the 3D animal model of *yin-yang* sides on the body surface (Figure 3.3), we can see that the lateral side of the upper limb (forelimb), where LI and SI lodge, pertains to the *yang* side, one of the primary distribution areas for somatic reflex zones. Because the body movement can greatly affect intestinal functions, and motor organs of the upper and lower limbs are reciprocally coordinated, stimulating some points of the upper limb might affect intestinal functions. However, this kind of

influence may be indirect, and such actions might be realized in two ways. First, it acts on the rectum through continuous distribution of somatic reflex zones on the body surface. Second, it is through somatic reflex zones overlapping with intestinal reflex zones to achieve such influence. The first hypothesis has already been supported by numerous clinical studies including the knowledge of anatomy. It was reported that needling certain acupoints of the 12 regular meridians could effectively relieve constipation^[89], which indicates a certain extent of non-specificity in actions of acupoints in treating constipation. In other words, it is not necessary to stimulate intestinal reflex zones with a specific distribution pattern to achieve such results. According to the knowledge of anatomy, the upper 2/3 of rectum is composed of smooth muscle, while the lower 1/3 is composed of striated muscle, i.e., the skeletal muscle. Rectum is the terminal portion of the large intestine, which function has much correlation with intestinal functions or symptoms, such as constipation and diarrhea. Thus, constipation may be treated with stimulation on either 12 regular meridians or somatic reflex zones. As for concepts of visceral reflex zones overlapping with somatic reflex zones, refer to the subsequent text.

The recognition of stomach reflex zones distributed on both upper and lower limbs has been supported by ample clinical trials or references about acupoint efficacies^[83–88]. For example, many acupoints at upper limbs, such as Shousanli (LI10), Neiguan (PC6), Jianshi (PC5), and Laogong (PC8) are chosen to treat gastric diseases or symptoms, such as nausea, vomiting, acid reflux, peptic ulcer, and gastritis. In addition, these acupoints are located at the *yin* side of the upper limb. On the other hand, many acupoints or reflex points on the lower limb also can be used as master points for gastric diseases. Zusanli (ST36) is their representative. Therefore, classical

description about ST, which travels along the lower limb instead of the upper limb, is obviously incomplete, and needs to be complemented.

Because the visceral reflex zones on the limbs are band-shaped instead of lines, each of them may be

segments of TE on the upper arm all pertain to border zones of the upper limb. Almost all courses of GB and KI on the lower limb and partial courses of BL and SP on the leg pertain to border zones of the lower limb (Table 3.5).

Table 3.4 Relationships between the 12 Meridians and Visceral Reflex Zones of the Limbs

Visceral Reflex Zones	12 Regular Meridians
Lung zones	LU, PC
Heart zones	PC, HT
Stomach zones	PC, ST, SP
Intestinal zones	ST, SP
Urogenital zones	KI, SP, BL, partial LR
Liver, gallbladder, spleen, and pancreas zones	LR, GB, partial SP

composed of acupoints with similar efficacies that are located on two or more meridians. For example, the lung reflex zone on the medial side of upper limb may contain local segments of LU and PC. The intestinal reflex zone of the lower limb may contain local segments of ST and SP. Table 3.4 lists the corresponding meridian segments of every visceral reflex zone on the limbs.

3.8.3 Relationship between central reflex zones and the meridian system

Central reflex zones located at the midline of head and trunk are similar with traveling courses of GV and CV. Almost all acupoints of the 12 regular meridians on the extremities pertain to the territories of central reflex zones. Most meeting points of the 12 regular meridians on the head also are located within central reflex zones (scalp zones). Segments of meridians located on the boundary of *yin-yang* sides of the trunk and limbs pertain to the territories of central reflex zones (border zones). For instance, segments of LI, SI, and HT on the forearm and

Table 3.5 Relationships between the 14 Meridians and Central Reflex Zones on the Limbs

Central Reflex Zones	The 14 meridians
Middle zones	GV, CV
Border zones Upper arm	LI, TE
Forearm	LI, SI, HT
Hand	LI, SI, TE, HT, PC, LU
Thigh	GB, KI
Leg	GB, KI, BL, SP
Foot	ST, GB, BL, SP, LR, KI
Trunk	GB
Scalp zones	GV, BL, GB, TE, ST

3.9 Local Overlapping and Layering of Reflex Zones

In the meridian system, many important acupoints can be applied to treat either visceral or somatic disorders. From the perspective of acu-reflexology, it is considered as the consequence of overlapping visceral and somatic reflex zones on those points. Because visceral and somatic reflex zones appear on the body surface concurrently, their local overlapping is inevitable. In addition, certain acupoints can be used to treat disorders of several viscera, which also may be due to overlapping of corresponding several visceral reflex zones on those points. Similarly, central reflex zones have local overlapping areas with visceral reflex zones as well as somatic

reflex zones. Thus, the overlapping of different types of reflex zones might explain why many common acupoints possess miscellaneous efficacies. The following are some frequent overlapping among several reflex zones.

3.9.1 Overlapping of somatic and visceral reflex zones

Somatic reflex zones cover the entire body surface while visceral reflex zones are only partially distributed at the *yin* side of the extremities (especially below the elbow and knee) and certain areas of the chest, abdomen, and the back on the trunk. Main overlapping regions of somatic and visceral reflex zones are below the elbow and knee of the *yin* side of the limbs, as well as on the chest, abdomen, and the back. In addition, there may be overlapping regions of these two types of reflex zones on the medial side of the upper arm and thigh. In the human body, the anterior side of lower limb not only preserves the distribution of visceral reflex zones (e.g., stomach and intestinal reflex zones), but also possesses the characteristics of *yang* side (e.g., against the gravity, and maintenance of the standing posture), having distribution of primary somatic reflex zones. Thus, somatic and visceral reflex zones also may overlap on the anterior side of lower limb.

It is known that not all acupoints of the 12 regular meridians and the 8 extraordinary meridians can be used for visceral disorders. Suppose all acupoints including the 12 muscle regions and 12 cutaneous regions only represented somatic reflex zones of the whole body, then those acupoints used to treat visceral disorders such as Zusanli (ST36), Yanglingquan (GB34), Neiguan (PC6), and Shousanli (LI10), would be considered as the overlapping locations of somatic and visceral reflex zones. In other words, any acupoint used to treat both visceral and somatic disorders are located at overlapping

regions of their reflex zones. It is also correct to assume that any acupoint or reflex point located at overlapping regions of both somatic and visceral reflex zones should be the most important stimulation locations. For overlapping scopes of somatic and visceral zones at the medial sides of forearms and legs, see Color Figures 8D and 10E at the end of the book.

3.9.2 Overlapping within visceral reflex zones

The overlapping phenomenon of several visceral reflex zones at the medial side of upper arm is evident. Clinically, certain primary acupoints of PC at the medial side of forearm, such as Ximen (PC4), Jianshi (PC5), Neiguan (PC6), and Laogong (PC8) can be used to treat disorders of the heart, lungs, or the stomach. This might be because these points are located at an overlapping region of the heart, lungs, and stomach reflex zones (Color Figure 9).

Overlapping of several visceral reflex zones on the lower limb is also obvious (Color Figure 11). The stomach and intestinal reflex zones overlap at the anterolateral side of the leg. The intestinal zone, urogenital zone, liver, gallbladder, spleen, and pancreas zone overlap at the medial side of the leg. Certain important acupoints of the lower limb, such as Zusanli (ST36), Diji (SP8), and Sanyinjiao (SP6) have multiple efficacies, which might due to such overlapping of corresponding visceral reflex zones. There is a special area at the medial side of the knee, between Ququan (LR8) and Yinlingquan (SP9), which is overlapped by the urogenital zone, liver, gallbladder, spleen, and pancreas zone as well as the intestinal zone. From our experience, when these viscera have pathological changes, this region might show certain positive reactions, and stimulate this region would achieve a better therapeutic effectiveness for corresponding visceral diseases (refer to Sections 21.5 and 22.4).

Visceral reflex zones also have the overlapping

phenomena on the trunk. For example, VI and VU zone on the abdomen overlap almost completely. VH, VL, and VS zones on the chest partially overlap with each other. VL and VS zones on the chest overlap with a partial VLG zone. On the back, there are partially overlapping of VH, VL, VS, and VLG zones, and overlapping of VI and VU zones. There is an inverse triangle at the lumbosacral area, including Dachangshu (BL25), Guanyuanshu (BL26), Ciliao (BL32), Shiqizhuixia (EX111), and Yaoyangguan (GV3) that are perhaps overlapping areas of VI and VU zones. From our experience, when these viscera have pathological changes, this region might show certain positive reactions, and stimulate this region would achieve a better therapeutic effectiveness for the corresponding visceral disease (refer to Sections 21.3, and 22.4). For the overlapping scopes of different visceral reflex zones, see Color Figures 2~4 at the end of the book.

3.9.3 Overlapping between central and somatic or visceral reflex zones

Central reflex zones are located at midlines of the trunk and boundaries of *yin-yang* sides of the extremities. They may overlap with either visceral and/or somatic reflex zones distributed at the same region (Color Figures 8c,e and 9c,d at the end of the book). Because of such overlapping, there are many acupoints of GV and of the extremities can be used for somatic, visceral, and central disorders.

The above are the overlapping of three major types of whole body reflex zones on certain areas of the body surface. The following are **layered characteristics** of reflex zones.

As analyzed in the preceding Section 2.3, an acupoint located at muscular portions of the body may have a certain depth, and its tissue structure may have more than one layer. Perhaps one might ask the following questions: What layer of tissue

structure pertains to the somatic, visceral, or central zones while these reflex zones appear on an overlapped region of the body surface simultaneously? Are these reflex zones on the skin, subcutaneous tissues, muscles, or other tissues? What are the differences between their reflex layers? What are the differences of reflex layers between different visceral reflex zones? Does the overlapping of reflex zones occur at the same or different layers of the tissue structure? To answer them, we have to first clarify whether reflex zones on the body surface actually have layered characteristics.

We consider most reflex zones with certain depths have layered characteristics, which direct evidences are the observed meridians phenomena, including the propagation needling sensations along the meridians (PNSAM). It was reported that when puncturing every *jing (well) point* of the three-foot-*yin* meridians, all of PNSAM met at Sanyinjiao (SP6), then separated and ascended along their own courses of meridians^[13]. This experiment indicated that the three-foot-*yin* meridians should be independent or layered when they passed through Sanyinjiao (SP6). Otherwise, after they met, why could they keep their propagating sensations along their individual courses?

Actually, although the meridian theory did not tell about the layering effects of meridians, there were certain cues from the meridian system. The first is the proposal of the meeting points, of which Sanyinjiao (SP6) is an example. The second is that in the meridian system, both the muscle and cutaneous regions of the meridians are divided into 12 systems along with the 12 regular meridians. The 12 muscle regions are the muscular system that pertains to the 12 regular meridians, while the 12 cutaneous regions and the 15 collaterals are sections of the meridians on the skin. Their distributions generally coincide with traveling courses of the 12 regular meridians,

but they usually do not enter viscera. Therefore, all these regular meridians, muscle regions, cutaneous regions, and collaterals could be considered as different layers of somatic reflex zones.

Clinically, pathological reflex phenomena of the body surface often emerge at different layers of points. For examples, some of them may manifest skin hypersensitivity, skin rash, or papuloid while others may be subcutaneous hard nodules, thickened or hardened tendons, or muscular tissues. Sometimes, for tenderness appearing at the same point, even if the degree of tenderness is similar, the depth of tenderness may differ according to differences of diseases.

On the other hand, positive reactions of somatic or visceral disease at local or distal reflex points may have different depths. For somatic diseases, their positive reactions in local or adjacent reflex points may appear on all layers from the superficial to deep tissues. However, in the distal reflex points, due to the consecutive characteristic of somatic reflex zones, the positive reactions may only appear at the layer with the same tissue structure as the diseased region. In other words, the tissues in distal reflex points showing positive reactions of somatic diseases may be identical to the diseased tissue structures. For instance, reflex points of skin diseases often emerge on the skin or subcutaneous tissues, while reflex points of muscular diseases reside within the muscular layer. Reflex points of neuralgia also emerge on the nerve trunks or branches. When applying therapeutic stimulation at these reflex points, targeting corresponding tissue layer usually has better results. For visceral diseases, however, the depth in their local or distal reflex points may be both superficial, such as Head's zones and visceral referred pains.

In summary, tissue structures at different depths of the body surface, either superficial or deep, are possible to become the location where reflex zones

emerge. It is still unclear the depth difference between somatic and visceral zones as well as that among different visceral zones. However, it is worthy of endeavor in further studies. Claiming the layering characteristic of reflex zones is beneficial to clarify the distribution rules of reflex zones appearing and overlapping at different depths of the body surface. It is also crucial to enhance therapeutic effectiveness by accurately striking corresponding sensitive centers within points during clinical acupuncture.

3.10 Relationships between Micro and Macro Reflex Zones

In the meridian system, the meridians are distributed on the whole body, while only some of them are on the portions of the body surface. In other words, a limited region or portion of the body surface only correlates with partial viscera or tissues of the entire body. However, ample practices have demonstrated that certain micro regions of the body, such as the ears, nose, hands, feet, tongue and the face, can correlate with the entire body including all viscera and portions of the body^[90]. The meridian theory cannot explain these phenomena well, but it is rational from the perspective of reflex, as the human body is a perfect automatic control system, every portion of which is reciprocally correlated and coordinated. Their neural networks are reciprocally connected via nervous centers, so information of the whole body can be more or less reflected onto certain micro regions of the body surface.

There is a common characteristic for various micro reflex zones, which always emerge at the most

sensitive and flexible areas of the body or in sensory organs. For example, ears, nose, tongue, eyes, and face, as well as hands and feet are either very sensitive or flexible parts of the body, or are sensory organs themselves. The 12 stimulation points of wrist-ankle acupuncture are also near the two flexible joints of the body: the wrist and ankle. Presently, one may have noticed that micro reflex zones for micro acupuncture therapy have almost “occupied” all sensitive or flexible areas of the body except genitalia. Why not every portion of the entire body could become micro reflex zones? The reason might be that some of **information pathways** within the body have different thresholds or resistance that may be formed during the process of biological evolution, which might result in great differences of reflex zones formed at different regions. Comparing with other portions of the body, the ears, nose, tongue, eyes, and face, as well as hands and feet have very close and reciprocal correlations with other organs and tissues of the body, and have a greater significance in adapting to the environment. Moreover, when these portions are stimulated via acupressure or acupuncture, their hypersensitivities might lead to better therapeutic effects.

However, comparing these micro reflex zones, we can see there are distinct differences in their efficacies, which mostly depend on whether they have routinely received external stimulation, as well as the structure and functions of these specified regions. For examples, the auricular reflex zones are more effective than the hand or foot reflex zones. The hands or feet are constantly under frequent external stimulation, such as during walking, standing, picking up and grabbing things. This routine stimulation may gradually lower the sensitivity of these regions, especially those bulged portions that pertain to somatic reflex zones, resulting in weakened effects from subsequent

therapeutic stimulation. Thus, in this case, only a stronger stimulation may produce distinct results. However, auricular reflex zones are different from that in hands or feet. They seldom receive external physical stimulation, thus during the treatment, even weak stimulation, such as light pellet-pressure on the point can induce good results. Of course, on the hands and feet, certain “hidden” *yin* regions that pertain to visceral reflex zones (e.g., concaved areas near the middle of the palm and sole) may still have a relatively high sensitivity toward the external stimulation. Therefore, when using the same intensity level to stimulate reflex zones on the hands or feet, its influence is more distinct on visceral zones in comparison to that on somatic zones. When stimulating somatic zones, it is advised to provide a stronger stimulation. Actually, nowadays, stimulation areas used by **reflexologists** of the feet and hands are no longer limited to palms or soles, as they are already extended to other areas of the extremities ^[91~93], achieving better efficacies.

The micro reflex zones existing at various parts of the body may also be divided into somatic, visceral, and central reflex zones. Their distribution rules are similar to the whole body reflex zones. Somatic zones and visceral zones are mainly distributed at *yang* and *yin* regions, respectively, while central zones are located at the boundaries of *yang* and *yin* regions. The identification of *yin* or *yang* region for micro reflex zones is different from that for the whole body reflex zones. It may be distinguished by the concavity and prominence of distribution areas, of which those concaved locations usually are less susceptible to the external stimulation than those bulged, therefore the concaved pertains to *yin*, while the bulged pertains to *yang*. Actually, this principle of *yin* or *yang* regions of micro reflex zones coincides with the one used for the whole body reflex zones.

The concaved and bulged areas in the ear are

clearly shown in Color Figure 12. The concaved areas include the cavum conchae, cymba conchae, and triangular fossa where visceral reflex zones might concur, while the bulged areas include the dorsum of auricle, scapha, and supracurs antihelix where somatic reflex zones might be located. The boundaries between concaved and bulged areas are antihelix, antitragus, antihelix-antitragus notch, and interthagic notch where central reflex zones might be located, such as *Spine* on the antihelix, *Subcortex* and *Brainpoint* on the antitragus, *Brainstem* on the antihelix-antitragus notch, and *Endocrine* on the interthagic notch. Likewise, the concaved triangular fossa might pertain to visceral reflex zones (*Uterus* or *Reproductive organs*), while the boundaries between it and the supracurs antihelix (reflex zone of the lower limb) might pertain to central reflex zones, of which resides an important and commonly used point *Shenmen*. Such distribution patterns of central reflex zones might also be obvious in micro reflex zones of the hand or foot.

In the whole body reflex zones, the diaphragm serves as a borderline of visceral reflexes at upper and lower limbs. It is also presented in micro reflex zones, such as that in the ear^[95,96]. Primary concaved parts of the auricle are divided by the helix crus that may represent the diaphragm, into the cavum conchae and cymba conchae. Inside the cavum conchae might mainly reside reflex points that could treat disorders of the heart, lungs, and upper portions of stomach, while inside the cymba conchae might mainly reside reflex points that could treat disorders of lower portions of stomach, intestine, liver, spleen, pancreases, gallbladder, bladder, and urogenital organs. Such distribution patterns of micro visceral reflexes in the cavum conchae and cymba conchae are similar to that of whole body visceral reflexes on the upper and lower limbs but with an inverse direction. The cavum conchae which

might represent the viscera above the diaphragm is below the helix crus, while the cymba conchae that might represent the viscera below the diaphragm is above the helix crus. In the micro visceral reflex points of nose acupuncture, there might be similar distribution patterns with the auricular points.

Note that in either micro regions or the whole body, the formation of reflex zones possess both characteristics of precise localization and vague diffusion, which may be resulted from **accurate reflex** and **vague reflex** respectively. The vague reflex is also known as **diffusible reflex**. Because of the diffusible reflex, be cautious when using micro or whole body reflex zones to diagnose diseases. In addition, it may be just the reason for the relative specificity in actions of acupoints.

Hinted from the notion of diffusible reflex, it is more important to learn and understand distribution rules of reflex zones rather than memorizing their precise territories. For example, a relatively trustworthy rule for auricular visceral reflex zones are that they may be distributed at the concaved areas, but their exact territories may vary. Remember, those descriptions or atlases about distribution of auricular points are merely empirical conclusions from some practitioners, thus they often differ in different texts. Until now, no convincing scientific evidences about them have been provided.

3.11 A Simplified Model of Reflex Zones or the Meridians

Figure 3.8 is a simplified model for the meridians or reflex zones, which is composed of three parts, soma, viscera, and nervous centers along with their

connecting pathways. This model has included modern studies about embryogenesis that every somite of higher mammals and human body are composed of these three parts during their embryo stage (refer to Section 3.7). In addition, all somatic and visceral activities or functions are coordinated through nervous centers. Figure 3.8 can be further simplified to Figure 3.9.

Because the human body uses many feedback systems to adapt changes of the environment, all of these systems are reciprocally connected. Not only certain activities of certain tissues or organs may

influence functions of other organs or tissues, but they also have to be coordinated. There are plenty of examples in daily life. When a person tries to perform movements of the lower limbs, it needs coherent support from the upper limbs. When sprinting, not only are the lower limbs and the lumbosacral part in motion, but the upper limbs are also needed to be forcefully swung back and forth. If the upper limbs were kept still, then muscles of the lower limbs could not move. This is an example showing that different parts of the body have to be coordinated during movements.

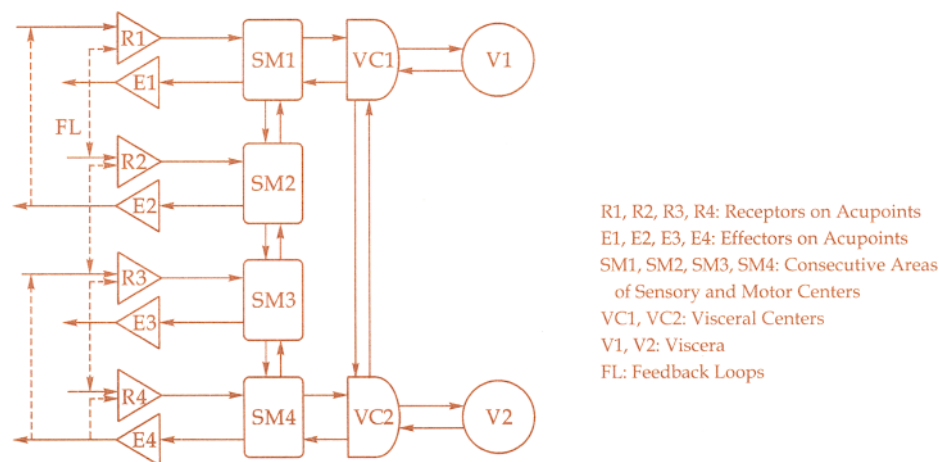


Figure 3.8 A Model of Reflex Zones or the Meridians

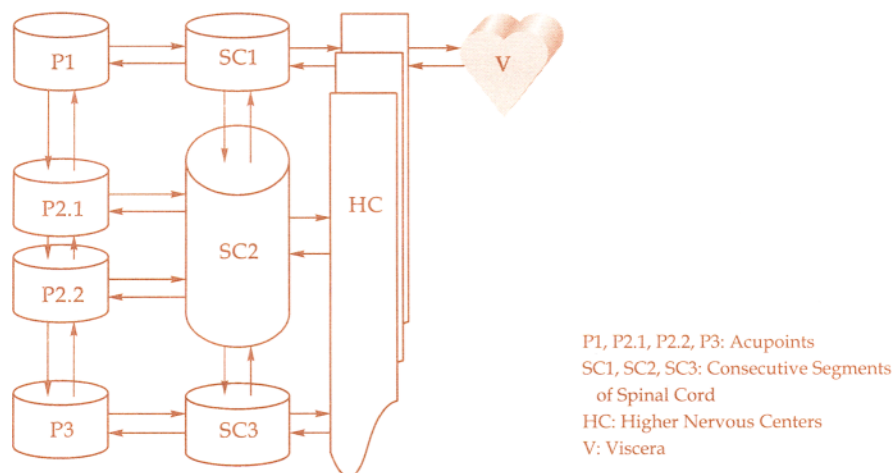


Figure 3.9 A Simplified Model of Reflex Zones or the Meridians

A similar relationship of coordination exists between viscera and soma. When a person enters an active exercise mode of the entire body from a rest state, not only do the muscles of the entire body begin to move, but also the sympathetic nervous tone will increase due to the stimulation of nervous centers by increasing demand for oxygen and energy during the activity. Accordingly, there will be faster heartbeats, increased pulmonary ventilations, temporary inhibitions of the gastrointestinal activities, and redistribution of the blood supply in the entire body.

No matter where the coordination occurs, among various somatic parts, between viscera and soma, or among different viscera, it needs to be completed through neural networks with the involvement of nervous centers. As for nervous centers that participate in the formation of reflex zones or the meridians, usually they are multi-leveled.

Because neural networks of the human body is very complex and unclear until now, this model simplifies nervous centers as the **visceral center (VC)** and **somatic center (SM)**, which only receives somatic sensory inputs and controls movements (Figure 3.8). Somatic parts are simplified as **somatic sensory receptors (R)**, **somatic effectors (E)** and **feedback paths (FP)** that represents the peripheral connection. Various viscera are represented by the symbol V. The connection line between the visceral center (VC) and viscera (V) does not only represent neural networks, but may also represent the connection to humoral factors.

Not only there are feedback paths ($E1 \rightarrow R1$, $E2 \rightarrow R2$, $E3 \rightarrow R3$ or $E4 \rightarrow R4$) between effectors and sensory receptors (such as $E1$, $R1$, $E2$, $R2$, $E3$, $R3$, or $E4$, $R4$), but also when they are very close, they may form a circuit between each other. Suppose $R2$, $E2$ are near $R1$, $E1$, $R3$, and $E3$, then $E2 \rightarrow R1$, $E2 \rightarrow R3$, $E1 \rightarrow R2$, and $E3 \rightarrow R2$ may form a circuit. This kind

of circuit may be realized by changes of tension in the regional tissues (such as muscle fibers), as well as their vibration or twitching (refers to Section 5.4). Therefore, connections in this simplified model are not neural.

In this model, the coordination between viscera (V) and somatic parts (R, E) may be achieved through the circuit of $R \rightarrow SM \rightarrow VC \rightarrow V \rightarrow VC \rightarrow SM \rightarrow E \rightarrow R$. The coordination between viscus 1 (V1) and viscus 2 (V2) may be achieved through the circuit of $V1 \rightarrow VC1 \rightarrow VC2 \rightarrow V2$, while the coordination between various somatic parts may be achieved through the circuit of $R1 \rightarrow SM1 \rightarrow SM2 \rightarrow E2 \rightarrow R2 \rightarrow SM2 \rightarrow SM1 \rightarrow E1 \rightarrow R1$, and may also be achieved through the feedback connection between $E1 \rightarrow R2$ and $E2 \rightarrow R1$.

In this model, $R1$, $R2$, $R3$, $R4$,... and the corresponding $E1$, $E2$, $E3$, $E4$... may represent either various acupoints of the 14 meridians or corresponding reflex points within the whole body reflex zones, as well as represent various micro reflex zones within certain regions of the body, such as the auricle. They correlate with various organs, tissues of the body, and corresponding nervous centers. Therefore, this model can describe either the formation of whole body reflex zones and the meridians, or the formation of micro reflex zones on certain small parts of the body.

In addition, there are the shortest feedback paths (circuits) for any part of the somatic surface $E1$, $E2$, $E3$, $E4$ with their corresponding nervous centers $SM1$, $SM2$, $SM3$, and $SM4$ (refer to Figure 3.8) as below.

Circuit 1: $E1 \rightarrow R1 \rightarrow SM1 \rightarrow E1$

Circuit 2: $E2 \rightarrow R2 \rightarrow SM2 \rightarrow E2$

Circuit 3: $E3 \rightarrow R3 \rightarrow SM3 \rightarrow E3$

Circuit 4: $E4 \rightarrow R4 \rightarrow SM4 \rightarrow E4$

If the threshold of first circuit is lower compared with the surrounding second, third and fourth

circuits, as long as R1 received a lower intensity level of external stimulation (e.g., finger pressing, needling, moxibustion), the center SM1 will sense it, which indicates R1 is more sensitive than R2, R3 and R4. Meanwhile, R1 or E1 area is just a sensitive acupoint, while other relatively insensitive areas, such as R2, R3, and R4, might not be locations where acupoints lodge. If thresholds of these four circuits are lower than that in the surroundings, then all of them are acupoints. If they also have lower threshold connections with a single viscus, then the line linking them together is just a classical meridian (refer to Section 4.1).

When suffering from certain visceral or somatic disorders, corresponding reflex points may emerge at certain areas on the body surface as below. In Figure 3.8, certain areas E1 and E2 on the body surface have the following shortest feedback circuits with a certain viscera (V1), respectively.

Circuit 1: $E1 \rightarrow R1 \rightarrow SM1 \rightarrow VC1 \rightarrow V1 \rightarrow VC1 \rightarrow SM1 \rightarrow E1$

Circuit 2: $E2 \rightarrow R2 \rightarrow SM2 \rightarrow SM1 \rightarrow VC1 \rightarrow V1 \rightarrow VC1 \rightarrow SM1 \rightarrow SM2 \rightarrow E2$

When viscus V1 becomes dysfunctional or diseased, the path threshold of $V1 \rightarrow VC1$ is first altered, which may influence inputs and outputs between VC1 and SM1, and latter affected the feedback path of $SM1 \rightarrow E1$ or $SM1 \rightarrow SM2 \rightarrow E2$. Therefore, there may be an increase of local sensitivity (e.g., tenderness) or other positive reactions such as hard nodules at R1 or R2 area, indicating the emergence of reflex points. If R1 is a location of acupoint and R2 is a non-acupoint, then positive reflexes or reflex points from V1 may emerge at either acupoint (R1) or non-acupoint (R2). However, because Circuit 1 has a lower threshold than that of Circuit 2, in most cases, the reflex point of V1 often emerges at R1 that originally pertains to the acupoint.

It is the same for somatic motor organs when they

become diseased. Circuits between E3 of the body surface and the other two parts E1 and E2 are as follows.

Circuit 1: $E3 \rightarrow R3 \rightarrow SM3 \rightarrow SM2 \rightarrow SM1 \rightarrow E1 \rightarrow R1$

Circuit 2: $E3 \rightarrow R3 \rightarrow SM3 \rightarrow SM2 \rightarrow E2 \rightarrow R2$

Circuit 3: $E3 \rightarrow R3 \rightarrow SM3 \rightarrow E3 \rightarrow R3$

Suppose E3 of certain somatic part becomes diseased, it may change the threshold of the first circuit and have a reflex point of E3 appear at the original acupoint R1. It may also change the threshold of the second circuit and have another reflex point of E3 appear at R2, which originally is a non-acupoint. In addition, it may change the threshold of the third circuit and have the third reflex point of E3 appear at R3 of E3 region, which is just an *Ashi* point recognized clinically.

According to the same principle, when nervous centers SM1, SM2, or SM3 becomes diseased, at least there will be certain reflex points emerging at R1, R2 or R3 of the body surface.

When these reflex points merge into clustered regions or zones, they become corresponding types of whole body reflex zones or those micro reflex zones.

In the subsequent text, this model will also be applied to clarify various meridian phenomena due to reciprocal reflexes, relative specificity in actions of acupoints, and analgesia, rehabilitation, and regulatory effects of acupuncture, as well as characteristics of propagating needling sensations.

3.12 Reflexotherapy: the Ascription of Acupuncture

The essence of meridians, which is the basis of

acupuncture therapy, has been discussed in the above text. Actually, acupuncture is one kind of external therapy, and the meridians system stimulated by acupuncture is a primitive description about reflex zones that appear on the body surface with certain distribution patterns. Primary effects of acupuncture are realized through the reflex process of the human body. If there were no neural reflex arcs, there would be no existence of the meridians and effects of acupuncture. Thus, acupuncture therapy is indeed one kind of **reflexotherapy**. We have proposed a new term **acu-reflexology** to define **the reflex theory and techniques of acupuncture directed by modern science** [3].

Claiming that acupuncture is one kind of reflexotherapy, not only can clarify therapeutic mechanisms of acupuncture and the essence of meridians that have been mysterious for thousands years, but also very advantageous to guide acupuncture practitioners in their clinical practices. Acupuncture practitioners can focus their attention on the transmission characteristics of acupuncture information and corresponding control means to overcome the randomness in the therapeutic process and to raise the certainty of effects.

In the last several decades, there have already been substantial valuable experiments and clinical studies in these aspects. The following are some examples that consider acupoints as the endings inputting or outputting reflex information. Shi *et al.* studied the intermediate substance that might transfer mechanical force of needling to tissue structures related to produce various needling sensations within acupoints. They observed that fibers of connective tissues were the initial structures to transfer mechanical forces of needling to the stretched adjacent tissues [153]. Zhang *et al.* innovated a type of measuring apparatus of needle-manipulation techniques that could assess changes of physical quantity simultaneously when

twisting, lifting-thrusting, and swinging the needle [159]. Dong *et al.* set up one type of objective indicator, the graph of needling-evoked potentials, which was reproducible and compatible for responses around the needle induced by 10 kinds of simple needling techniques. Moreover, they compared the relationship between those needling techniques and types of afferent fibers from the cutaneous and muscular nerves activated by them [160,161]. In addition, there were studies on main sensory receptors within certain commonly used acupoints such as Hegu (LI4), Zusanli (ST36), Sibai (ST2), Shenmen (HT7), Shaohai (HT3), and Neiguan (PC6), and segmental characteristics of their afferent and efferent fibers [16,68~70,162]. Obviously, further studies in this field are very helpful to control the randomness in the operation and to increase the reproducibility of effectiveness.

Besides, categorizing acupuncture as a kind of reflexotherapy has a great promotion role to advance other forms of reflexotherapies. The meridian system is the richest recognition about connections among different portions of the body, the interior and exterior, the left and right, the upper and lower, while whole body reflex zones derived from the meridian system expand micro reflex zones from the hand, foot, and ear to the entire body. It can guide point selection and association for acupuncture, as well as massage or other modalities. In addition to acupuncture, stimulation means applied on reflex zones may be massage, *tuina*, chiropractics, infrared radiation, laser, electrical therapy, magnetic therapy, external application of Chinese herbs, and so on. Accordingly, effectiveness of various classical reflexotherapies will be greatly enhanced. Acupuncture serves as a type of reflexotherapy with the unique oriental style and is ready to be integrated into the mainstream of contemporary medicine along with other modalities.

However, because acupuncture is one kind of

reflexotherapy, its application also subjected to certain limitations. For example, though acupoints or reflex points are outputting endings of internal information on the body surface, reflective information acquired often are vague and partially dependable. Although acupoints or reflex points are inputting endings of physical stimulation into neural networks of the body, the therapeutic information input from them are also non-specific and cannot ensure to be inputted into corresponding nerve networks, their roles in altering the property of network are also uncertain. These are possible reasons why applications or therapeutic effectiveness of acupuncture therapy is still limited. In fact, this common weakness is possessed by almost all reflexotherapies.

Certainly, after comprehending the weakness of acupuncture as one kind of reflexotherapy, we may need to seek a strategy to overcome it. In Part Two, we will make systemic considerations on reciprocal characteristics of reflexes, including outputs of diseased signals on the body surface, inputs of acupuncture signals onto reflex points or acupoints, as well as various influencing factors of signal transmission in the entire therapy. All these considerations will be used to direct acupuncture techniques. The purpose is to obtain optimal effects provided by acupuncture therapy. All these contents as well as the following discussions about mechanisms of acupuncture and the propagation of needling sensations pertain to the scope of **acu-reflexology**.

Mechanisms of Acupuncture Functions

A new concept on **whole body reflex zones (WBRZ)** has been proposed in the preceding text to substitute the meridian system. However, as a complete theory developed based on the meridian theory, acu-reflexology should be able to explain all phenomena that occur during the clinical practices of acupuncture. In this chapter, our discussion will focus on the relative specificity in actions of acupoints, as well as the mechanisms for functions of regulation, analgesia, and rehabilitation of acupuncture. As for principles of propagation of needling sensations, we will analyze them in Chapter 5.

4.1 Relative Specificity in Actions of Acupoints

Is it possible to achieve similar effects when stimulating either non-acupoints or acupoints? Or are there particularly effective acupuncture points when treating certain diseases? This has been a controversial question for a long time, but it is almost conclusive, and the answer is definite. As seen in the relationship between acupoints and acupuncture actions, there are two opposite aspects: **specificity**

and relativity in actions. The combination of them is referred as the **relative specificity in actions of acupoints.**

In general, the specificity in actions of acupoints is manifested in three aspects. First, the differences of acupoints or locations stimulated may influence the incidence and degrees of acupuncture effects. For example, clinical studies showed that the stimulation on Shuigou (GV26), Suliao (GV25), and Yongquan (KI1) could significantly raise the blood pressure, while minimal or no effects are present when other acupoints are stimulated. Actually, there are significant differences between different acupoints or between acupoints and non-acupoints on most functions of the circulatory system, including heart rate, cardiac contraction force, vasoconstrictive activities, as well as the blood pressure. In 2001, Chiu *et al.* of Taiwan, China reported differences of EA-induced neural activation detected by manganese-enhanced functional magnetic resonance imaging (fMRI) in rabbits. Results showed that the stimulation on Zusanli (ST36) resulted in an activation of the hippocampus, whereas stimulation on Yanglingquan (GB34) resulted in an activation of hypothalamus, insula, and motor cortex. Moreover, each acupoint had a corresponding cerebral linkage^[97].

Second, stimulate different acupoints may influence properties of acupuncture effects. For

example, puncturing Yamen (GV15) and Huagai (CV20) could increase the amount of neutrophilic white cells and decrease the amount of eosinophilic white cells. Yet stimulation of Naohu (GV17) could yield complete opposite results. Puncturing Zhaohai (KI6) could promote urination after the water load in canines, but puncturing Shenshu (BL23) showed its inhibition.

Third, there is a reciprocal enhancing relationship among efficacies of different acupoints. For example, puncturing Shenmen (HT7) showed the effect of decreasing blood pressure for experimental hypertension, while puncturing Dadun (LR1) could further enhance the decreasing effect. However, same results did not occur for other points of KI. Currently, there is insufficient evidence for special reciprocal inhibiting relationship among actions of different acupoints.

The specificity in actions of acupoints exists during either needling or moxibustion. Zhai *et al.* of Shanghai, China observed in the tumor-bearing mice that cellular immune functions of those groups accepting moxibustion treatment at different acupoints were maintained at a relatively higher level. Among them, Guanyuan (CV4) group seemed to be the most impressive in immune regulation^[36]. Lee *et al.* of Korea demonstrated in spontaneously hypertensive rats that moxibustion at Xinshu (BL15) and Xiaochangshu (BL27) had distinct differences in impacts of blood pressure and renal functions. Results showed that the urine volume increased significantly after moxibustion at BL15 but decreased at BL27. The systolic blood pressure decreased after moxibustion at BL15, but this effect was not observed at BL27. The urinary excretion of Na⁺ decreased after moxibustion at both BL15 and BL27. Their mechanisms might differ. Results also showed that plasma levels of aldosterone and renin activity increased significantly, while levels of atrial natriuretic peptide

decreased significantly after moxibustion at BL15. On the contrary, plasma levels of both aldosterone and atrial natriuretic peptide increased significantly after moxibustion at BL27^[98].

However, the specificity in actions of acupoints is also relative. This kind of relativity exists in three aspects. First, puncturing an acupoint may influence functions of multiple organs. For instance, needling Zusanli (ST36) could affect not only functions of the digestive, respiratory, and circulatory systems, but also defensive and immune functions of the body.

Second, stimulation at different acupoints may induce the same effects on certain physiological functions. For instance, puncturing anyone of Renying (ST9), Dazhu (BL11), Feishu (BL13), Chongyang (ST42), Lidui (ST45), and Zhongwan (CV12) could strengthen respiratory functions, while needling anyone of Shimen (CV5), Renying (ST9), Zusanli (ST36), Hegu (LI4), Neiguan (PC6), Sanyinjiao (SP6), Yongquan (KI1), and Taichong (LR3) could lower the blood pressure. Among many double-blinded, placebo-controlled clinical studies of acupuncture reported, researchers could not detect significant differences between the group with real acupuncture that received acupuncture at specific acupoints and the group of control that was treated with sham acupuncture at non-specific locations (refer to Sections 15.4, 25.1~25.3). It suggested that there might be also similar effects between certain acupoints and non-acupoints stimulated, which is a manifestation of the **relativity in actions of acupoints**. These situations often occur while puncturing acupoints and non-acupoints located within the same reflex zone.

Third, under different conditions, effects of stimulating same acupoints on a certain organ may vary. They often depend on preexisting states of that organ prior to acupuncture. For example, puncturing Neiguan (PC6) could either slow down the faster

heart rate for tachycardia or increase the slower heart rate for bradycardia, even though tachycardia and bradycardia occur in the same patient alternately. The effect of Neiguan (PC6) in changing the heart rate is relative rather than absolute.

Thus, efficacies of acupoints are considered relatively specific. However, some acupoints may have a greater specificity and a lesser relativity, while other acupoints are vice versa. For example, points within central reflex zones may have lesser specificity in actions than that of other two types of reflex zones. In other words, there may be a greater relativity in their central actions such as antidepressant and relief from addictions (e.g., smoking, alcoholism, and drug addiction) (refer to Sections 15.4, 25.1~25.3).

The relative specificity in actions of acupoints is difficult to be explained using the meridian theory. A prevailing viewpoint of modern physiology is using **dermatomal rules** to describe the relationship between the viscera and corresponding body surface (refer to Section 3.2). Because a certain region or a group of acupoints on the body surface has the same segmental innervations with corresponding viscera, needling some acupoints at the region will produce some special effects for the corresponding viscera. On the other hand, the same region on the body surface are often innervated by several consecutive neural segments, and their sensory afferents have extensive connections within nervous centers, which can be further connected to various viscera through the endocrine system. This causes a generalization of acupoint efficacies, i.e., the relativity of special actions of acupoints. However, this kind of explanation is still controversial because distribution patterns of acupoints, which have specific efficacies, are not always in accordance with the dermatomal rules. Among them, many acupoints are often trans-segmental, and their actions are not merely limited

to regulatory functions of viscera. Therefore, to our current knowledge, there must be some kind of unknown mechanisms involved.

From the perspective of acu-reflexology, the specificity in actions of acupoints is determined by two basic characteristics of acupoints. The first is the sensitivity of acupoints. It has been demonstrated that many sensory receptors or nerve branches are distributed within acupoints and extraordinary points, so these points often possess a higher sensitivity than surrounding non-acupoints. In other words, thresholds of sensory receptors within acupoints and their connected neural networks are lower than its surroundings. Thus, with the similar level of intensity, stimulation at acupoints may input more information than at non-acupoints.

The second is the reflectivity of acupoints. Because reflex zones that can reflect physiological or pathological states of the corresponding organs or tissues, acupoints within reflex zones should have a greater functional specificity than other acupoints outside reflex zones. Take visceral reflex zones as an example. Because acupoints constituting certain visceral reflex zones are reflex points that can reflect physiological functions or pathological states of corresponding viscera, they have shortcut connections to the viscera. Accordingly, these acupoints are optimal locations of stimulation when applying external therapies such as acupuncture to treat corresponding visceral disorders.

However, in the formation of reflex zones, there are dual characteristics of reflexes: the precise localization and vague diffusions. Thus, not only the boundaries of reflex zones are rather unclear, but also several visceral reflex zones may be locally overlapped. Acupoints located at the overlapped area should have effects on multiple visceral functions. In addition, because of continuous distribution of somatic reflex zones on the body surface, they may

overlap with coexisting visceral reflex zones that are distributed in segments. When either needling or moxibustion with a greater intensity stimulate any acupoints or sensitive points outside visceral reflex zones, it is still possible to induce certain levels of effects on the corresponding visceral functions. Moreover, inputs by stimulation of acupoints are merely non-specific intervention after all, which may evoke extensive or diffused effects, especially when humoral factors are activated. Lastly, no matter what responses of the body may occur, they all are achieved by automatic regulation of neural networks within the body. Therefore, properties or directions of those responses resulted from stimulation of acupoints are also influenced by preexisting functional states of the body. All these may explain the relativity in actions of acupoints.

The relative specificity in actions of acupoints can be further clarified using the simplified model of reflex zones showed in Figure 3.8, where the shortest circuit from certain portions of the body surface E1, E2, E3, and E4 to a certain viscus V1 is as follows:

Circuit 1: $E1 \rightarrow R1 \rightarrow SM1 \rightarrow VC1 \rightarrow V1 \rightarrow VC1 \rightarrow SM1 \rightarrow E1$

Circuit 2: $E2 \rightarrow R2 \rightarrow SM2 \rightarrow SM1 \rightarrow VC1 \rightarrow V1 \rightarrow VC1 \rightarrow SM1 \rightarrow SM2 \rightarrow E2$

Circuit 3: $E3 \rightarrow R3 \rightarrow SM3 \rightarrow SM2 \rightarrow SM1 \rightarrow VC1 \rightarrow V1 \rightarrow VC1 \rightarrow SM1 \rightarrow SM2 \rightarrow SM3 \rightarrow E3$

Circuit 4: $E4 \rightarrow R4 \rightarrow SM4 \rightarrow SM3 \rightarrow SM2 \rightarrow SM1 \rightarrow VC1 \rightarrow V1 \rightarrow VC1 \rightarrow SM1 \rightarrow SM2 \rightarrow SM3 \rightarrow SM4 \rightarrow E4$

When the threshold of the first circuit is lower than other nearby ones such as the second, third, and fourth circuits, as long as there is a lower intensity of external stimulation, such as acupressure, needling, or moxibustion acting on area R1, the center SM1 will sense it. Meanwhile, a certain impact on the function of V1 will occur. Therefore, at this time,

R1 or E1 is the acupoint that has the shortest path to V1. In other words, stimulating R1 has a more distinct influence to V1 than stimulating nearby non-acupoints or other acupoints at R2, R3, or R4, namely R1 has the specificity.

If thresholds of the second and third circuits are as low as the first circuit, all of R1, R2, and R3 may be acupoints with specific effects on V1. When they cluster into an area, it will become a reflex zone of V1 on the body surface. If they only form a line, it would be a portion of the traveling course of a classical meridian on the body surface. During acupuncture at these points, even a weak stimulation may greatly affect functions of V1. If thresholds of the second and third circuits are slightly higher than the first circuit, stimulating R2 and R3 with greater stimulation intensity will still have a certain level of effects on V1, which may even be realized indirectly via feedback connections between them and R1. In this case, R2 and R3 can be considered as acupoints without the specificity in actions on V1.

Suppose R4 is an acupoint outside the reflex zone of V1, namely its threshold of connected neural networks is much higher than other three circuits. If so, it seems that R4 does not have the specificity of actions on V1, but still has its own lower threshold circuit with the viscus V2: $E4 \rightarrow R4 \rightarrow SM4 \rightarrow VC2 \rightarrow V2 \rightarrow VC2 \rightarrow SM4 \rightarrow E4$. Thus, R4 is a reflex point or acupoint with the specificity in actions on V2.

Because of the connections between E4 and R1, R2, R3 or between R4 and E1, E2, E3, the excitation induced by the stimulation on R4 with greater intensity may propagate to locations of E1, E2, and E3. It may influence functions of V1 through the first three circuits. Likewise, the excitation induced by stimulation on R2 or R3 may propagate to E4 to influence functions of V2 via the fourth circuit. These might explain the principle about the first two types of relativity in actions of acupoints. The third type

of relativity might be achieved mainly by changing the threshold of circuits.

From above, it is clear that the specificity in visceral actions of acupoints is the most significant for acupoints within a single visceral reflex zone, while acupoints located at overlapping areas of several visceral reflex zones have a greater relativity of actions. Other acupoints located outside this visceral reflex zone lack the specificity in actions on this viscus. If comparing differences of specificity of acupoints among various types of reflex zones, we assume the least specificity is for acupoints within somatic reflex zones that continuously distribute across the whole body, and the greatest for acupoints within visceral reflex zones. In other words, the specificity of acupoints used for somatic diseases is lesser, while the specificity of acupoints used for visceral diseases is greater. As for central reflex zones, regional zones located on the scalp or spinal vertebrae may have a greater specificity of actions, such as scalp zones that were originally proposed due to their nearby correlations with corresponding functional areas of the cerebral cortex. However, distal central zones located on the extremities may not have distinct specificity in their actions of nervous excitation or inhibition. If this hypothesis can be proved, it will have an important instructive significance for selection of optimal points in clinical acupuncture.

After analyzing mechanisms on relative specificity in actions of acupoints, the concept of acupoint and relationship between acupoints and reflex points are further clarified. There are two aspects for the concept of acupoint. An **acupoint** is a location on the body surface where either external stimulation information can be inputted or internal physiological or pathological information of the correlated organs or tissues can be outputted. The first aspect suggests that any sensitive location on the body surface where

certain sensory receptors or nerve endings lodge densely may become an acupoint. Needling, moxibustion, and other external therapies can be applied over there. The second aspect indicates that an acupoint is either a reflex point or not a reflex point at all. Reflex points are actually locations where there are shorter connecting pathways between the locations and viscera or other body portions, and where internal physiological or pathological information from correlated organs and tissues may output. Not all acupoints are reflex points. That is the relationship between classical acupoints and reflex points.

Of course, if based on a generalized concept of point beyond the meridian system, points are those more sensitive locations on the body surface, while reflex points are those points with more distinct specificity. Though a point may not be a reflex point, a reflex point must be a point. It is either acupoint or an extraordinary point. If it is newly discovered, then it is called a new point.

Classical acupoints may also serve as an indicator function for mapping reflex zones because their anatomical locations have been clearly defined and documented in TCM texts. Clinically, when a reflex point appears at the location of an acupoint, the name and anatomical location of the acupoint are used to describe the reflex point. In our WBRZ charts (Color Figure 2~5, 13~17 at the end of this book), the boundaries for each reflex zone are marked with certain acupoints.

In summary, due to the characteristics that acupoints are more sensitive than their surrounding non-acupoints and that most acupoints usually are located within certain reflex zones, the needling actions at acupoints are more significant than that at non-acupoints. This is the **specificity in actions of acupoints**. However, tissues of non-acupoints surrounding acupoints usually have the same

innervations as those acupoints, and the only difference between them might be the stronger stimulation required by the activation of non-acupoints. From this perspective, the specificity in actions of acupoints is also relative, and a modern view about **points may exist anywhere on the body surface** might be correct in certain situations, such as when applying EA with an intense stimulation.

Of course, optimal actions of acupuncture can be obtained only when acupoints or reflex points of corresponding reflex zones are stimulated. A classical TCM statement **better missing acupoints than the meridian** emphasized the importance of meridians over acupoints during the point selection process. From our experience, to complement the above statement, we proposed another statement **better missing the meridian than reflex points**. Truly, the importance of reflex points as **specific acupoints** is increasingly emphasized in contemporary medical acupuncture. The **relativity in actions of acupoints** could also be summarized using the **diffusible reflex** (or vague reflex) (refer to Section 3.10). For either the output of internal information of the body or the input of intervening information from acupuncture stimulation to the body, their reflexes could either be accurate from point to point, or extensively diffusible. Accurate reflexes are the basis of specificity in actions of acupoints, while diffusible reflexes are the main reasons behind the relativity in actions of acupoints.

4.2 Mechanisms of Regulatory Functions of Acupuncture

Although effects of acupuncture on body functions is miscellaneous, ample studies since 1950s have

shown that one of the most significant features of acupuncture is its regulatory function. This effect mainly depends on the preexisting functional state prior to acupuncture. When functions are in a hyperactive state, acupuncture may reduce it. When functions are in a hypoactive state, acupuncture may enhance it. When functions are imbalanced, acupuncture may regulate it to the relative balance. Therefore, this kind of regulatory effect is benign and bi-directional.

Over the years, there have already been systematically reports on the regulatory effects of acupuncture on the entire body, including various physiological systems such as viscera, neural system, endocrine system, blood ingredients, defensive and immune functions, as well as the metabolism process and certain organic changes of tissues and organs. For more details, refer to related review articles ^[29]. As for contents closely related to clinical acupuncture, refer to related diseases in Part Three.

The regulatory effects of acupuncture manifest not only throughout the whole body, but also at stimulated regions. The following are two examples that are closely related to the effectiveness of acupuncture. The first is the regulation of local sensitivity or **pain threshold**. Oftentimes, there were many sensitive tender spots emerging locally after injuries of soft tissues. When these tender spots or *Ashi* points were stimulated with acupuncture, their sensitivity levels were immediately lowered. On the contrary, sensitivity levels of certain portions on the body surface in some patients were low during the initial session of stimulation, but with more sessions of acupuncture, their sensitivity toward stimulation with the same intensity were gradually raised.

The second is the regulation of local muscle tension, where the practitioner may often feel **tenseness and dragging sensations around the needle (TDSAN)** when puncturing certain points

with a lower muscle tension. This kind of feeling is resulted from an increased regional muscle tone. Similarly, after needling, the muscle strength could be enhanced from the preexisting lower state. On the contrary, regions with local higher muscle tensions may become relaxed after needling. In some patients, when puncturing certain locations, tension of local tissues or a needle-stuck feeling could be felt initially. However, with certain needle-manipulations and some length of needle-retaining period, the local tension could disappear completely. When removing the needle, the feeling around the needle could be just like sticking into a piece of *tofu*, where there was little or no resistance at all. This kind of regulation of muscle tension is especially significant during EA. It also serves as an excellent example for classical principles of *asthenia requiring tonification*, and *sthenia requiring purgation* in TCM. When functional activities of the body are imbalanced, needling stimulation will regulate and promote the recovery of balance based on the requirement of normal physiological activities through self-regulatory systems of the body.

Concerning the mechanism of regulatory effect of acupuncture, although it is not completely clear presently, generally, it is thought to be realized through neural-hormonal reflex activities, of which there are four scenarios ^[29].

(1) Through various neural reflexes such as axonal reflex, spinal reflex and whole body reflex, acupuncture can result in instant regulatory effects on functions of corresponding organs and tissues. For instance, the excretion of bladder, movement of the rectum and instant contraction of blood vessels and other reactions could be induced by this way. In general, this regulatory way of acupuncture occurs quicker but does not last long, and has shorter post-stimulation effects.

(2) Directly through autonomic nervous centers

and indirectly through the endocrine system to regulate various visceral functions and secretions of glands. This way, acupuncture can have an impact that is more extensive on the body.

(3) Regulate various humoral factors, especially hormones. This can be further divided into two ways. The first is that acupuncture act on related organs directly through effects on hormone secretion. For instance, the blood sugar and vasoconstrictive function could be regulated through secretion of adrenaline, and the production of breast milk could be regulated through secretion of prolactin. The second is that acupuncture act on target organs through the feedback control of hormone secretion. For example, contraception by acupuncture might be due to the negative feedback to excessive secretion of **luteinizing hormone (LH)** and **follicle stimulating hormone (FSH)** induced by needling. Ultimately, they might interfere with the maturing process of the follicle as well as ovulation.

(4) Regulate functions of the cerebral cortex, then further affect the subcortex centers or the endocrine system and regulate functions of various organs. For example, it was said that acupuncture action to reduce blood pressure in treating primary hypertension was completed by this way.

Accordingly, both neural and humoral mechanisms are associated during regulatory process of acupuncture. However, they may vary with different situations. Sometimes neural factors are primary, and humoral factors are secondary, while other times, vice versa. Sometimes a single type of effect induced by acupuncture is realized through multiple ways, while other times, multiple functions can be realized through a single way. Sometimes the primary way varies at different stages of development of acupuncture effects. For example, the initial increase of the white blood cell count induced by acupuncture was mainly achieved through the

neural reflex, but post-stimulation sustaining of such effect was primarily achieved via humoral factors.

However, it must be noted that no matter what complicated ways regulatory effects of acupuncture are realized through, they all pertain to the category of reflex regulations and depend on intact neural reflex arcs. In laboratory experiments, when portions of the arcs, such as local sensory receptors, afferent nerves, efferent nerves, or nervous centers were destroyed functionally or structurally, such regulatory effects of acupuncture could disappear or be weakened. Clinically, same results were observed in patients with corresponding neurological diseases.

It is also reasonable to view the regulatory effect of acupuncture from the perspective of cybernetics. Imbalance of functional activities or disorders of the body can be considered as changes of thresholds in certain neural networks inside the automatic control system of the body. Thresholds of neural networks in the healthy body are usually constant, or may vary within a small range. However, when diseases occurred, certain thresholds might become either higher or lower, so that functions of the body are separated from the balanced states in different directions.

Structures of the human body are very similar to **homomorphic machine** in cybernetics. If a portion of the body was only slightly deviated from the balanced state, the higher or lower thresholds of neural networks could be recovered to normal values through interactions between that portion and other portions. Consequently, the body will be returned to a balanced state once again. In other words, the body has a self-healing ability. Of course, this kind of ability in an automatic control system or the human body is rather limited. When the imbalance is severe, additional interventions are required to strengthen the recovery force from imbalanced states and to increase the probability to recover balance.

Stimulation information inputted by acupuncture at acupoints belongs to this kind of external intervention. Effective stimulation on specific reflex zones or points can deliver intervening information to corresponding neural networks that need to be fixed. By changing their thresholds, it can promote conversions of functional activities towards the direction that is beneficial to life, recover imbalanced portions to the normal balance, and achieve the goal of healing. Because regulatory actions of acupuncture on thresholds of neural networks are bi-directional, whether the level of thresholds is higher or lower, it could be regulated back to the normal. In other words, no matter which direction the body may deviate from the normal state, as long as those deviations are not too far or last too long, they have certain possibilities to be regulated back by acupuncture.

The regulatory process of acupuncture is also illustrated in Figure 3.8 (refer to Section 3.11). When certain viscera or portions of the body such V1 became disordered, it was most likely caused by changes of the threshold of $V1 \rightarrow VC1$ circuit due to stimulation of internal or external environments. It could affect inputs or outputs between VC1 and SM1 and further affect the circuit of $SM1 \rightarrow E1$ or $SM1 \rightarrow SM2 \rightarrow E2$, which could induce some reflex phenomena such as raised local sensitivities (e.g. tenderness) at either R1 or R2. Meanwhile, if needling acupoint or reflex point R1 or R2, with proper intensity through its effect on the circuit of $R1 \rightarrow SM1 \rightarrow VC1$ or $R2 \rightarrow SM2 \rightarrow SM1 \rightarrow VC1$, it could recover the altered threshold between $VC1 \rightarrow V1$ back to the normal state. Suppose the thresholds of related networks or circuits were lowered or raised with hyper- or hypo- functions of V1 respectively, when those changed thresholds were recovered by acupuncture, functions of V1 would recover as well.

When somatic motor organs had disorders, most

were resulted from changes of thresholds at any part of the circuit $E3 \rightarrow R3 \rightarrow SM3 \rightarrow E3 \rightarrow R3$. In the mean time, acupuncture at related reflex points R1, R2, or a local *Ashi* point R3 could recover altered thresholds back to the normal. Their actions might be through circuits of $R1 \rightarrow SM1 \rightarrow SM2 \rightarrow SM3 \rightarrow E3$, $R2 \rightarrow SM2 \rightarrow SM3 \rightarrow E3$, $R3 \rightarrow SM3 \rightarrow E3$ or the direct circuit of $E2 \rightarrow R3$ on the body surface, respectively. Thus, disorders at E3 are relieved.

The above has explained why acupuncture has regulatory effects for the body, as well as the directions of regulation related to preexisting functional states. However, it must be noted that because regulatory effects of acupuncture are merely achieved by changing thresholds of neural networks of the body, they have significant impacts only on those functional disorders with small threshold alterations. If a patient is severely diseased, or suffering from a serious organic disease, it will be very difficult to be cured by acupuncture alone.

Besides, regulatory actions in both directions are often not equivalent with each other. For example, in the rehabilitation of motor and sensory functions by acupuncture, there might be such a characteristic, i.e., its excitation roles to nerves or muscles are greater than inhibition. Clinically, there might be such a tendency that acupuncture might have better effectiveness in treating paralysis than tremors or spasms (refer to Sections 14.6, 14.7, 14.9 and 14.10).

Therefore, do not expect acupuncture to cure every disease, instead, expect better results when treating a disease that has a relative short disease course, namely start acupuncture as soon as possible. On the other hand, in order to ensure effects of acupuncture, it is necessary to input stimulation information into corresponding neural networks effectively. A series of strict requirements are proposed for the initial point selection (considering the specificity in actions of acupoints) and subsequent

controlling of the entire manipulation process (refer to Part Two).

4.3 Mechanisms of Acupuncture Analgesia

Since the first report on the success of acupuncture anesthesia in 1970s, much attention has been attracted to the effectiveness of acupuncture therapy worldwide. Analgesia is one of the most important effects of acupuncture. Generally, mechanisms of acupuncture analgesia contain mechanisms of acupuncture anesthesia, but the latter does not represent the entirety of acupuncture analgesia. This is because acupuncture not only treats acute or transient pain, but also chronic or persistent pain resulted from inflammations or other causes. Clinically, the pain usually occurs prior to acupuncture, either needling or moxibustion can be used for treatment. For acupuncture anesthesia, an induction period of acupuncture is required prior to the surgery and only needling or acupressure may be applied. In addition, the surgical pain pertains to the category of acute pain. However, most modern studies on mechanisms of acupuncture analgesia are conducted focusing on the mechanisms of acupuncture anesthesia. In the following discussion, we will first outlook those studies on acupuncture anesthesia^[99], then provide a complementary explanation on mechanisms of clinical acupuncture analgesia, and finally analyze their implications in improving results of clinical analgesia. Primarily, mechanisms of acupuncture anesthesia or analgesia include two closely associated aspects: neural and humoral mechanisms.

4.3.1 Neural mechanisms

Effect upon arrival of *qi*, literally meaning pain is eliminated instantly when needling sensations are acquired after needle-insertion, is a familiar clinical fact when acupuncture is used for kinds of pain. Of course, such quick responses are not resulted from changes of humoral factors. There were similar successes during acupuncture anesthesia, where surgical pain could be completely inhibited or never even felt without the need for an induction period, in some cases with exceptional results, or when some reflex points or nerve trunks were stimulated for anesthesia. Therefore, acupuncture analgesia is generally considered as a kind of neural effects, namely a consequence due to interaction of different sensory inputs within CNS. Usually, surgical pain signals are conducted through thin nerve fibers, while needling signals may convey through either thick or thin nerve fibers. Because both of them have similar ascending pathways between the spinal cord and the cerebral cortex (refer to Section 2.4), their integration may occur at various levels of CNS, such as the spinal cord, brainstem, thalamus, caudate nucleus, cerebral cortex to inhibit pain impulses and eliminate or relieve the pain.

The posterior horns of spinal cord and the parafascicular nucleus in thalamus are thought as two essential locations that transmit and receive pain. According to the **gate theory** proposed by Melzack and Wall in 1965, the signal strength from the spinal cord delivered to the higher centers depends on the proportion of activities of thick and thin fibers activated by external stimulation. Activities from thick fibers may reduce the signals while activities from thin fibers may increase them ^[98,101]. At least, this might explain situations where needling signals are conducted through thick nerve fibers. For example, when sensory receptors activated by needling are muscle spindles, needling signals

transmitted through thick fibers might begin to inhibit pain signals from thin fibers at posterior horns of the spinal cord. This mechanism could mostly explain why generating needling sensations is often necessary to achieve effectiveness when acupuncture is applied to treat painful diseases. In addition, it might explain why massaging painful sites of the skin could often relieve pain during everyday life. However, the gate theory is only suitable to explain specific situations when needling signals are transmitted through thick nerve fibers and the spinal cord. It is rather difficult to explain other situations when signals activated by puncturing acupoints are transmitted through thin nerve fibers.

In addition, during acupuncture anesthesia, auricular needling is often used. By stimulating sensory receptors at auricular points, signals inputted into the body are transmitted through the trigeminal lemniscuses instead of the spinal cord. There were studies demonstrated anterior and posterior portions of the nucleus of spinal tract of trigeminal nerve had similar feedback effects to the gate system in the posterior horn of spinal cord, which could be used to modulate transmissions of pain impulses ^[102]. This might be able to explain why auricular acupuncture has analgesia effects on surgical or painful irritation on the head and face. However, anesthesia effects of auricular acupuncture during thoracic and abdominal surgeries cannot be explained by any hypotheses about the gate control occurring at either posterior horns of the spinal cord or the nucleus of spinal tract of trigeminal nerve.

Actually, a situation where a type of sensory afferents inhibits another type may arise at every level of CNS. The first involved is the thalamus. Physiological studies have shown that primitive senses such as pain are merely functions of the thalamus, so acupuncture analgesia might occur at the level of thalamus. For instance, clinically, there

was one kind of hypersensitive pain, where the patient had voluntary and unbearable central pain. Exams indicated that when hypersensitivity occurred, there was a coexisting loss of other senses at various extent, the worst one of which was the loss of deep sensation, especially that from the muscle. Pathological autopsy verified medial portions of thalamus related to reception of the pain was intact in the patient, while other structures of the thalamus related to general sensations were mostly destroyed. It seems to indicate that activities within the pain center of thalamus are subject to inhibition from impulses of general somatic senses. Once this kind of inhibitive effect is withdrawn, the phenomenon of hypersensitive pain will emerge.

The thalamus is a secondary relay station for somatic sensory afferents. First, afferent nerve fibers of superficial senses from the limbs, trunk, and neck ascend and arrive at the ventral posterolateral nuclei in the thalamus through the lateral spinothalamic tract and anterior spinothalamic tract, while those from the head arrive at ventral posteromedial nuclei in thalamus through the trigeminal lemniscus. Then, on one hand, specific projecting fibers originated from the ventral posterior nuclei and geniculates, which receive visual and auditory afferent inputs, are projected on specific areas of the cerebral cortex to induce specific sensations and activate the cerebral cortex to deliver related efferent impulses. On the other hand, non-specific projecting fibers originated from the intralaminar nuclei are projected to other widespread areas of the cerebral cortex to maintain or alter its excitation states.

The parafascicular nucleus, centrolateral nucleus, and centromedian nucleus are primary nuclei of intralaminar nuclei within the thalamus. However, they do not directly link with cerebral cortex and their fibers may be diffusely projected to the entire cerebral cortex through indirect multiple-synapses

connections. Studies showed the integration between needling and pain at the level of thalamus mainly occurred within those nuclei. On one hand, stimulation at parafascicular nucleus and its vicinity in the human body could aggravate pain for some patients and result in propagating burning pain on the contralateral side of the body [6]. On the other hand, electrophysiological studies on parafascicular nucleus in some animals showed that there were certain cells within the nucleus that were sensitive to nociceptive afferent impulses from the body surface. They might induce electric responses with certain characteristics, which could be inhibited partially by puncturing acupoints, stimulating sensory nerves with a weak electric current, or other non-nociceptive stimuli. In addition, neurons with similar electric reactions could also be found in the centrolateral nucleus [103].

However, it has been observed in experiments that inhibiting effects of EA stimulation on neuronal charges of pain at the centrolateral nucleus or parafascicular nucleus were never completely attained [103]. Therefore, it is possible that there are other structures of brain besides the thalamus involved in neural mechanisms of analgesia. Until now, ample experimental studies have been completed surrounding both nonspecific and specific sensory projection systems. Among them, more studies focus on reticular structures of brainstem, caudate nucleus, and the cerebral cortex that have closer connections with the thalamus.

From current understanding of neurophysiology, ascending fibers of lateral tract of spinal cord are known to be in part projected onto the magnocellular nucleus of reticular structures in the medial side of medulla oblongata, and then ascend through the central and tegmental funiculus in the midbrain. Finally, they terminate at the intralaminar nuclei in the thalamus, including the centromedian nucleus.

Further studies have discovered that reticular structures of brainstem, especially activities of the magnocellular nucleus and central tegmental tract of midbrain in the medial side of medulla oblongata play a certain role during acupuncture anesthesia. The evoked potentials due to pain reaction could not only be recorded at these areas, but also inhibited by EA on certain acupoints ^[104,105]. In addition, a direct stimulation with a low frequency (e.g., two times/sec) in accordance with that during clinical EA was applied at the central tegmental tract in the midbrain also had analgesia effects. Its analgesia characteristics were similar to clinical acupuncture anesthesia. For instance, it needed a longer induction period and had longer aftereffects of stimulation ^[106]. However, after lesions made at both sides of the area, a weakened EA analgesia remained, which indicates that the area is also not the only pathway for EA analgesia ^[107].

Although the caudate nucleus pertains to the extrapyramidal system, it has been verified that it may induce nonspecific responses to various sensory stimuli including visual, auditory, somatic, or visceral stimuli, as well as could participate in the analgesia process during acupuncture anesthesia. Electrical stimulation on certain acupoints, such as Hegu (LI4) in rabbits could induce evoked potentials of the caudate nucleus. If providing a direct stimulation at sites where evoked potentials were induced in the caudate nucleus, pain thresholds of the body could be raised, which was similar to that by EA at Hegu (LI4). Moreover, stimulation on the caudate nucleus could strengthen effects from EA, and vice versa after lesion of the caudate nucleus. It was said that actions resulted from stimulation of the caudate nucleus were achieved through inhibiting painful afferent activities at the centromedial nucleus of thalamus and other structures ^[108].

The question of whether or not the cerebral cortex

is involved in the process of acupuncture analgesia has been a controversial one. Clinically, puncturing Hegu (LI4) to relieve toothache is an almost fail-proof example. Throughout time, the effectiveness has been explained by the fact that the puncturing establishes a new excitation focus, which inhibits the focus resulted from toothache on the cerebral cortex, or that preceding attention is shifted or distracted by acupuncture. The latter was proposed because many patients suffering from toothache or other neuralgia became worse at night or during resting time than during daytime or working. The former implies that there might be two excitation foci for the priority competition within the cerebral cortex. Once the excitation focus from acupuncture has inhibited the focus from pain and taken a priority, the pain will be relieved accordingly. For surgery under acupuncture anesthesia, it usually needs about 20~40 min of induction period for acupuncture prior to the surgical operation ^[109]. An important role of the induction period is thought to be related to establishing the priority focus of acupuncture and ensuring its stability. In patients who had cranio-cerebral surgeries, researchers observed that acupuncture could indeed inhibit cortical potentials evoked by pain, and that effect had the specificity in actions of acupoints, i.e., different degrees of the effect were induced by different acupoints.

However, some experiments in animals have demonstrated that actions of acupuncture analgesia still existed even after transverse section at levels above the midbrain or after removal of the cerebral cortex. This also implies that the cerebral cortex might be not such important for acupuncture analgesia. There are other results in support of this conclusion. For instance, acupuncture anesthesia can be used for either conscious or unconscious patients, who had coma or shock, as well as for livestock. Currently, most researchers have recognized that the

cerebral cortex is definitely involved in the process of acupuncture analgesia although its role might not be extremely important.

Recently, researchers have tried to apply the technique of fMRI of the whole brain to demonstrate non-invasive actions by acupuncture stimulation in healthy subjects ^[110~113]. Wu *et al.* of Taiwan, China observed that puncturing Zusanli (ST36) and Hegu (LI4) of nine healthy subjects resulted in significantly higher scores of generated needling sensations and substantial bradycardia. In addition, acupuncture at both acupoints resulted in the activation of hypothalamus and nucleus accumbens and in the deactivation of rostral part of anterior cingulate cortex, amygdala formation, and hippocampal complex, while the control stimulation did not result in such activation and deactivation. This implies that the central mechanism of acupuncture analgesia at Zusanli (ST36) and Hegu (LI4) is by activating structures of descending anti-nociceptive pathway and deactivating multiple limbic areas subserving pain association. This experiment may form a basis for future investigations of endogenous pain modulation circuits in the human brain ^[111].

In addition, Hui *et al.* of Harvard Medical School, USA, observed that needle-manipulation on Hegu (LI4) produced prominent decreases of fMRI signals in the nucleus accumbens, amygdala, hippocampus, parahippocampus, hypothalamus, ventral tegmental area, anterior cingulate gyrus, caudate, putamen, temporal pole, and the insula in all 11 subjects who experienced needling sensations. In a marked contrast, signal increases were observed primarily in the somatosensory cortex. The two subjects who experienced pain instead of acupuncture sensation exhibited signal increases instead of decreases in the anterior cingulate gyrus, caudate, putamen, anterior thalamus, and the posterior insula. Superficial tactile stimulation to the same area elicited signal increases

in the somatosensory cortex as expected, but no signal decreases in the deep structures. These preliminary results suggest that the needle-manipulation modulated the activity of the limbic system and subcortical gray structures of the human brain ^[112]. In 2001, by reading PET scans, Biella *et al.* of Italy reported that most of activated areas by acupuncture shared with areas activated in acute and chronic pain states ^[114].

In summary, the main roles of CNS at various levels in acupuncture analgesia may be considered as follows. Pain signals and needling signals enter the spinal cord through sensory nerves. First, they are processed at collagen areas of the posterior horn, then transmitted upward through the spinothalamic tract until the thalamus, and finally entered the cerebral cortex. During this course, there is a certain integration of two signals at almost every level of CNS, but the main integration might be completed within the thalamus. It is easier for needling to inhibit nonspecific sensory projection system. Activities of specific sensory projection system cannot be inhibited unless point selection is proper and stimulation amount is greater. Moreover, the inhibition of specific sensory system is less than that for the nonspecific system ^[115].

4.3.2 Humoral mechanisms

An **induction period** of acupuncture prior to surgeries usually is required for acupuncture anesthesia. Under certain situations, anesthesia effects may sustain even without needling after the induction period. In addition, analgesia effects of acupuncture may sustain for a certain period after the operation, otherwise known as aftereffects of acupuncture anesthesia. These clinical facts indicate roles of humoral factors in mechanisms of acupuncture anesthesia. The humoral factors have characteristics of slow and persistent actions.

It was first reported in 1959 that humoral factors were involved in acupuncture analgesia. The most convincing evidence is the result of **cross-circulation** experiments in animals under acupuncture conditions. Cortical evoked potentials are often used as a response indicator for pain. During an acupuncture analgesia experiment by a group of researchers from Medical Academia Sinica, the blood circulation in two cats were connected to each other through cervical arteries, then an electrical stimulation was applied to acupoints of one of the cats. They found that cortical evoked potentials induced by stimulation of their greater splanchnic nerve could be inhibited not only in the donor cat quickly, but also in the recipient cat if the stimulation reached a certain level of intensity and lasted for certain length of time. The inhibition effects of acupuncture in both cats had certain time differences. Evoked potentials of the donor cat receiving acupuncture were generally inhibited in the first 5~15 min of needling, while that of the recipient cat without acupuncture were inhibited slightly later. It was found that effects appeared as early as the 15-min mark or as late as the 65-min mark after many needling trials. In the experiment, 21 trials of reciprocal needling were completed in ten pairs of cats. Apparently, there were no signs of any evoked potentials that were not inhibited in donor cats receiving acupuncture while inhibited in recipient cats without acupuncture. After needling was terminated, evoked

potentials were resumed one after the other in both kinds of cats, but cats without acupuncture resumed faster. The time it took to fully recover evoked potentials back to the control level in both kinds of cats was about 5~20 min. Because there were no connections between nervous systems of two kinds of cats, this experiment verified that certain humoral factors did change in donor cats receiving acupuncture after electrical stimulation reached a certain level of intensity and sustained for a certain length of time. They could influence recipient cats through the connected blood circulation ^[28].

This is a typical example that verifies the involvement of humoral factors in acupuncture analgesia. Later, similar phenomenon has been observed in rabbit experiments when cerebrospinal fluid was **cross-perfused**, i.e., acupuncture-induced analgesic effects were transferred from the donor rabbit to recipient rabbit ^[116]. So what humoral factors are involved? Numerous experiments have demonstrated that these factors include endogenous opiate-like substances and many neurotransmitters such as serotonin (5-HT), acetylcholine (Ach), non-epinephrine (NE), and dopamine (DA), some of which might have antagonism actions ^[117]. Their contents vary during acupuncture anesthesia: some may increase while others may decrease. The following formula summarizes the relationship between partial humoral factors and effects of acupuncture analgesia.

$$\text{Acupuncture analgesia} \propto \frac{(\text{Endorphins})(5\text{-HT})(\text{Ach})(\text{ACTH})(\text{Cortisol})(\text{Mg}^{++})(\text{PGE})}{(\text{NE})(\text{DA})(\text{Ca}^{++})(\text{PGF}_{2\alpha})}$$

Among above factors, **endorphins** or **enkephalins** are the most significant. The blockage of EA-induced analgesia by Naloxone and by antiserum against endorphins suggests that endorphins are indeed involved. Recent studies have demonstrated the

release of endorphins into the cerebrospinal fluid following EA.

Opiate sensory receptors in CNS may be classified according to their pharmacological, behavioral, or binding studies. Classical μ -sensory receptors

probably have β -endorphin as an endogenous ligand and seem to be involved in the modulation of pain perception, low-frequency acupuncture analgesia, as well as in promoting the release of prolactin, **growth hormone (GH)**, and **thyroid-stimulating hormone (TSH)**. The met-enkephalin is likely to be an endogenous ligand for δ -sensory receptors, which predominates in the basal ganglia and limbic systems, as well as may inhibit the release of corticotrophin-releasing factors. It has been suggested that the newly described κ -sensory receptors may inhibit the release of vasopressin and gonadotrophin-releasing factors, of which dynorphin may be their endogenous ligands. Endogenous opiates controlling cardiovascular and respiratory reflexes are likely to activate μ -sensory receptors, while high-frequency acupuncture may alleviate symptoms of opiate withdrawal by allowing an increase in met-enkephalin to activate δ -sensory receptors^[118] (refer to Section 25.3). A study showed that a **low frequency** (2 Hz) and a **high frequency** (100 Hz) of EA selectively induce the release of enkephalins and dynorphins^[116]. In the periphery, β -endorphin is concentrated in the corticotrophs of the anterior pituitary and is co-secreted with ACTH and related peptides. Circulating met-enkephalin originates in the gut, sympathetic nervous system, and adrenal medulla. Met-enkephalin may also be extracted from carcinoid tumors and pheochromocytomas. Elevations in circulating met-enkephalin may occur in certain disease states with cardiovascular and psychiatric manifestations^[118].

In order to explain the relationship between humoral factors and mechanisms of acupuncture anesthesia, first we have to answer a relevant question. During acupuncture anesthesia, both puncturing and surgical operation are very similar external stimulation in nature. Contemporary physiological

studies have demonstrated their signals can be transmitted inside the body through the same nerve fibers or pathways and can be received by the same central structures. Moreover, any external stimulation can be converted to pain perceptions when they reach a certain level of intensity. Why there are different neural-humoral responses after these two signals are inputted into the body?

In our opinion, the cause is the difference of signal property, i.e., the pain input is a **nociceptive signal**, while the needling input is a **non-nociceptive signal**. Responses of the body to these two kinds of stimulation signals are obviously distinguishable. The following is an in-depth explanation for humoral mechanisms.

When pain or nociceptive signals are inputted into the body, the purpose of entire reaction of the body is to achieve the ultimate goal of **flight** (escaping from the stimulation) no matter what behavioral reflexes or the activation of **sympathetic-adrenal medulla axon** is activated. Because inputting pain signals are intense enough in provoking escaping movements of the body and in activating the process of sympathetic-adrenal medulla axon even without further presence or accumulation of stimulation. The activation process of sympathetic-adrenal medulla axon is called **emergency reaction**, which manifests excitation of the sympathetic nervous system and increases secretion of epinephrine and norepinephrine. The consequence includes a rearrangement of the blood supply in the entire body, increasing blood flow amount to muscles, and having enhanced body sensitivity to pain, and so on.

If the input is a type of non-nociceptive signals, such as acupuncture, reactions of the body are different. Because they are generally less intense, unless their actions are sustained for a certain period and are accumulated to the level that is critical to the body, they become a kind of stressors. This may

lead to a **stress reaction** through **hypothalamic-pituitary-adrenal cortex system** and manifested as rising ACTH and cortisone levels in the blood. Not only do those two kinds of hormones have anti-nociceptive effects, but the entire stress reaction can also modulate the adaptability of body to reduce impacts from stressors of various aspects.

However, based on the knowledge of physiology, these two reaction systems are often mixed to some extent and have to complement each other for their main functions. Because nociceptive stimulation of surgery, which can induce the emergency reaction, is a stressor itself, it can also increase secretions of ACTH and cortisone. On the other hand, if acupuncture stimulation is very intense or lasts for too long, it may also activate actions of the sympathetic-adrenal medulla system (refer to Section 2.8), which is similar to reactions occurred when nociceptive stimulation existed. Moreover, the sympathetic-adrenal medulla system is also involved in the stress reaction, in which there are increasing contents of epinephrine and non-epinephrine in the blood. Therefore, no matter how the pain irritation or needling is applied, there will be the activation of those two systems simultaneously. The only difference is that the former mainly activates the sympathetic-adrenal medulla system, while the latter mainly activates the hypothalamic-pituitary-adrenal cortex system [6]. However, the emergency reaction of the body activated by the sympathetic-adrenal medulla system occurs immediately after receiving the nociceptive stimulation and lasts for a short duration. The stress reaction activated by needling or nociceptive stimulation through the hypothalamic-pituitary-adrenal cortex system occurs more slowly and lasts longer.

The above is a general outlook on the input of nociceptive and non-nociceptive signals into the body. During acupuncture anesthesia or clinical

analgesia of acupuncture, these two kinds of signals may be inputted into the body successively or concurrently so that the situation is obviously more complicated.

In a case of acupuncture anesthesia, operative stimulation may last for several hours or even longer, and the signals of pain are very intense. In contrast, needling signals that start prior to the operation seem to be less intense. Although general acupuncture does not have significant impact on functional activities of the adrenal cortex in normal people, it might still activate the hypothalamic-pituitary-adrenal cortex system gradually if its stimulation sustains for 20~40 min. It might induce the stressor reaction in advance so that the subsequent operative stimulation could not induce intense pain perception and the emergency reaction. This might be why a proper longer period of induction usually is necessary to obtain optimal results of acupuncture anesthesia. It was observed clinically that pain thresholds might increase with a prolonging of needling period during acupuncture anesthesia and reach the maximum value at around 40 min of induction. Either an extended or a reduced induction period would affect the results of acupuncture anesthesia. If the induction period was too short, then stimulation will be too weak and will not be enough to activate the hypothalamic-pituitary-adrenal cortex system. On the other hand, if the induction period were too long, consequentially there would be two coexisting possibilities. First, due to the consequence of growing adaptability of the body to needling stimulation anti-nociceptive effects from the stress reaction would subside gradually. Second, the excessively intense needling would convert to emergency stimulation, so that it would enhance the activation of sympathetic-adrenal medulla system and then promote the pain perception.

For clinical analgesia of acupuncture, acute or

chronic pain is preexisting, which may be resulted from acute injuries or chronic inflammations. When pain was caused by acute injuries, though the pain might not be as intense as during surgery, it still would induce a significant emergency reaction, and manifest excitation of the sympathetic-adrenal system. In the preceding section, we have analyzed directions of regulatory effects that are related to preexisting functional states prior to acupuncture. Therefore, even if the needling duration is short, it may still weaken impacts from the emergency reaction as long as it reaches a certain level of intensity. When pain was caused by chronic inflammations, the emergency reaction had already been over, while the stress reaction activated by it was insufficient in controlling the inflammation or pain yet. Meanwhile, acupuncture could activate a new stress reaction or enhance the preexisting weak stress reaction to eliminate inflammations and pain. Over time, researchers have demonstrated that acupuncture can strengthen activities of the adrenal cortex in patients or diseased animals (refer to Section 2.8).

Besides needling, moxibustion or another thermal therapy is frequently used for analgesia, clinically. Their mechanisms may be explained as the activation of the stress reaction because either cold or hot stimulation pertain to stressors. To date, there have been substantial reports on moxibustion therapy activating functions of the hypothalamic-pituitary-adrenal cortex.

The above is the outline of acupuncture anesthesia or the involvement of acupuncture in analgesia. Nonetheless, it should be noted that neural mechanisms are still predominating for acupuncture anesthesia or analgesia. Not only because analgesia effects of acupuncture are dependent on intact neural reflex arcs, but also changes of humoral factors are secondary reactions of neural excitation. Moreover, changes of most neurotransmitters occur in the

process of transmitting and integrating both pain and needling signals at various levels of the nervous system.

In 1976, we proposed a simplified model about the meridian or information (reflex) zone to clarify general mechanisms of acupuncture anesthesia by applying principles of **cybernetics**^[1]. Because surgical pain and needling signals are transmitted into the same structures of CNS through the same nerve fibers or **information pathways**, in that model, we assumed that the **pathway capacity** of neural networks might be limited. Moreover, due to the necessity of induction period, there might be an amplifying process of non-nociceptive signals such as needling signals during the induction period. Once amplified needling signals occupied all or a majority of pathway capacity in advance, the subsequent inputs of surgical pain signals could not be transmitted through the same pathways, so that the pain could no longer be received by nervous centers.

In addition, through establishing a mathematical model and making a half-quantity treatment of signals, we analyzed the amplifying process of needling signals and competitions between them and pain signals. Applying this math model could clarify extensive clinical or experimental facts about acupuncture anesthesia. Actually, the proposed information pathways in that model is a discrete representation of various anatomical structures in neural-humoral mechanisms mentioned as above, and competitions of pathway capacity actually include various integrating actions such as blockade or antagonism.

In summary, there is a very subtle relationship between the stimulation signals of acupuncture and the pain during acupuncture analgesia. It manifests not only in similarities and in differences between these two kinds of inputting signals, but also in associations among reflexive neural-humoral

mechanisms activated by them. Moreover, their analgesia effects are correlated closely to the duration or stimulation intensity. If the needling intensity or duration is insufficient, those neural-humoral factors will not be activated to inhibit the pain effectively. An overly long or intense needling will become nociceptive instead of the non-nociceptive, which has been supported by the experiment on inhibiting neuronal discharges of centrolateral nucleus or the parafascicular nucleus in thalamus. When the stimulation intensity was weaker, the inhibition effect of neuronal discharges was more significant. When the stimulation intensity was overly intense, there were no signs of any inhibitions; instead, pain responses were increased ^[103]. Accordingly, the uncertainty commonly seen in the effectiveness of acupuncture anesthesia or analgesia may be attributed to this kind of subtle relationship between acupuncture and pain signals.

4.3.3 Cues to improve clinical effectiveness

The above is a basic discussion about mechanisms on analgesia of acupuncture. Actually, for acupuncture practitioners, no matter what the underlying mechanism may be, the most important thing is to know what kind of cues could be retrieved to improve the effectiveness of clinical analgesia. The following are several cues that may be helpful in the clinical practice.

[Cue 1] The **non-specificity** and the **specificity** in analgesia actions of acupoints or stimulation locations should be considered sufficiently for acupuncture analgesia. In Section 4.1, we have discussed the relatively specificity in actions of acupoints. Acupoints have either the specificity or **relativity** in analgesia. The latter is more significant and can be referred to as the non-specificity in analgesia action of acupoints, which are represented in two aspects.

First, acupuncture at any location on the body surface may have analgesia effects to some extent. This may explain why those acupoints with good analgesia results for somatic pain almost lodge throughout the body surface. Second, acupuncture at certain acupoints may achieve analgesia effects on the entire body. For example, needling Hegu (LI4) or Zusanli (ST36) of one side in healthy subjects could generally raise pain thresholds on bilateral sides of the body ^[117]. Such points usually exist at locations where there is higher sensitivity, such as within the central reflex zones, so they have a greater analgesia effect on the entire body than other points even when they are stimulated with the same intensity.

The specificity in analgesia actions of acupoints is represented in the following three aspects. First, stimulation on certain acupoints may have better results for pain of certain body parts. Second, for pain at various body parts, there are specific acupoints with optimal results of analgesia. Third, among those acupoints with the non-specificity, their analgesia effects are still distinguishable. Therefore, the non-specificity in analgesia actions of acupoints is also relative. This phenomenon may be referred as relative non-specificity, which is similar to defining the specificity in actions of acupoints as relative specificity.

There was no specificity found for the inhibition action of pain discharges in the parafascicular nucleus by somatic afferent impulses, which indicates the excitation of any somatic nerves may generate analgesia effects to a certain extent at the thalamus level. However, at the level of spinal cord, somatic afferent impulses from the same or adjacent segments innervating the pain area generally had greater effects in inhibiting the pain than that from other farther segments. This might be partial neural basis for the non-specificity and the specificity in

analgesia actions of acupoints.

Thus, the following rule might exist: for vague or diffused pain, the non-specificity of acupoints is more significant, namely, any acupoints with higher sensitivity on the entire body surface can be selected for acupuncture to obtain marked effectiveness. It is because the interaction between needling and pain signals might occur in the intralaminar nucleus that pertains to non-specific projection system of the thalamus. On the other hand, for somatic pain with precise locations or in a limited area, the specificity of acupoints is especially significant. One may select those acupoints or reflex points located at the same or adjacent segments innervating the pain, especially those with sensory receptors such as muscle spindles connected to thick sensory nerve fibers, so that the gate control function of pain in spinal cord or specific inhibition of pain within the cerebral cortex and other structures are fully utilized. Of course, the above two kinds of selections may be combined. For example, one can first stimulate acupoints with non-specificity actions distributed on the entire body to control the diffused pain, and then stimulate local acupoints with specificity to relieve the regional or localized pain. This is a useful strategy to treat acute injuries of soft tissues or lumbago (refer to Sections 13.4 and 13.13).

On the other hand, when puncturing acupoints located on the head and face to control pain occurring at other body parts, the specificity of those acupoints may not be significant. It is because those needling signals are inputted mainly through thin afferent fibers of the trigeminal lemniscus. They integrate with pain signals ascending through the spinal cord at levels of the thalamus and higher centers. Studies showed that anesthesia results from auricular acupuncture at non-points were the same as that at points. However, when needling certain acupoints within a certain scope of body surface

innervated by spinal nerves, there was a significant specificity in analgesia actions of acupoints. For instance, during the surgery of thyroid gland, stimulation on Neiguan (PC6) of the upper limb had stronger analgesia effects than that on Zusanli (ST36) of the lower limb.

[Cue 2] Determining an appropriate stimulation intensity or acupoints may rely on the non-specificity or the specificity of sensory projection system. It was demonstrated that needling any of three points: auricular *Shenmen*, Hegu (LI4), and Zusanli (ST36) could inhibit evoked potentials at the central tegmental tract in midbrain that were induced by stimulation of the tooth marrow and could represent activities of non-specific sensory projection system. Moreover, this inhibition could occur distinctly in spite of the stimulation amount. On the other hand, the evoked potentials at the ventral posteromedial nuclei in thalamus, which represent activities of the specific sensory projection system, could be inhibited only by stimulation on some proper acupoints at a greater amount of stimulation. Moreover, the extent of inhibition in the latter was also smaller than that in the former ^[15]. This experiment indicates that a non-specific sensory projection system might play a primary role and there might be such a rule in existence: for somatic pain signals transmitted or received by non-specific sensory conduction system, the non-specificity of acupoints might be more significant. For those by specific sensory projection system, the specificity of acupoints might be more significant.

However, note that the specificity or nonspecificity in actions of acupoints, as well as the specific or non-specific sensory projection systems, are two completely different concepts. Be careful and do not mix them up. In addition, the specificity in actions of acupoints is not manifested only in the aspect of

analgesia actions; it also includes other aspects in actions of acupoints, such as their specific regulatory effects on visceral, endocrine, defensive, immune, and other functions. Thus, the above specificity and non-specificity of acupoints are only limited to the aspect of analgesia action. Because successes or failures of acupuncture anesthesia do not rely only on inhibition of the somatic pain, they are also closely related to whether visceral pain and pulling reactions occur during surgeries, where the specificity of acupoints might be significant for such aspects.

It was reported that when EA was applied on certain acupoints of the back and limbs, the pulling reactions of stomach could be inhibited at certain extents. However, the inhibition effect is more distinct when stimulating *Shu* points at the back and Neiguan (PC6) than stimulate acupoints on the lower limb. This verified the relative specificity in actions of acupoints and it was thought that acupoints with stronger inhibition might be in the proximity of those locations with afferent pathways of stomach pull reactions ^[119]. During acupuncture anesthesia, no matter which body parts are being operated on, any acupoint of the body could be selected for the incision pain of the skin according to the nonspecificity of acupoints. However, for operations on a specific viscus, it is better to select specific acupoints or reflex points corresponded to the viscus to achieve optimal holistic effectiveness.

[Cue 3] In order to achieve the goal of effective analgesia, one needs to pay attention to control the proper intensity and duration of stimulation. It was demonstrated that a direct stimulation on the central trigeminal tract in midbrain for a few seconds could inhibit the pain reactions for over ten min. If the stimulation intensity increased continuously, the pain reactions actually would not be inhibited anymore, instead, pain reactions would be enhanced ^[107]. This

area of the midbrain is the pathway where afferent impulses from the limbs are projected to the centromedial nucleus in thalamus, which is one of known central pathways for EA analgesia. It indicates that for effective acupuncture, though the stimulation lasts only for several seconds, it is sufficient to achieve longer analgesic effects, while an overly intense stimulation could actually reduce the effectiveness of analgesia.

Therefore, to enhance the effectiveness of acupuncture anesthesia or clinical analgesia, one may control the intensity of needling stimulation properly to be just right, neither overly weak nor overly intense. This might be especially important for stimulation on those acupoints where the afferent impulses are transmitted through thin nerve fibers. For instance, when needling certain acupoints where the pain perception is primary, overly intense stimulation could convert non-nociceptive afferent signals to nociceptive. However, when stimulating acupoints where their afferent impulses are transmitted through thick nerve fibers, such as those acupoints with significant generation of needling sensations, a more intense stimulation might be applicable. This is because their needling sensations are significantly different from the pain.

On the other hand, it is necessary to control the stimulation duration when controlling the intensity. This is because stimulation duration is another reference associated with stimulation intensity, namely, the **total stimulation amount is equal to the product of stimulation intensity and stimulation duration** (refer to Section 8.3). Generally, though acupuncture anesthesia needs the induction period of around 30 min, sometimes it will still work without the induction period, as there were past successful cases of no needle-retaining after the generation of needling sensations.

In order to control the proper stimulation, one may

follow the following principle: When stimulating reflex points with specificity in actions, either do not retain the needles, or only retain them for a short period after the generation of needling sensations. When stimulating points with nonspecificity in actions, it is suitable to retain the needles for a longer period. In other words, to avoid excessive stimulation, it is advised to utilize the specificity of points to its fullest advantage. Namely, start with the selection of optimal locations, such as reflex points or nerve trunks rather (refer to Sections 8.1 and 12.4) than only relying on increasing the stimulation intensity or prolonging the stimulation duration.

4.4 Mechanisms of Acupuncture Rehabilitation

Rehabilitation is another main function of acupuncture. For disabilities of various somatic mobility or senses, such as paralysis, aphasia, loss of hearing or sight, whether they are resulted from peripheral nerve damage or central causes, acupuncture can be applied for their rehabilitation and have a certain degree of effectiveness.

To date, there have been ample animal experiments and clinical trials about mechanisms of acupuncture on peripheral nerve injuries [29]. For instance, in an experiment with rabbits, puncturing Xuehai (SP10), Liangqiu (ST34) and Futu (ST32) helped restore functions of quadriceps muscle of the thigh, which was partially enervated, and prevented the lowering of muscular potentials in the normal side. Researchers thought that its mechanisms might be due to promoted proliferation of remaining intact nerve endings by acupuncture. In addition, it was reported puncturing Jiexi (ST41), Zusanli (ST36) and

Yanglingquan (GB34) in rabbits could help restore functions of partially denervated anterior tibial muscle. Moreover, after clamping the sciatic nerve in rabbits induced paralysis of real limbs, EA treatment could help recover their motor functions. Meanwhile, it was found that the acid-soluble phosphor and phosphor in the phospholipids decreased, phosphor in the nucleic acid increased, while phosphor in the protein did not change. Accordingly, it was thought that the decrease of phosphor in the phospholipids indicated improvement of injured nervous tissues, while the increase of phosphor in the nucleic acid could promote nerve proliferation and recovery of nerve functions. Other studies have shown that after puncturing Jianyu (LI15) and Huantiao (GB30) in patients with spinal radicular neuritis, the mobility of the muscle increased remarkably, and the rigid contraction trended back to normal. It was also observed that puncturing Dicang (ST4), Hegu (LI4), and Yangbai (GB14) could improve functions of moderately paralyzed muscle in patients with facial paralysis. However, when electrical stimulation on the facial nerve was applied, the conduction time was slightly increased. Hemiplegia from apoplexy is one of the most common indications in clinical acupuncture. The mechanism of acupuncture for central paralysis from apoplexy may be generally categorized into the following aspects.

First, in the acute phase of apoplexy, acupuncture may regulate the arteriolar vasomotion in the brain, improve blood supply to the distal end of blocked artery, or promote the absorption of local hemorrhage. This is beneficial to reduce inconvertible lesion or death of brain tissues. After the acute phase, they may promote blood circulation of the brain, help establishing the collateral circulation in ischemic portions, and have those neurons temporarily depressed to recover their normal functions.

The most common form of apoplexy is the cerebral ischemia. Until now, there have been numerous studies on mechanisms of acupuncture to treat the ischemic apoplexy. For instance, Xu *et al.* found that piercing Fengchi (GB20) into the contralateral Fengchi (GB20) could increase the blood flow of left and right vertebral arteries and basilar artery determined by a Doppler Velocimeter. Such method was deemed superior to classical needling method at Fengchi (GB20) ^[120]. Li *et al.* studied effects of **opposite needling** on the cerebral blood flow by Radioencephalogram (REG) in 90 different cases suffering from cerebral infarct that were confirmed by CT and in rabbits with acute experimental cerebral ischemia. They found that opposite needling had better instant effects in improving cerebral blood flow in the blocked side than that of ipsilateral needling, and demonstrated that needling actions on cerebral vessels were achieved through the ipsilateral sympathetic nerve ^[121]. We also observed that needling Taichong (LR3) of a healthy subject could markedly increase blood supply to a foot area that is correlated to the cerebral cortex by fMRI ^[122]. Improvement of cerebral ischemia might be one of reasons why patients who participated in acupuncture in their early stage rehabilitated quicker and better.

By using animal models with experimental cerebral ischemia, studies done by Cheng *et al.* further demonstrated that acupuncture could markedly reduce the local lesion area and neuronal damage after cerebral infarction. Neuro-protective effects of acupuncture against cerebral ischemia may be related to a regulation of neurotransmitters, intracellular factors, and genes. Acupuncture may also influence functions of ionic channels on cellular membranes, synthesis, split, and repairing of DNA inside cells, and regeneration of cells ^[123].

In a study done in 30 cases per group of acute

encephalorrhagia or cerebral infarction, Shi *et al.* observed that acupuncture could reduce contents of lipid peroxide (LPD) and thromboxane (TXA₂), and increase the activity of superoxid dismutase (SOD) and the level of prostacyclin (PGI₂). They concluded that acupuncture had beneficial regulative function on abnormal hemodynamics and could provide inhibition on free radical damage, which occurred during the pathological process of apoplexy. Acupuncture was also shown to protect structures and functions of the brain by elevating SOD activity and alleviating neural injury induced by lipid peroxidation. TXA₂ and PGI₂ are important factors for maintaining normal blood circulation and preventing thrombosis formation. Acupuncture could obviously enhance depressed PGI₂ and reduce increased TXA₂ to balance the value of PGI₂/TXA₂ ^[124].

Results from recent clinical studies on acupuncture treating ischemic cerebrovascular diseases are summarized in the following aspects. Acupuncture could markedly decrease the blood viscosity, hemagglutination index finger, fibrinogen, and platelet adhesion rate to improve blood circulation and increase blood supply to the brain. It could regulate serum lipid levels remarkably, accelerate clearance of oxygen free radicals, enhance the anti-oxidation ability of the body, decrease lipid peroxidation (LPO) content, and increase the activities of superoxidase dismutase (SOD) and catalase (CAT). It could also regulate the levels of TXA₂, PGI₂, NO and ET, lower blood TXA₂ and ET, elevate blood PGI₂, NO, and prevent vasospasm and thrombosis. It could lessen the inhibition of electrical activity of the brain during cerebral ischemia and promote its recovery after the global reperfusion, which functioned to protect brain cells. It could protect neuronal morphological structures of the brain and effectively provide material foundations for its

functional restoration ^[125].

Second, when local cerebral tissues were acutely injured, acupuncture might shorten the shock phase occurring on their surrounding or subordinate nervous structures due to the lesion. When higher centers are suddenly transversely cross sectioned, the spinal cord may temporarily lose abilities of reflex activity and fall into states without any reaction. This phenomenon is called the **spinal shock**. It mainly manifests as the lowering or even the attenuation of skeletal muscular tones and visceral reflex activities, which are innervated by the spinal cord below the transversal level. The cause is that they lost control from descending fibers of the cerebral cortex and other higher centers to the spinal cord. The resumption of spinal reflex activities after the spinal shock is slower in humans than in the animals. It takes about several weeks, sometimes up to several months ^[6]. Because controls of higher centers to spinal reflexes include both aspects of facilitation and inhibition actions, when the spinal shock is over, the extensor reflexes receiving the facilitation will be mostly weakened, while flexor reflexes receiving the inhibition will remain hyperactive.

Although the spinal cord is not completely transversely sectioned off in apoplexy patients, similar symptoms to the spinal shock at various extents usually may still occur on the extremities of the side innervated by the injured brain. It is even worse for patients who have lost consciousness. Moreover, the surrounding or subordinate normal neural structures of injured brain tissues might be involved in this kind of shock, which may be referred as the **boundary shock** or the **subordinated shock** of brain. Duration of local shock phase may vary depending on individual cases or disease conditions. During spinal or cerebral shock, limbs of the side innervated by the injured brain undergo flaccid paralysis and

lose all somatic reflexes such as the knee jerk as well as Babinski's sign that pertain to **flexor reflexes**. When the shock is over, because higher centers have not yet resumed their control to the paralyzed side, the limbs could show rigid paralysis and hyperactive flexor reflexes such as a positive Babinski's sign. The duration of shock phase and the extent of post-shock paralysis on upper and lower limbs of affected side vary depending on injured locations as well as their ranges in the brain. Usually, the shock phase of the lower limb is mild and recovers more quickly, while that of the upper limb is worse and recovers more slowly (refer to Section 14.9).

Spasticity is a common symptom in apoplexy patients, and its management constitutes a major problem in their rehabilitation. Acupuncture has been applied with moderate effects, which have been experienced clinically, but there is little objective evidence that supports its use. In 16 apoplexy patients with spastic hemiparesis, Yu *et al.* of Taiwan, China found increased spinal motoneuron excitability in paretic limbs, and acupuncture had effect that decreased the excitability ^[126].

If analogizing the shock state of brain cells surrounding or subordinating to the lesion as the "sleep state", during acupuncture treatment in the early stage of cerebral or spinal shock, somatic stimulation with effective intensity may "arouse" them as soon as possible, and help paralyzed limbs controlled by them to resume voluntary movements. Using the power spectrum analysis for EEG and records of somatesthesia evoked potentials (SEP), Chen observed that puncturing points of GV, such as Fengfu (GV16) and Jinsuo (GV8), or Baihui (GV20) and Shuigou (GV26) could drastically improve the recovery speed of EEG/SEP inhibited during cerebral ischemia. Their effects were better than needling other acupoints such as Chengjiang (CV24) and Yinmen (BL37) ^[123].

Third, at certain portions of the affected or opposite side in the brain, a functional area with certain compensatory actions could be established by repeated acupuncture.

Fourth, acupuncture could raise strengths of paralyzed muscles and prevent unused muscle atrophy. Many patients had a significant rise of muscle strengths shortly after acupuncture comparing with that before acupuncture ($P<0.05$). The mechanism was related to either increased excitation of neural pathways innervating these muscles including the pyramidal tract, or possible improvement of energetic states in local muscle fibers. The latter could have their thresholds of excitation reduced after acupuncture, thus more muscle fibers contracted synchronously when motor nerves were activated.

In addition, rehabilitation effects of acupuncture include resuming other dysfunctions, such as loss of hearing or vision, in which there are not only many clinical reports (refer to Sections 16.2 and 17.1), but also experimental studies on the mechanism. Liu *et al.* of Zhejiang College of TCM, China evaluated effects of EA treatment for kanamycin-induced

auditory impairment in guinea pigs. Results showed that EA was effective but no significant differences were found among different stimulation waveforms. Luxi (SI19), Yifeng (TE17), Shenshu (BL23), Sanyinjiao (SP6), Zhubin (KI9), and Waiguan (TE5) were all effective acupoints, especially the combination of Tinggong (SI19), Sanyinjiao (SP6), and Zhubin (KI9). Improvement in the cochlear function and excitability of the cortical and lower auditory center, increase of the mitochondrial SDH (succinate dehydrogenase) activity and energy supply in hair cells might have contributed to the mechanism of the treatment ^[127]. Cho *et al.* of Univ. of California, USA, using fMRI of brain, found that a vision-related acupoint is located in the lateral aspect of the foot. When acupuncture stimulation was performed there, the activation of occipital lobes was seen in 12 volunteers. Non-acupoints at a distance of 2~5 cm away from the vision-related acupoint on the foot were stimulated as a control, and the activation in the occipital lobes was not observed ^[112]. It provided a possible central mechanism for acupuncture effects to improve one's vision and to treat eye disorders.

Mechanisms of Propagation of Needling Sensations

The phenomena where needling sensations of soreness, distension, heaviness, and numbness are propagated from the stimulation location to other portions of the body are called **propagation of needling sensations**. They have various forms, of which **propagation of needling sensations along the meridians (PNSAM)** is the primary meridian phenomenon, and is considered as one of main building blocks for the meridian system. In Section 3.1, we have introduced achievements of modern studies about PNSAM. Clinically, it is mainly activated by needling, and it is a key factor in attaining therapeutic effectiveness of acupuncture. In general, needling sensations propagated to the diseases region, or called **arrival of *qi* at the diseased region (AQDR)** is considered relevant in enhancing results of acupuncture. In this chapter, we will mainly explore the mechanisms of various forms of propagations of needling sensations.

5.1 Classification of Propagation of Needling Sensations

Clinically, there are various forms of propagations

of needling sensations including PNSAM, which may be categorized as two major types according to their conducting characteristics.

The first type is the fast, jumping, or radiating propagation of needling sensations, which is represented by the electric-shock sensation generated by the stimulation at nerve trunks or branches. It occurs as soon as the nerve within the point is stroked, and its propagating direction is in accordance with the distribution and alignment of the nerve, which generally are from proximal to distal. Due to the refractory period of neural excitability, needling stimulation usually cannot induce consecutive electric-shock sensation, which subsequent waves only comes after certain intervals of stimulation.

This type of propagation may also include other sensations, such as distension or a peristalsis feeling of certain viscera such as jumping or pulsating due to its rapid propagation, and commonly induced by needling reflex points. The fact about needling sensations appearing at a distance from a needling location indicates that there is a shortcut between the needling location and other portions of the body. Meanwhile, even without an intense stimulation, a slight needle-manipulation may generate needling sensations to the corresponding reflective body part instantly, without the consecutiveness of traveling course on the body surface. The destination of

propagation may be on either the body surface or certain viscera. When the stimulation is persisted, the jumping sensation may either disappear instantly, or sustain for a short duration. Such phenomenon may appear repeatedly in the same patient.

The second type is the slow and consecutive propagation of needling sensations, which manifests sensations of soreness, distension, and heaviness and generally possess the following characteristics.

(1) Propagating along the meridians. Indicating the propagation route of needling sensations is almost in accordance with traveling courses of classical 14 meridians. However, the majority of needling sensations is locally distributed, and they seldom travel the entire course of the meridian. Due to this characteristic, this type of propagation is usually called PNSAM.

(2) Bi-directional propagation. Except those acupoints located on the limbs, as well as at the beginning or ending of meridians in the head and trunk, propagation of needling sensations induced by stimulation at other acupoints is bi-directional, and it is easier to be propagated to the distal end than to the proximal end.

(3) Propagating toward the diseased region. It is especially significant when needling reflex points.

(4) Slow propagation. The propagation speed is generally slow, ranging from a few cm/sec to tens of cm/sec, and it varies individually or on different body parts.

(5) Barrable propagation. The propagation can be blocked by mechanical oppressions or local cooling factors, sometimes even by scars on the body surface. However, there is also a report that the propagation of needling sensations could crossover surgical incisions in the skin and muscle ^[128].

The slow type of PNSAM may be further classified into two subtypes. The first subtype is the propagation of needling sensations of soreness,

distension, and heaviness. This mainly occurs when fleshy acupoints are punctured, accompanying certain reactions around the needle, such as TDSAN or muscle twitching. This PNSAM mainly travels at the deep portions of meridians with unclear routes of propagation, and generally is unable to crossover joints on the limbs. The second subtype is a more superficial and distinguishable propagation of needling sensations like that detected in the **meridian-sensitive subjects**. Usually, it is induced when a pulsating electrical stimulation at a low frequency was applied on superficial acupoints, such as *Jing (well) points* or *Yuan (source) points*. In addition to the electric-shock sensation, such propagations may include watering or peristalsis sensations and usually propagates farther, sometimes even the entire traveling course of a meridian.

In addition, a special propagation of needling sensations could occur on the phantom limb of amputees. Even though they lost a portion of their body, puncture those areas close to the remaining end could still induce the propagation of needling sensations to the phantom limb. This kind of propagation may be also classified as the above-mentioned fast or slow propagation, respectively.

Various types and characteristics of the propagation of needling sensations hint that their mechanisms are multiple. In the last few decades, though there already are ample studies and experimental results about its mechanisms in the two aspects of **propagation of excitation inside nervous centers (PEINC)** and the **activation of peripheral factors**, it is still too early to conclude the mechanisms of generating propagation of needling sensations, particularly the PNSAM phenomena.

Actually, both of PEINC and the activation of peripheral factors might be involved in the generation of propagation of needling sensations in different extents. The simplified model of reflex

zones or meridians (Figure 3.8) can explain different characteristics of the aforementioned two major types of propagations. Here we also propose three hypotheses to complement the illustration: **propagation of muscle tensions, transmission among sensory nerve endings, and retrieval of sensory memory**. For the first type, namely the fast propagation, PEINC and the retrieval of sensory memory may play a major role, especially **propagation of excitation inside the spinal cord**, which has been emphasized in recent studies. For the second type, namely the slow propagation, besides the involvement of central reflexes, the activation of peripheral factors is obviously involved. For example, propagation of needling sensations induced by stimulation at fleshy acupoints is probably resulted from propagation of muscle tensions, while PNSAM induced by stimulation at the superficial acupoints might also be related to the transmission among sensory nerve endings.

However, the premise of our discussion remains to be the perspective of acu-reflexology, namely, the formation of any needling sensation is dependent on the activation of sensory receptors, transmission of neural signals, and their reception at nervous centers. Thus, mechanisms about propagation of needling sensations are also dependant on them and pertain to certain reflective activities of the nervous system. In addition, since any needling sensation with different properties may be subjective, their propagations may also be subjective. Moreover, it should be emphasized that the propagation of needling sensations and the transmission of needling information are not identical. Although the existence of needling sensations certainly has afferent activities of needling information, the propagation of needling sensations is not necessarily required for the input of needling information. Thus, in the following text, when we mention certain tissues on the body surface

are not directly linked to propagation of needling sensations, it does not necessarily indicate that needling information cannot be inputted through those tissues.

5.2 Propagation of Excitation inside Nervous Centers

It has been over several decades since the assumption of propagation of needling sensations might result from PEINC was initially proposed. The notion is mainly based on the consideration in following three aspects. First, no interpretation about the phenomena of PNSAM has been found from the view of peripheral somatic tissue structures or physiological connections. Second, the propagation of needling sensations can occur on the phantom limb. Third, this proposal has certain basis of neural anatomophysiology. For example, in the sensory centers, including the sensory area of cerebral cortex and thalamus, which is the relay station of secondary sensory neurons, there are functional orientations corresponded to all parts of the body.

In many published reports discussing mechanisms on propagation of needling sensations, PEINC usually represents the propagation of needling sensations in the sensory area (or the sensorimotor area) of cerebral cortex. It is thought that puncturing a certain point on the body surface first induces the excitation of its corresponding representative area in the sensory cortex, namely, generating certain needling sensations, then the excitation impulse spreads within the cortex to stimulate surrounding other representative areas corresponded to other body parts. Accordingly, the needling-recipient has corresponding subjective

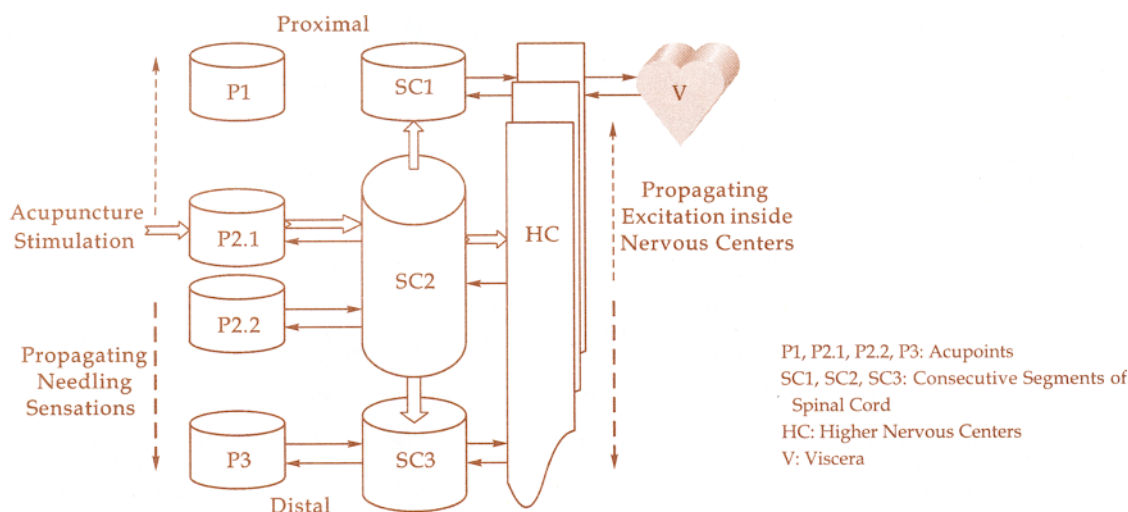


Figure 5.1 Model of Propagating Excitation inside Nervous Centers by Acupuncture

feelings about propagation of needling sensations from the stimulation location to the surroundings or distal parts of the body. Actually, PEINC has never been strictly defined. The propagating excitation could occur within either the sensory area of cortex (i.e., **propagation of excitation inside the cerebral cortex, PEICC**), or within the sensory relay nucleus of thalamus (i.e., **propagation of excitation inside the thalamus**). In addition, PEINC might also occur in the spinal cord (i.e., **propagation of excitation inside the spinal cord**). Sensory afferent nerve fibers from the limbs, trunk, and neck relay at the posterior horn of spinal cord and then ascend, but they might also diffuse within the same or adjacent segments, where certain somatic sensory afferent nerves and visceral sensory afferent nerves may converge, which is considered to be one of the primary links of viscera-body surface correlation. Various patterns of PEINC, whether it occurs within the cerebral cortex, thalamus, or spinal cord, it is illustrated in Figure 3.8 (refer to Section 3.11).

If redrawing Figure 3.8, 3.9 and 5.1 as above, the pattern of PEINC is more comprehensive. When needling the point P2.1, the excitation at the spinal center SC2 is induced first, then it propagates within

the same segment toward adjacent segments SC3 or SC1, even is transmitted toward the farther center HC, which may either be the thalamus or other related nervous centers, such as the sensoromotor area of cerebral cortex. Due to the propagating neural impulses within the nervous centers, the needling-recipient may feel the propagation of needling sensations arriving at the adjacent point P2.2 or farther points P3 or P1, or the location of corresponding viscera V.

As for the reason behind faster spreading of needling sensations toward distal portions of the body, whether it is from the viewpoint of PEINC or the activation of peripheral factors, it might be explained by that the pathways between distal portions of the body and nervous centers are more straightened than that between the proximal portions and nervous centers as below.

In the peripheral aspect, it manifests that there are higher sensory sensitivity and mobility on distal portions of the body than on the proximal. In other words, nerve endings or muscle spindles located on distal portions might have particularly low threshold for excitation, so the propagation of sensations activated by peripheral factors is relative easy.

In the central aspect, one of its manifestations is that representative areas of distal portions in nervous centers are large. It has been known that size of sensory projecting area in the sensory cortex is related to the abilities of fine senses on different portions of the body. The portion with a finer sense has a larger representative area. For instance, the representative area of the thumb and index finger is several times larger than that of the thoracic area innervated by 12 intercostal nerves. The size of representative area in the motor cortex is also related to the precise and complex extent of motions. The muscle with more precise and complex motor ability has a larger representative area. For instance, the representative area possessed by the hand including five fingers is almost equal to the area possessed by the entire lower limb^[6]. Therefore, PEINC induced by puncturing the distal is also relatively easier. In Figure 5.1, the propagating excitation inside the representative area of distal portions as well as the propagation of needling sensations toward the distal are illustrated as thicker dashed lines.

Currently, however, to explain mechanisms of propagation of needling sensations, it seems that the viewpoint about the propagation inside the spinal cord or thalamus is more convincing than that of PEICC.

The first type of propagation, namely the fast, jumping or radiating propagation of needling sensations, is considered to be related to PEINC. Its jumping characteristic might be due to the fast electrical transmission of neural impulses. However, it remains uncertain where these neural impulses occur in nervous centers or in peripheral nerves. Thus, it needs individual analyses based on different circumstances.

Clinically, there are three circumstances where the first type of propagation is induced: The first is the radiating propagation of electric-shock sensation

when certain peripheral nerve trunks or branches are directly stimulated. The second is the jumping propagation of needling sensations when certain reflex points are stimulated. The third is the propagation on the phantom limb.

Looking at the first circumstance, which is familiar to most experienced acupuncture practitioners. While puncturing acupoints, there is a 50% probability of striking nerves passing through or distributed inside acupoints, so it is a very common pattern of propagating needling sensations. Its characteristics are to travel along territories innervated by the stimulated nerve, mainly accompanying electric-shock or mixed sensations of numbness, distension, and heaviness. Due to its speed, it might be a jumping propagation with an insensible intermediate segment of the course. For example, when the needle tip is striking the sciatic nerve at the deep portion of Huantiao (GB30), the electricshock sensation propagated to the toes will take place immediately. When puncturing Zusanli (ST36) and striking the deep peroneal nerve by the needle tip, there will be mixed sensations of numbness, tenseness and heaviness jumped to the dorsum of foot instantly, while no obvious sensation at the anterolateral leg between the acupoint and dorsum of foot were observed. In these two examples, from the speed and routes of propagations, it is certain that there are electric impulses propagating along the sciatic nerve or the deep peroneal nerve to their endings, respectively. Although almost every sensation is generated in the sensory center, this kind of needling sensation with fast occurrence and radiation to nerve endings obviously might not be resulted from PEICC. Instead, it might be due to local propagations of neural action potentials that are induced by needling stimulation at peripheral nerves and branches.

Figure 5.2 illustrates the propagation of excitation

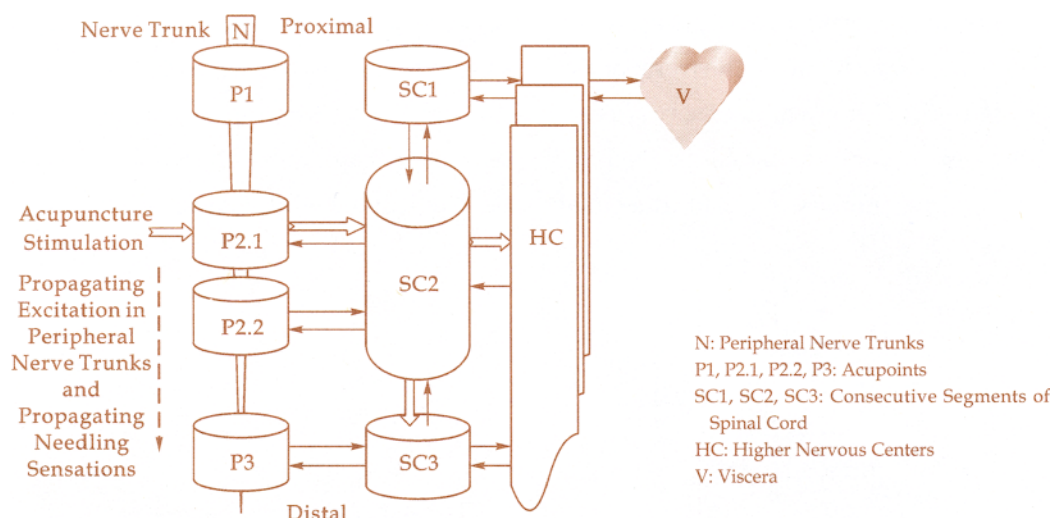


Figure 5.2 Model of Propagating Excitation by Puncturing Peripheral Nerve Trunks

to the distal points along the nerve fiber when the peripheral nerve trunk is punctured. Although conduction of action potentials on nerve trunks is bi-directional, only those radiated to the distal points can be felt, which might be related to the higher sensitivity of nerve fibers on distal portions of the body.

The second circumstance is the jumping propagation of needling sensations when certain reflex points on the body surface or in the ears are stimulated. It is often observed that some needling sensations seem to occur at corresponding viscera or certain portions of the body far away from the punctured points, such as pulsating sensations in the abdomen or the feeling of gastrointestinal peristalsis when puncturing Zusanli (ST36). The mechanism of PEINC, especially the propagation inside spinal cord is more suitable to explain this type of propagation.

When discussing mechanisms of the referred pain, we have already noted that afferent nerve fibers from both diseased viscera and referred somatic areas enter the spinal cord through the same dorsal roots and may converge on the same neuron of the spinal-thalamus tract. Thus, when a certain visceral disease appears, its referred pain may appear at a

corresponding location on the body surface at the same neural segment (refer to Section 3.2). It is believed that this kind of viscera-body surface correlation should also be bi-directional, namely when needling certain locations on the body surface, certain responses of the corresponding viscera will be likewise induced. This kind of responses may manifest as either regulatory impacts of acupuncture on the corresponding viscera, or the sensory activity of corresponding viscera. Although visceral feelings are usually vague or indistinct, when it is strengthened by certain pathological factors, oftentimes it will be felt at certain degrees because the pathological factors may decline the threshold of corresponding sensory neural network (refer to VC1→V1 circuit in Figure 3.8). This might also explain why needling sensations can easily jump up to the diseased viscera.

Of course, besides the segmental level of spinal cord, the jumping propagation of needling sensations could take place in higher centers, such as the thalamus or cerebral cortex. In other words, it could be a kind of mixed propagations of excitation inside nervous centers including the spinal cord, thalamus, and cerebral cortex. For example, when puncturing

auricular points, propagating needling sensations may jump from auricular points to the trunk or the extremities (Figure 5.3). Meanwhile, sensory afferent fibers of trigeminal ganglion that carry needling sensations relay at the primary nuclei of trigeminal

nerve of pons and the nuclei of spinal tract, then ascend to the ventral posteromedial nuclei of the thalamus. The jumping propagation of needling sensations may occur between the pons and spinal cord, or inside higher centers above the thalamus.

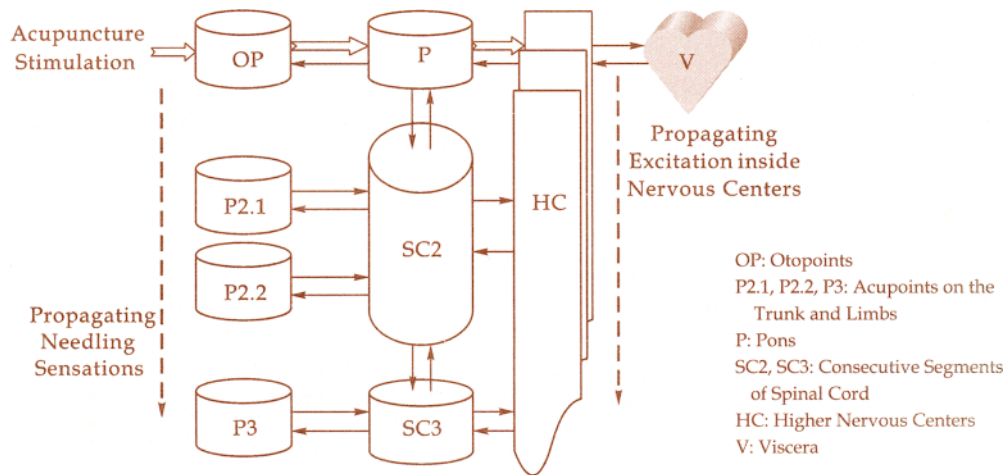


Figure 5.3 Model of Propagating Excitation inside Nervous Centers during the Puncturing of Otopoints

The third circumstance of fast propagation is the propagation of needling sensations on the phantom limb. It was considered as the most powerful evidence for PEICC. However, due to the structural characteristics of the sensory cortex, where there is a mosaic pattern of excitation and inhibition activities, the propagation of needling sensations on the phantom limb might not be a simple PEICC. Instead, it seems like either the propagation inside the spinal cord or the retrieval of sensory memory (refer to Section 5.6).

Moreover, in addition to the fast form, the propagation of needling sensation on the phantom limb has a slow form, which, like PNSAM in normal subjects, is even more difficult to be explained by the propagation inside the cerebral cortex or the

thalamus. First, the speed of neural conduction is much faster than that of PNSAM. Second, when puncturing points of the lower limb, the PNSAM will directly propagate from the lower limb to the head through the trunk instead of the upper limb, which is not in accordance with the projection rules of somatic representative areas in the sensory cortex.

Therefore, the propagation of needling sensations on the phantom limb, whether it is the fast or slow form, is difficult to be explained with the propagation inside the cerebral cortex or the thalamus. Instead, its central mechanism seems like the propagation inside the spinal cord that is identical to the normal sensory process, as well as the retrieval of sensory memory that will be discussed in Section 5.6.

5.3 Activation of Peripheral Factors

In the previous section, we have mainly examined the relationship between the fast and jumping major type of propagation of needling sensations and PEINC. Among the first major type, the propagation of needling sensations induced by puncturing peripheral nerve trunks and their branches obviously cannot be explained by PEINC. Instead, it pertains to the activation of peripheral factors.

The activation of peripheral factors in the discussion about mechanisms of needling sensations generally indicates primary structures in generating propagation of needling sensations are on somatic portions. Of course, since every needling sensation is generated from nervous centers, the involvement of nervous centers is never excluded. The second major type of propagation, namely the slow and consecutive propagation of needling sensations, particularly the PNSAM, is usually considered closely related to the activation of peripheral factors, yet it is unclear which factor plays the major role and how it is involved.

Because no particular structures have been found within acupoints that are different from tissues recognized in contemporary medicine, it is generally acknowledged that every known tissue structure on the body surface and somatic sensory receptors distributed among them are the primary foundation of generating various needling sensations. Thus, they all may become peripheral factors to activate propagation of needling sensations. In Section 2.3, we have already analyzed that during the puncturing of fleshy acupoints, the targeted tissue structures by the needle may have at least six layers: the skin, subcutaneous tissues, muscles, or tendons, nerve trunks or branches, blood vessels and the periosteum. These tissues at different layers of acupoints

should be examined sequentially from the perspective of the activation of peripheral factors.

Because the traveling courses of the 12 regular meridians on the body surface are along the longitudinal axon, most nerve trunks, muscles, and large blood vessels, which are distributed longitudinally and in accordance with the traveling directions of meridians, may serve as peripheral factors involved in propagation of needling sensations. In the preceding text, peripheral nerves have been recognized as one of peripheral factors, but it is not suitable to explain the slow propagation of needling sensation because it usually generates fast radiating electric-shock sensations when peripheral nerves are stimulated. So what are roles of the muscles or blood vessels in peripheral factors of generating the slow type of propagation?

In the slow and consecutive propagation, sensations of soreness, distension, and heaviness are most frequently encountered. While these sensations become stronger at the needling region with a persistent stimulation, they slowly propagate toward the surroundings longitudinally. The locations of their traveling courses are not very clear, perhaps in deep parts of the meridian and seldom crossover joints when they occur in the limbs. When they are mainly generated by puncturing of fleshy points, there are accompanying TDSAN or muscle twitching around the needle. These phenomena indicate that muscles at acupoints and distributed along the meridian courses are most likely to be principal peripheral factors in activating such propagations. Accordingly, we will propose a pattern named as the **propagation of muscular tensions** in the next section and consider they are induced mainly by the activation of muscle spindles. However, in the second major type of propagating needling sensations, there is another form induced by pulsating electrical stimulation at certain superficial acupoints, and its

traveling courses may be relatively superficial and propagated farther. Because there may not be any muscle spindles lodged within these superficial acupoints, this kind of propagation seems to be activated by stimulating sensory nerves in the skin or subcutaneous tissues. It also has a few other possible mechanisms, which are summarized in the subsequent hypothesis about the **transmission among sensory nerve endings**.

As for the close relationship between blood vessels and the essence of meridians, it has been reported for many years, and mostly is from the perspectives on the activation of sympathetic nerves innervating the vasomotion. There are abundant sympathetic nerve endings distributed within acupoints and beneath the courses of meridians, which is usually related to the low electric resistance of acupoints. The red lines or papuloid zones of skin accompanying PNSAM are probably resulted from the inhibition of sympathetic nerve fibers that control the vasomotion. In a recent study about the relationship of sympathetic nerve and PNSAM, it was found that there was an information pathway existing within the skin of advanced vertebrae animals, which could transmit acupuncture signals and depended on the release and action of sympathetic neurotransmitters. Such pathways could be called **sympathetic sensitive lines**, which were considered as the essence of meridians^[133].

It is now known that regulatory activities in ANS are closely correlated to the realization of acupuncture effects, but the sensations from puncturing the blood vessel walls directly are mostly regional severe pain and are seldom conductive. Moreover, upon the activation of autonomic nerve fibers, there are often changes of regional temperature, which do not necessarily accompany the propagation of needling sensations. Alternatively, even if the temperature change occurs, it occurs later than the

occurrence of propagation of needling sensations. Therefore, it still lacks proof about the involvement of blood vessels or autonomic nerve fibers within acupoints as a principal peripheral factor in activating such propagations. Of course, the needling information also could be inputted into the body through stimulation on blood vessels and autonomic nerve fibers within acupoints, because the transmission of needling information and propagation of needling sensations are not the same concept (refer to Section 5.1).

In addition, the connective tissues within the skin or other layers of acupoints might be related to the essence of meridians. At superficial points, though there might be a lack of muscles, other tissues may exist. The tissues stimulated by needling are the skin first, then subcutaneous or deep connective tissues including membranes of muscles, articular sacs and ligaments, and the periosteum. Acupuncture practitioners often experienced that only when there is a “fullness” feeling around the needle, there will be generation and propagation of intense needling sensations. This kind of “fullness” feeling around the needle also may often occur when striking subcutaneous tissues or the periosteum besides muscles within acupoints. When the body becomes ill, most reflex points on the body surface are often manifested as forms of **hard nodules** in spite of their depths. Except for those hard nodules consisting of rigid or spastic muscular tissues, the remaining reflex points with hard nodules are mostly composed of connective tissues.

Recently, through the state-of-the-art technology, Fei *et al.* verified that the physical basis of meridians and 50~60 common acupoints might be in a complex system, which was mainly composed of connective tissues and interwoven with blood capillaries, nerves, lymph vessels, and so on. This system was called **connective tissue structures**, which was

considered as the carrier of various organs, tissues and cells, as well could perform functions of transmission and adjustment of substances, messages and energy with the cells [136]. However, there is no generation of sensations in the denervated skin or connective tissues, as well as in the extracellular stromas. It also lacks evidences if considering these tissues as the material basis of propagating needling sensations. Thus, they are impossible to become peripheral factors in the activation of the propagation.

5.4 Hypothesis: Propagation of Muscle Tension Waves

In 1976, we proposed a hypothesis that the activation of muscles along the meridians is most likely one of the peripheral factors involved in the slow propagation of needling sensations^[1]. Accordingly, in most situations of *deqi*, whether they are the soreness, distension, or heaviness felt by patients or TDSAN felt by practitioners, they are all related to the rising muscle tensions at the needling region.

In Section 2.5, we have analyzed the relationship between the response around the needle and the muscle tension. Briefly, the increase of muscle tension at the needling region is realized through spinal reflexive centers. As the primary sensory receptor within fleshy acupoints, the muscle spindle contains type I and type II afferent nerve fibers that could trigger the stretch reflex. It is also innervated by γ motoneurons from the spinal cord that could increase the sensitivity of sensory apparatus within muscle spindle through facilitating the contractions of intrafusal fibers. Hence, when muscle spindles are stimulated, stimulation signals may be strengthened through a positive feedback circuit and raise the

tension of extrafusal muscle fibers through α motoneurons that controls the muscle, in effect serving as the anatomical bases for the generation of regional muscle tension (see Figures 2.5 and 2.6).

The pattern of the **propagation of muscular tension waves** is illustrated in Figure 5.4, where we have replicated several positive feedback circuits shown in Figure 2.6 and arranged them in a line to explain the possible mechanism of propagating needling sensations activated by puncturing a muscle spindle. Specifically, it requires a reciprocal action between peripheral factors and nervous centers. M1, M2 (M2.1, M2.2), and M3 represent acupoints located at the continuous portions of a muscle.

When puncturing the point M2.1, due to the stretching stimulation of needling on muscle spindle MS2.1, the intrafusal I and II nerve fibers are first activated and afferent impulses are transmitted to the reflex centers in the spinal cord. Through the connection of interneurons, α motoneurons in the corresponding spinal segments are activated, which may lead to reflective increases of the sensitivity of muscle EF2.1 at the needling region accordingly. Then it may squeeze the regional nerve endings or other sensory receptors SE2.1, such as Pacinian corpuscles, to induce sensations of soreness, distension, and heaviness. Through the above mentioned positive feedback circuit of increasing the sensitivity of muscle spindles, it may further intensify the regional muscle tension and needling sensations along with a sustaining needling stimulation. This is the rough process of how needling could serve as a source of intensive needling sensations within a fleshy point, which has been previously analyzed in Section 2.5.

At this time, the next questions arises is how do the needling sensations spread to its surroundings slowly? According to the hypothesis, the nerve endings along propagation routes on the body

surface are similarly stimulated due to the reflective increases of propagating muscle tensions. For example, when muscle spindle of MS2.1 at point M2.1 is activated by needling, the tension of muscle EF2.1 will reflectively increase, which can squeeze regional nerve endings or other sensory receptors SE2.1, such as Pacinian corpuscles, to induce needling sensations. On the other hand, neural discharges of the muscle spindle will sustain along with continuous needling stimulation that may result in a periodic increase of muscle tension. It is likely to have formed a vibration source, which can deliver vibration waves to surrounding tissues and squeezes nerve endings or other sensory receptors SE2.2 lodged at surrounding tissues to induce needling sensations.

Moreover, the persistent or even enhanced afferent impulses from muscle spindle MS2.1 may further activate γ motoneurons in the same or adjacent segments of spinal cord. Activation of γ motoneurons may further raise the sensitivity of adjacent muscle spindles, especially those within the same or adjacent motor units, such as MS2.2, which can facilitate the excitation of muscle spindles when they receive propagating stimulation of muscle tension waves from the surroundings. Concurrently, through spinal reflexes, α motoneurons at the same or adjacent segments and their dominated portions are activated to raise the muscle tension and have them propagated farther. Apparently, this is the reason why the initial muscle tension should not be quickly attenuated, instead, it may be sustained for a period or even enhanced. In addition, the excitation may also be propagated among α motoneurons inside the spinal cord, of which the connection has already been detected.

Therefore, if the needle-manipulation is sustained, not only signals in this regional reflex circuit may increase, they can also be spread to farther parts in

the spinal cord, such as SC3 or SC1. It will result in a distant propagation of muscle tension waves through an increase of muscle spindle sensitivity in the farther parts as MS3 or MS1. Meanwhile, the needling-recipient might feel the propagation of needling sensations from M2.1 to M3 or M1.

In the above pattern, there are two forms of propagation of the muscle tension waves. The first is the direct mechanical transmission though the vibration of muscular tissues. The second is the electrical transmission through spinal reflex activities, particularly that of α motoneurons. Nevertheless, regardless of the type of transmission, the generation of propagating needling sensations is the result of regional raised muscle tension squeezing sensory nerve endings or barosensory receptors inside the muscle. Accompanying the propagation of muscle tension waves, sensory nerve endings at adjacent or distant muscles will be activated successively and begin to deliver impulses to higher centers such as the cerebral cortex, which will sense the propagation along the traveling direction of the muscle tension.

This hypothesis has been supported by a number of experimental studies^[70,140-142] in addition to having a well-known anatomophysiological basis about the generation of muscular tension. Applying neurophysiology and histochemistry in their studies, Xie *et al.* of China observed that in the ventral horn of the spinal cord, a small group of motoneuron innervated each acupoint, and these neuron groups of homomeridian acupoints formed a discrete longitudinal column, which was the mirror image of acupoints, and there were dentro-dentritic projections occurring in the labeled motoneurons. It supports the notion that PNSAM pathway should be a secondary sense elicited by intrinsic reflective activity occurring in muscle compartments innervated by motoneurons with a well-oriented

arrangement^[142].

More importantly, the hypothesis of the **propagation of muscle tension waves** not only completely corresponds to the actual clinical circumstance of generating needling sensations, but also may explain almost all characteristics about the propagation of needling sensations.

First, the hypothesis might explain this form of propagation's ability to possess the characteristics of slowness and consecutiveness. It seems that both central reflexes with multiple synapses and peripheral tissues such as muscles are involved. More importantly, the propagation of muscle tension might be a process of mechanical vibration, so it would be reasonable to have a slower speed comparing with that of the electrical impulse in the nerve conduction.

Because this kind of vibration source is only formed when muscle spindle are activated, changes and propagation of muscle tension waves can only occur within muscles, thus the needling sensations induced by them often travel along the direction of the same muscle (or adjacent synergic muscles). Hence, the alignment of muscles along the major axon of limbs is in accordance with courses of the

meridians at the same region, and needling sensations propagating along muscles often have similar characteristics to PNSAM.

This hypothesis is in accordance with clinical observations about the propagation of needling sensations induced by puncturing certain acupoints at muscular regions. The sensations were mostly soreness, tenseness, and heaviness at vaguely defined locations, generally manifested as band-shaped or sometimes spindle-shaped. Their propagations generally did not crossover joints. Once the stimulation was paused, needling sensations no longer propagated toward distal areas though not immediately. Instead, they returned in a reverse direction and gradually subsided during the returning process^[13].

Second, this hypothesis might clarify why the propagation of needling sensations could be bi-directional and blocked by mechanical oppression on their traveling routes, as well as which blockage could be dredged by applying the method of **needling-relay to circulate qi (NRCQ)**, namely allowing the sensations to continuously propagate forward (refer to Section 3.3). As shown in Figure 5.4, when puncturing the point M2.1, the muscle tension may spread toward either M3 or M1, i.e.,

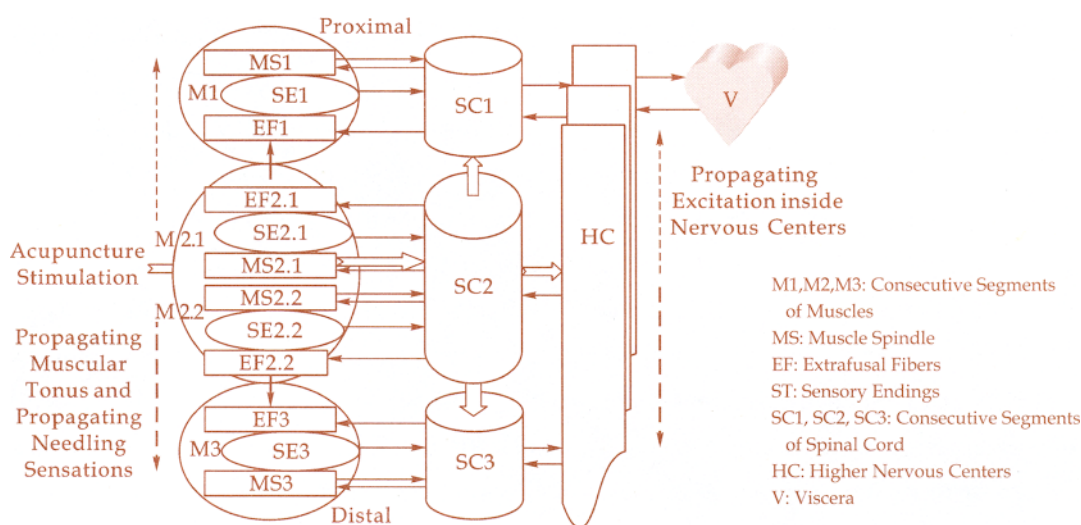


Figure 5.4 Model of Propagating Needling Sensations by Activation of Muscle Spindles

the propagation of needling sensations could be bi-directional. However, there are hypersensitivity and better mobility in distal portions than in proximal portions of the body, which indicates there are special lower thresholds of excitation in sensory receptors such as nerve endings and muscle spindles in distal portions. Accordingly, the propagation of muscle tension or needling sensations should be especially easier toward the direction of M3 that pertains to distal portions.

If needling sensations are not intended to be spread to M3, one may apply a finger pressure on M2.2, the location between M2.1 and M3, which is supposed at the distal side of the needling point M2.1. This kind of mechanical oppression may block the propagation of muscle tension or needling sensations toward distal portions. Meanwhile, there are no other mechanical oppressions applied at the proximal side of M2.1, namely, the propagation of muscle tension toward the proximal side is not blocked. Therefore, the propagation of needling sensations toward M1 in proximal portions is consequent. Moreover, due to the blockage at M2.2 that can reduce the shunt of muscle tension waves from M2.1 to distal portions, the propagation of muscle tension waves toward other directions including the proximal portion M1 is strengthened accordingly.

When the propagation of needling sensations arrive at M1, if it has attenuated and can not continue forward, one solution is to continuously strengthen the stimulation at the original needling point M2.1. One can also insert another needle at the blocked location M1 to provide the same stimulation, which may strengthen the tension of extrafusal muscle EF1 at M1 through increasing the sensitivity of MS1. It probably will make muscle tension waves or needling sensations further spread toward the proximal portions of the body. This might be the principle of

NRCQ method applied in clinical acupuncture.

In addition, this hypothesis may also explain the tendency of propagating needling sensations toward the diseased region, i.e., **arrival of *qi* at the diseased region (AQDR)**. Due to pathological stimulation, the sensitivity of muscle spindles at the diseased region may be raised, which can result in decreased thresholds of connection pathways (neural networks) between the diseased region and corresponding reflex points. Thus, the propagation of muscle tension waves or needling sensations generated on the reflex points may easily spread toward the diseased region.

In short, the above hypothesis almost can explain the characteristics of slow and consecutive propagation of needling sensations between two adjacent joints, which are most commonly seen in clinical acupuncture. However, how does it explain the characteristics of PNSAM or why the propagation is still able to travel across joints or different muscles in certain situations with persistent stimulation?

Actually, as reported in various studies about the phenomena of PNSAM^[148], the distinguishable propagation routes along the meridian occurred mostly on the limbs. When applying stimulation on the extremities, needling sensations could seldom spread to the trunk or head. If it did occur, then the needling-recipient probably could describe approximate propagation routes, such as the anterior, lateral, or posterior sides of the body. The precise propagation routes on the head or face could not be induced unless the regional stimulation was applied. Moreover, it was observed that the propagation of needling sensations on the trunk or head had miscellaneous routes or directions over 60 types. Obviously, the phenomena of PNSAM cannot be elucidated by any single mechanism, though the traveling courses of meridians on the limbs could

be in accordance with the propagation of muscle tension waves.

On the other hand, it was reported that the slow-moving PNSAM often had more difficulties in crossing over larger joints such as knees, hips, or shoulders, where there were pauses of propagation. The interrupted propagation could resume its traveling only by strengthening the stimulation^[13]. As for the mechanism of PNSAM that crossover the joints, it might be related to the diffusion of electrical excitation in nervous centers, especially in the spinal cord, such as electrical transmissions among α motoneurons in the spinal cord^[142,145]. This kind of transmission and the propagation of muscle tension waves might play different roles. In other words, the muscle tonus propagated by the muscle tension waves might lead to the propagation of needling sensations in a single muscle, while the electrical transmission between α motoneurons in the spinal cord might play a greater role in the distant propagation through promoting needling sensations across adjacent muscles or joints.

Therefore, the mechanism of longdistance propagation of needling sensations across joints when needling muscular regions could be explained in conjunction of mechanical propagation of muscle tension waves and electrical transmission of excitation in the spinal cord. As shown in Figure 5.4, the stimulated point M2.1 and its adjacent location M2.2, which was reached by the propagation of needling sensations, might be on either the same muscle or two different but synergic muscles innervated by the same segment of spinal cord. However, M3 or M1 might be on other muscles different from M2.1 and M2.2 or innervated by other segments of the spinal cord. When puncturing M2.1, impulses activated in muscles of this location could either raise sensitivity of MS2.1 and MS2.2 through increasing the excitation threshold of γ motoneurons at the same segment,

or spread to adjacent segments of the spinal cord.

In summary, the propagating distance induced by the activation of muscle spindles at a single location might be limited after all, which was mostly located at the needling region or between two adjacent joints of the limb. Of course, it might spread farther if other mechanisms of promoting the propagation such as the aforementioned propagation of excitation in the spinal cord, as well as the transmission among sensory nerve endings and the retrieval of sensory memory as below that are involved altogether.

When M1, M2.1, M2.2 and M3 are replaced with acupoints P1, P2.1, P2.2 and P3 respectively, Figure 5.4 could evolve to Figure 5.5, which is an example of puncturing P2 to induce propagation of needling sensations toward the proximal end, and displaying a general pattern of propagating excitation during PNSAM. This might be used to illustrate various mechanisms about propagation of needling sensations discussed in this book.

5.5 Hypothesis: Transmission among Sensory Nerve Endings

Clinically, PNSAM occurs not only when stimulating acupoints lodged at muscular regions, but also under experimental conditions, particularly in the body of the **meridian-sensitive subjects**, where electrical stimulation at some superficial acupoints of the extremities often may induce a distant propagation. This kind of propagation has more superficial and distinguishable traveling courses, unlike that in the deep muscles. Therefore, it is difficult to be illustrated with the above hypothesis of propagating muscle tension waves.

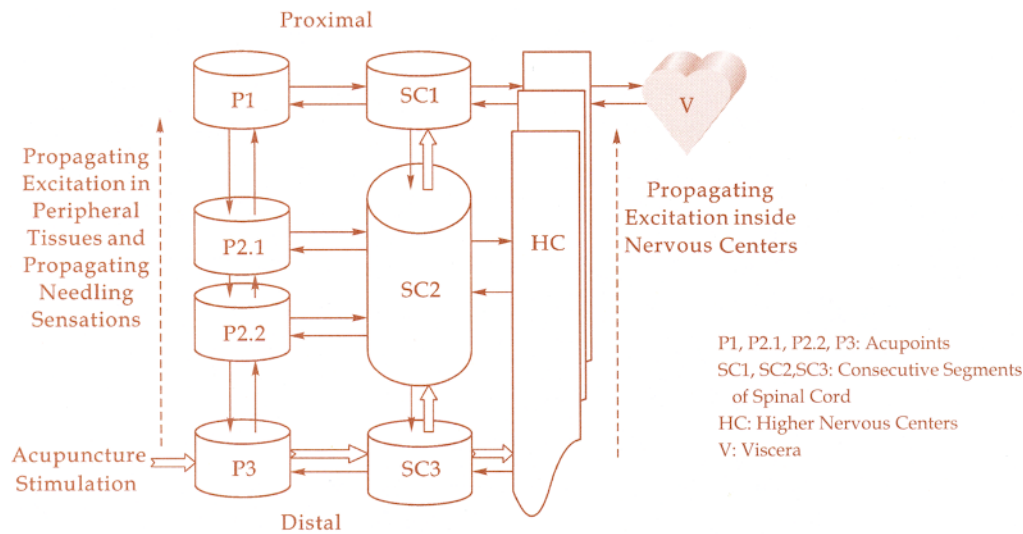


Figure 5.5 Model of the Propagation of Excitation and Propagation of Needling Sensations along the Meridians

Obviously, at points without muscle spindle, PNSAM may be induced by the activation of other sensory nerve endings in the skin or subcutaneous tissues. The hypothesis of **transmission among sensory nerve endings** proposed that when sensory afferent impulses were induced by needling stimulation at sensory nerve endings lodged at superficial portions of points, they might simultaneously activate other surrounding sensory nerve endings or adjacent locations through diffusion of excitation by various direct or indirect connections between different sensory nerve endings. Thus, propagation of needling sensations along certain routes on the body surface could be felt.

Stimulation at a single cutaneous nerve could increase discharges of other adjacent cutaneous nerves^[144]. Although its causes remain unclear, it indicates that indeed, there are more subcutaneous sensory neurons lodged along the meridian activated with stimulation of EA, and afferent impulses can be projected to the same or adjacent segments in the spinal cord. This is mostly likely the basis for inducing PNSAM and directly lends support to the hypothesis of transmission among sensory nerve endings.

The proposal about the transmission of needling signals through connections between superficial sensory nerve endings is based on the following anatomical and clinical facts.

First, there is certain overlapping in the territory innervated by cutaneous nerves from adjacent segments, which makes the transmission among the nerve endings possible.

Second, some experiments^[146] have demonstrated that peripheral nerve endings could be connected under certain conditions to continue the transmission of the excitation. Moreover, this kind of connection was subjected to the inhibition of sympathetic nerve activity.

Although it is unclear how sympathetic nerve activities affect the connection among sensory nerve endings, the sympathetic nerve activity no doubt can affect the phenomenon of emerging red lines or papuloid zone at the skin during PNSAM.

Many acupuncture practitioners may have experienced skin flushing around the punctured point that occurs either instantly at the time of needle-manipulation or gradually during the needle-retaining period. This phenomenon pertains to a

kind of red areola response due to dilation of arterioles. Generally, its occurrence is mostly related to axonal reflexes between sensory nerve endings and blood vessels as below. When sensory afferent impulses from cutaneous nerves were ascending, they could also spread to regional blood vessels along the same nerve reversely and released vasodilative substances at its endings, including P substance and/or ATP. These substances could directly act on the blood vessels or first act on **mast cells** near blood vessels to make them release histamines to dilate blood vessels further. Therefore, red areolas around the needle and the commonly seen wheal responses in some sensitive individuals are generally the consequences of axonal reflexes.

Accordingly, it is easy to comprehend that the red lines or papuloid zone appearing at the skin during PNSAM might also be the consequence of axonal reflexes as red areolas or wheal reactions around the needle.

PNSAM induced by puncturing superficial acupoints is one kind of fine parasthesias that usually occurs only at superficial tissues on the body surface and sometimes accompanying red lines or

papuloid zones that appear at the skin. Accordingly, a hypothesis of needling-relay through axonal reflexes was proposed to describe these cutaneous responses and the fine PNSAM only when superficial tissues were stimulated. However, this hypothesis cannot explain the deep propagation of needling sensations^[138,139].

In summary, the transmission among sensory nerve fibers on the body surface might also be a mechanism for the slow propagation of needling sensations. Whether the transmission is through direct or indirect connections, it can be illustrated as Figure 5.6. On one hand, posterior root fibers from upper, middle and lower segments of the spinal cord (SC1, SC2, SC3) constitute a single cutaneous nerve that dominates P2, and distributions of its nerve ending (P2E1, P1E2, P3E2) are interweaving and overlapping. On the other hand, the nerve ending P2E1 that innervates P2 may have a direct or indirect connection (J1-2 or J2-3) with nerve endings P1E1 and P3E1 that innervates adjacent parts P1 and P3, respectively. This kind of connections either might be an electrical synapse among axons or the **junction of nerve-mast cell**.

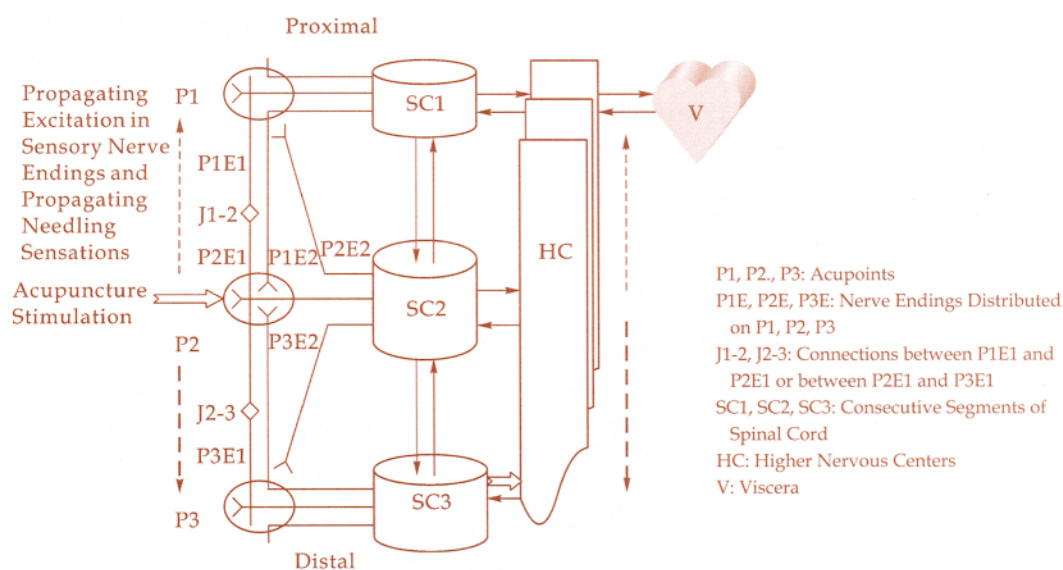


Figure 5.6 Model of Transmitting Excitation in Sensory Nerve Endings

When P2 is subjected to needling or electrical stimulation, sensory afferent impulses from the affected region may be inputted into corresponding segments of spinal cord through two pathways. One is the direct excitation of P2E1, P1E2 and P3E2 that is the composition of the same nerve, and the second is through the activation of other adjacent cutaneous nerves by excitation of J1-2 or J2-3. Through these two ways, particularly the latter, the needling-recipient will sense needling sensations as if they come from territory P1 or P3. Along with a continuous stimulation, these sensations may continuously spread toward the surrounding distal parts of the body, which forms the phenomenon of superficial needling sensations propagating on the body surface.

Applying the hypothesis of transmission among sensory nerve endings, it can also explain some characteristics possessed by this form of propagation. First, the distribution sequence of dermal segments along the meridian on the trunk and limbs is in accordance with that of spinal segments, which makes PNSAM on the limbs or trunk possible. Next, because of complicated circuits among sensory nerve endings or a series of axon reflexes of retrograde nerve fibers involved, the speed of this form of propagation becomes slower. Furthermore, any mechanical oppression on the route of propagation may directly block circuits among superficial nerve fibers or neural transmission of axon reflexes to interrupt the propagation of needling sensations.

Certainly, this hypothesis is not a unique mechanism in clarifying the slow propagation of needling sensations induced by puncturing superficial acupoints, which may need to combine this hypothesis along with the other two previously proposed, i.e., propagation of excitation in the spinal cord and propagation of muscle tension waves. A study by using Horseradish Peroxidase conjugated Cholera

Toxin B subunit (CB-HRP) tracing technique indicates that there is a reflex circuit of afferent-integration-efferent neural network between primary transsegmental sensory nerves and motoneurons in the spinal cord that innervate muscles at Houhai (a new point) of the rat^[147]. Therefore, whether the sensory afferent impulses are from superficial or deep points, the mechanism about the propagation of muscle tension waves might also be activated through this kind of neural network so that these two kinds of propagations, superficial and deep, may be integrated as one.

5.6 Hypothesis: The Retrieval of Sensory Memory

When exploring the mechanisms of propagation of needling sensations, whether applying the above hypotheses on the activation of peripheral factors or the propagation of excitation in nervous centers, the following difficult question must be addressed. When the excitation of nervous centers is propagated to certain adjacent spinal segments or representative areas of cortex, why can the needling-recipient feel needling sensations at corresponding somatic locations where no direct needling was applied?

A persuasive interpretation is that the organism has a memory for senses (inherited or acquired after birth) from the past including sensations induced by stimulation on the body surface. This kind of memory pertains to our subconsciousness and has already been stored in the corresponding central structures. It usually cannot be sensed, but can be retrieved by conditions that are similar to the stimulation experienced in the past.

It has been demonstrated that applying electrical

stimulation at the representative zone of lower limb on the postcentral gyrus could result in a subjective sensation that seems to be from the lower limb, while the stimulation at the representative zone of the face could induce a subjective sensation from the face^[6]. As for the causes of these phenomena, it is generally thought that there are corresponding spatial orientations of the final sensory neurons in nervous centers to the first sensory afferent neurons from the soma and the secondary interneurons. When the final sensory neurons are stimulated, the recipient will “misidentify” that the stimulation is from corresponding somatic parts. Why does such kind of misidentification occur? The basis, obviously, is that there are traces of past sensory afferent stimulation of the body that have been stored in the sensory areas of cerebral cortex. They may be directly retrieved by a foreign stimulation. For example, certain types of somatic memory in nervous centers can be retrieved when a direct electrical stimulation is applied. Likewise, it is also possible to have specific somatic sensations retrieved by stimulation at particular locations on the body surface, such as acupoints, or via other stimulation means.

There can be a variety of memorable sensations (a variety type of sensory memory). For example, a person who had eaten a sour plum in the past could associate the sourness of the fruit and even could have an increasing secretion of saliva when seeing or heating about a plum. It is a typical conditioned reflex, which depends on the memory about the taste of plum. In fact, the human brain has excellent memory and association functions, not only for sensations of special sensory organs (i.e., the taste, smell, vision, and hearing), but also for other sensations induced by somatic or visceral stimulation. For example, the visceral referred pain possesses the characteristic of memory. The repeated onsets of certain referred pain in the same patient often had

similar propagation routes and hypersensitive zones on the body surface. Motor sense is another example. A swimmer could quickly stay afloat in the water upon entering a swim pool even if she had not swam in years. Likewise, a biker can quickly maintain the balance even if he had not biked in years. For the motor memory, though they are mostly intrinsic or cannot be sensed, they can still be retrieved instantly under a certain condition that mimics the past.

In fact, the establishment of every conditional reflex in the human body may be considered as the manifestation of the ability of memorizing past senses and retrieving past memory. The conditional reflex is a major mechanism of learning. It has been reported that conditional reflexes can be set up for various effects of acupuncture on the body functions, such as saliva-secretion, analgesia, vasotonia, skin temperature, milk-secretion, blood sedimentation, and white blood cell counts^[29]. In the formation process of these conditional reflexes, memories or learning about needling sensations and their propagation are certainly involved.

Clinically, the feelings or pains on the **phantom limb** are common and one of the best evidences for retrieving the memory of somatic sensations. It was observed that in 40 cases of amputees between ages of 8~59 who had a limb amputated, 37 cases had feelings or pains about the phantom limb. Four cases had the limb amputated before they reached age 10. Among these four cases, three cases never had feelings or pains about the phantom limb, and another one only had them until one month after surgery^[130]. This implies that pediatric amputees seldom have the phantom limb phenomena. Its cause might be related to the shorter time usage of the limb in children than adults, i.e., in general, pediatric amputees have a weaker sensory memory on their amputated limbs. Of course, further studies are needed to prove this assumption.

Then, which portion of the body or through which stimulation type or intensity may sensory memory is generated most easily? According to the regular recalling process of human, the closer the new stimulation are to the past stimulated body part and the more it is similar to the past stimulation properties, the more easily the sensory memory occurs, otherwise known as *the scene brings back memories* in Chinese. Obviously, stimulation on the body surface may easily retrieve the stored past information from the sensory memory of corresponding and continuous parts on the body surface.

Figure 5.7a illustrates the process of activating the sensory memory of the upper limb by puncturing Jianyu (LI15) in a healthy person, which may be involved in the mechanism of propagating needling

sensations along the arm. Figure 5.7b illustrates the process of activating the sensory memory of propagating needling sensations along the phantom limb by needling Jianyu (LI15) in an amputee.

It has been observed clinically that the propagation of needling sensations on the phantom limb by stimulating Huantiao (GB30) in lower limb amputees is completely the same as that in a normal person, which is a kind of fast needling sensations quickly generated and spread to the extremities. It has been affirmed that needling sensations at Huantiao (GB30) in normal persons are mainly caused by stimulation of the sciatic nerve, which are composed of mixed fibers of sensory neurons and motoneurons. Due to the bi-directional conduction characteristics of nerve fibers, the excitation in the

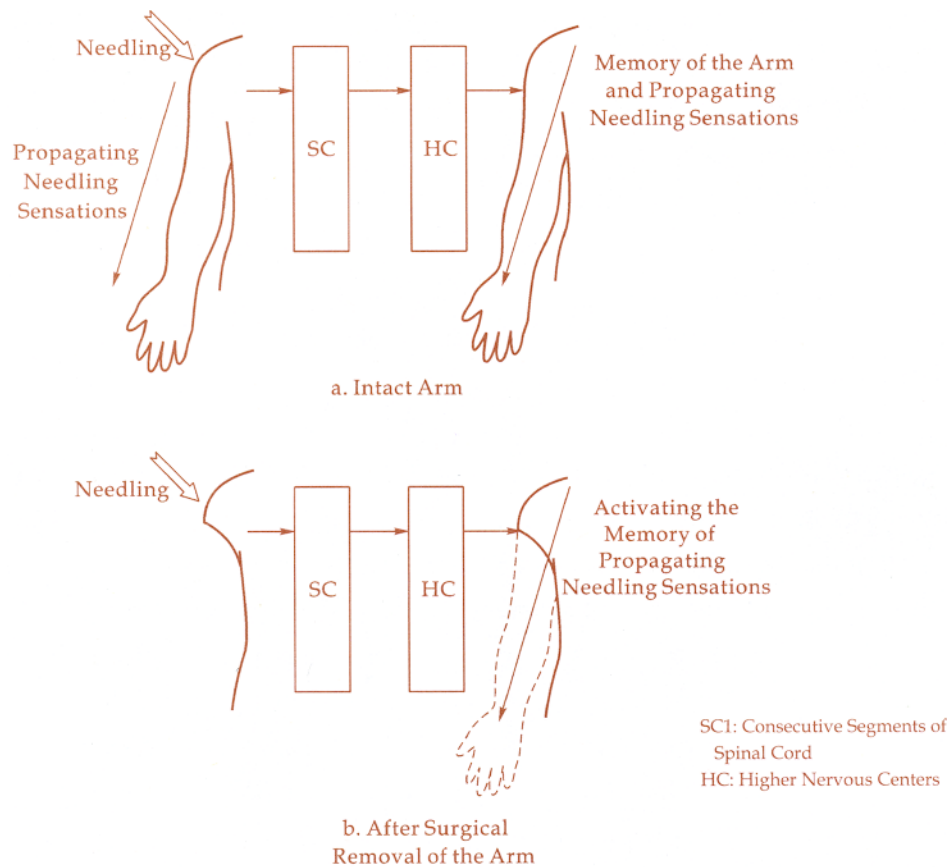


Figure 5.7 Model of Activating the Memory of Propagating Needling Sensations

sciatic nerve may be propagated toward either the distal or the proximal portion of the body. However, during most of the times, why does the needling-recipient only feel propagation of needling sensations toward the distal end? It might be because the sensory sensitivity of distal portions of the body is higher than that of proximal portions. In other words, sensory neurons lodged in distal portions of the body might have lower threshold of excitation. For the same effect of stimulation on Huantiao (GB30) in lower limb amputees, it might be due to the retrieval of the sensory memory saved in various levels of centers by stimulating the remaining end of the sciatic nerve. The basis of this kind of sensory memory might also be just in the remaining end of the sciatic nerve, i.e., after the lower limb was amputated, the original property of distal sensory neurons, such as a lower excitation threshold, still exists in their remaining end. The projecting order of these neurons in the posterior horn of the spinal cord might also remain unchanged. Thus, puncturing Huantiao (GB30) may stimulate the remaining end of sciatic nerve, excite the remaining portions of corresponding sensory neurons, relay at the spinal cord and make specific projections on the thalamus and cerebral cortex, and finally induce the same needling sensations as that in the normal people. If this hypothesis can be proved, all parts on the body surface in the normal people should have similar bases for the sensory memory as long as there are nerves passing through.

The current consensus on the generation of memories is that they are mostly due to a persistent alteration of synaptic transmission efficiency that may further result in the formation of new neural circuits. Its bases are the plasticity of synapse in the nervous system, the synthesis of new proteins, and so on. Memory may be categorized as short-term and long-term. The latter is related to the sprouting of

pre-synapse nerve fibers and the formation of new synapses in nervous centers^[148], namely the long-term memory resulted from a repeated and persistent stimulation may have its basis of morphological changes. Over a long time, various types of sensory or motor stimulation from the body surface certainly left traces of long-term memory in nervous centers, i.e., they would have corresponding neural circuits. Actually, the formation of representative areas of different somatic parts at the sensory cortex may be considered as the consequence of developing this kind of long-term memory during the evolution process of creatures.

Memory may take place in either the cerebral cortex or sub-cortex structures. The primary memory about muscular activities may mostly exist in sub-cortex structures. Any of the most sensitive or flexible body parts, the most habitually or well-trained actions, the frequently experienced stimulation on the body surface would leave memory traces in the cerebral cortex and sub-cortex structures.

In addition, morphological changes due to the long-term memory may occur in the peripheral neural networks. The above-described hypotheses of propagation of muscle tension waves and transmission among sensory nerve endings might just intend to illustrate these kinds of memory circuits. Various tissue structures on the body surface are particularly easy to have functional and morphological changes when they are subject to an internal stimulation over a long-term. Obviously, the formation of acupoints, reflex points, as well as the meridians or reflex zones is the consequence of this kind of long-term memory. It was found that in accordance with the low impedance of meridian courses, the skin corneum on the meridian courses becomes significantly thinner compared with that on non-meridian courses^[134]. It might be one kind of change in the skin due to a long-term memory

caused by certain internal stimulation of the body, such as that of viscera-body surface correlation.

Accordingly, the formation of meridian courses on the body surface might have two main causes of long-term stimulation. The first is the sensory and motor stimulation from body surface tissues themselves, and the second is the reflective stimulation from viscera, nervous centers or other somatic parts. The generation of PNSAM might be also caused by the retrieval of these two types of long-term memory. Actually, as long as one of them is retrieved, certain extents of PNSAM may take place at certain locations.

Common needling sensations are soreness, tenderness, heaviness, and numbness. All stimulation types including manual acupuncture or EA that can induce sensations are suitable in inducing their original memory. It has been reported that needling-recipients who have had PNSAM are particularly susceptible to inducing the same propagation of sensations. In addition, the traveling courses of PNSAM that have occurred are easier to reappear during the second round of stimulation, with a shorter inducing time. In subjects who have practiced *qigong*, PNSAM occurs easily, more frequently and obviously^[150]. The fact that PNSAM is reproducible in the same recipient indicates it is not an occasional occurrence. Additionally, it may be a consequence of retrieving past sensory memory via similar stimulation.

Certainly, in order to induce the past memory, the stimulation must attain certain intensity or be sustained for a certain period. Moreover, it would even be better if the cerebral cortex could be put in a peaceful state, such as the quiescent state of the mind when practicing *qigong*. It has been demonstrated that the quiescent state of the mind could raise the incidence of PNSAM, and its mechanism might be related to the excitation in the nervous center governing electrical responses of the skin because

the central transmission time in this kind of reflex was obviously shortened^[151].

In addition, the mental induction may have a positive influence on PNSAM. It was reported that PNSAM could be induced by a random kind of stimulation without touching the skin of acupoints in eight of 14 pediatric asthma patients who had received the test repeatedly^[152]. This experiment indicates that in test-recipients who have had past experience about the propagation, even dropping a hint may induce their latent past memory about PNSAM.

Thus, during the process of propagating needling sensations, the mechanism about retrieval of sensory memory could coexist with others, namely, different types of propagating needling sensations might result from their actions, separately or in conjunction with each other.

In summary, the principles of propagating needling sensations are very complicated, and cannot be explained by just a single kind of mechanism. Both propagating excitations inside nervous centers and the activation of peripheral factors may be involved in the generation of propagating sensations, although in different extents. For the first type of fast propagation, the propagating excitation inside nervous centers including the retrieval of sensory memory might play a major role, especially, the phenomenon about propagation of excitation in the spinal cord is a subject of attention in recent years. For the second type of slow propagation, there is a significant activation of peripheral factors in addition to the involvement of central reflexes. For example, the propagation of needling sensations induced by stimulating muscular points might be dependant on the propagation of muscle tension waves, while PNSAM induced by stimulating superficial acupoints might be due to the excitation transmitted among sensory nerve endings.

PART Two

Systemic Methodology of Acupuncture

Acupuncture therapy is one of classical external medical interventions. Based on the reflective connections (or the **meridians**) between the interior and exterior of the body or among various body parts, acupuncture at a certain level of intensity is applied at specific reflex points (called **acupoints**) to achieve the goal of curing diseases or relieving symptoms. This kind of external therapy has randomized characteristics, such as varied methods of point selection and association, different levels of stimulation intensity, as well as individual patient responses to the treatment. This kind of randomness may lead to a great variation of therapeutic results according to the experience and techniques of practitioners, so it is a practical and critical challenge. It has greatly hindered the development of acupuncture therapy. However, despite scores of modern studies on the essence of meridians and mechanisms of acupuncture therapy, few researchers have applied a scientific methodology to direct the entire process of acupuncture therapy or to control its randomness.

In this part, a systemic methodology will be applied to analyze the coupling relationship between the practitioner and the patient. Discussions will focus on how to obtain various output information that reflects the internal state of the patient, how to input the control information of acupuncture, and how to proceed with the consideration of feedback revision to make timely adjustments of the treatment plan, as well as how to control various influential factors of effectiveness.

Black Box of the Patient

In the preceding part, it has elucidated that the effects of acupuncture are primarily realized through reflex mechanisms of the nervous system. The reflective process also involves humoral fluid or other media. Although a general consensus have yet to be made on the mechanism of acupuncture and the essence of meridians, scientific methods still can be adopted to control the acupuncture process. Here, the **black box** theory of cybernetics is discussed.

From the perspective of black box theory, the treatment process of TCM including acupuncture is like a doctor or a TCM/acupuncture practitioner dealing with a human black box. Because the black box is unavailable for internal inspection, the practitioner can only investigate its outputted information that corresponded to internal changes. Then, through the analysis and judgment (diagnosis) of this information, the practitioner formulates treatment plans, and inputs therapeutic intervention (treatment) into the black box to control its internal changes. The most commonly used means of treatment for TCM practitioners today are Chinese herbs and acupuncture. When needling therapy is applied, the needle may strengthen the coupling relationship as it is not only a therapeutic tool that inputs acupuncture information, but also serves a medium for the practitioner to receive certain feedback information from the patient's body, such as the tenseness and dragging

sensation around the needle (TDSAN) which indicates *deqi*. The coupling relationship between the practitioner and the patient's black box is illustrated in Figure 6.1.

Generally, acupuncture practitioners emphasize two types of information outputted from the patient's black box. One is the information about general symptoms and signs of the disease; the other is the special reflex information on the body surface of the patient, namely the information of reflex zones or acupoints. Sometimes the latter may be included in the former. For instance, referred pain within reflex zones is actually a symptom itself, and changes of local skin temperature or appearance at acupoint may be symptomatic. However, because of the importance of reflex information particularly for acupuncture therapy, it is discussed here separately from the symptomatic information.

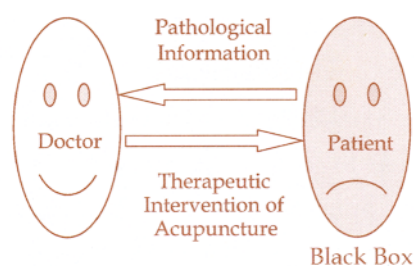


Figure 6.1 Coupling Systems between the Doctor and Patient

When one becomes diseased due to disturbed physiological functions and subsequent responses of the entire body to local pathological changes, various symptoms such as fever, headache, dizziness, vomit, diarrhea, soreness/pain of joints, and dyskinesia may appear. These symptoms often are the first disease information outputted by the patient's black box, and must be gathered and understood by any medical doctor, TCM practitioner, or acupuncture practitioner.

During the process of diagnosis and treatment, besides collecting basic patient information such as the main complaints, previous and current disease condition, family medical history, and a list of prescribed medications, doctors also need to emphasize on gathering various internal information of the patient through physical examinations, laboratory diagnostics, or other contemporary medical means. In this aspect, medical doctors have already had a standard set of systematic and scientific theories and techniques in place, which are still rapidly moving forward along with the advancing of science and technology. As if opening up the patient's black box for a direct inspection of its internal structures, this approach also fits in with the requirements of contemporary medical therapeutics, such as prescribing medications and performing surgeries. The more the doctors understand about the internal changes of the patient as well as the underlying mechanisms of the disease, the greater the chances of curing or controlling it.

Compared with contemporary medicine, the method used by TCM practitioners and acupuncture practitioners to acquire the internal information of the body is much simpler. **Observation, smelling, interrogation, and palpation** (or otherwise known as **four diagnostic methods**) are the four pillars of Chinese medicine that have embodied almost all means of TCM diagnosis. It implies that TCM

practitioners have been utilizing their own sensory organs to acquire patient's information since the inception of TCM several thousands years ago. Due to the primitiveness of these means, TCM practitioners cannot observe internal details of the patient's black box and could merely assume changes of the internals by observing the external phenomena of the black box. In the TCM bible *Yellow Emperor's Internal Classic*, it was stated *whatever exists internally must manifest signs externally*. This notion has been the guiding ideology behind TCM clinical diagnosis for ages. However, over a long-term of practice, many TCM practitioners have accumulated abundant experiences in applying these diagnostic means to acquire information of the patients. Tongue and pulse diagnosis have now become two important "windows" of the body for TCM practitioners to peek inside the patient's black box. In addition, with modern advancement of science and technology, numerous novel TCM diagnostic methods have emerged, including the computerized meridian diagnosis, auricular point probe, and pulse analysis system. Although the outputting information from these devices may not be as accurate or microcosmic compared with known medical diagnostic tools (e.g., CT or MRI), they do possess unique features. These newly developed diagnostic methods may be able to reveal the current holistic state of patients or to predict future pathological changes that may exist within a certain system of the body or at a certain stage of disease course.

However, a well-rounded understanding of the fundamentals of contemporary medicine is indispensable to any TCM practitioners or acupuncture practitioners. Among them, only those who are proficient in both TCM and contemporary medicine are able to more completely and accurately collect the patient and disease information, diagnose the disease condition, and to treat the patient more

effectively. Moreover, in this web-based age when patients have easy access to professional medical web sites dedicated to inform and educate (e.g., WebMD.com), more and more medical terms have been integrated into the common language used by patients when describing their diseases. It is hard to imagine that someone who could not comprehend a patient's main complaints would be able to provide competent and quality TCM or acupuncture care. The abundant physiological and pathological knowledge in contemporary medicine also provides a scientific basis for acupuncture practitioners to comprehend and explain the relationships between internal and external changes of the human black box to patients.

In addition, the tendency of over-mystifying TCM diagnostic methods must be avoided. In China, especially in the remote countryside, it has been known that some patients intentionally withhold their main complaints during the initial session until a TCM diagnosis via palpitation and other diagnostic measures have been performed. They often try several different TCM practitioners, and afterwards, they only consider the one that who was able to correctly identify their current symptomatic complaints and predict future diseases as the brilliant and most suitable practitioner. In the West, there were also reports when patients with little or no TCM knowledge tried to judge a TCM practitioner's expertise through similar approaches. Actually, these are the consequence from over-mystifications of TCM diagnostic methods and their applications scope. The point is, even though much accurate holistic information about patients could be collected via various TCM diagnostic methods (e.g., pulse taking and

tongue diagnosis, auricular points probing, or measurements of meridians), they are in no way related to fortune-telling or quackery. In most circumstances, to achieve an accurate diagnosis, TCM practitioners need to acquire various information from all available aspects of the patient's body, especially that of the main complaints in order to conduct a comprehensive, systematic, holistic and integral analysis.

Actually, diagnostic means of TCM also correspond to its treatment methods, which may be categorized into internal therapies (e.g., the orally intake of Chinese herbs) and external therapies (e.g., acupuncture). Besides acupuncture, external therapies of TCM also include external applications and fumigations of Chinese herbs, as well as surgeries with TCM. Nevertheless, acupuncture is the most representative of all TCM external therapies. Because of the characteristics of external therapy, acupuncture practitioners are generally more aware of the reflex information from the whole body surface of the patient (namely the meridian phenomena often described in the study of classical acupuncture) than TCM practitioners who are strictly herbalists. As important as the information gathered by the tongue and pulse diagnoses, the reflex information acquired from the body surface is also relevant to the clinical acupuncture therapy. It is, therefore, the second kind of information that the acupuncture practitioner must acquire from the patient's black box.

Since the detailed techniques about the tongue and pulse diagnoses can be found in many TCM texts, they are omitted in this book. In the sections below, we will discuss the reflex information from the body surface specifically.

Gathering Reflex Information from the Body Surface

When the patient is regarded as a black box, reflective changes of diseases, which appear on local reflex zones of the body surface, are either an objective indicator in evaluating diseases or a basis in selecting stimulation locations; hence, the practitioner must carefully inspect them. According to the perspective of acu-reflexology, diseases may be categorized into three types: somatic, visceral, and central, where any type, especially somatic diseases may lead to distinct positive reactions on the body surface.

The **eight principal syndrome differentiation** of TCM consists of four pairs of syndromes: **cold or hot, deficiency or excess, exterior or interior, *yin* or *yang***, representing the four aspects of clinical reflex information that TCM practitioners or acupuncture practitioners need to acquire from the patient's body surface. Moreover, they have specific connotations in differentiating reflex information on the body surface besides their holistic diagnostic applications.

Briefly, the reflex information on the body surface may be gathered mainly from four aspects by observing or inquiring the patient. The first is the information to determine if the body is cold or hot, such as the skin temperature on the affected area, which may be lower (cold) or higher (hot) compared with that of other parts of the body. The second is the information to assess the states of *qi* (energy flow). Are the tissue structures of the affected area

or the reflex zone bulged (excess) or concaved (deficiency)? Is the tissue tension decreased (deficiency) or increased (excess)? Are the reflex points emerging at muscular (excess) or fatty (deficiency) region? The third is the information about the location or the extent of the disease, which are often referred the **exterior or interior** in terms of TCM. Is the tender spot caused by visceral (interior) disorders or somatic (exterior) disorders? Are there any regional or referred tenderness? It is also necessary to consider various properties of tender spots, such as degrees and symmetries of tenderness, as well as body responses upon pressing. In other words, are those reflex points pathological or physiological? The fourth is the information used to identify *yin* or *yang* aspects of the disease. Are the signs of disease or reflex points on the body surface mainly located on the *yin* side (the abdomen or the anteromedial side of limbs) or the *yang* side (the back or the posterior and lateral sides of limbs)? In terms of the meridians, which meridian (*yin* or *yang*) has been affected mostly?

In short, the disease information acquired through the eight principal syndrome differentiations not only is from the internal, but also from the body surface. All four aspects mentioned above need to be considered when we analyze various methods to gather reflex information on the body surface and

evaluate their connotations.

When certain reflex signals on the body surface are weak, vague, and difficult to be judged, useful solutions such as **signal amplification or filtration** where an amplifier or filter can be applied when collecting reflex signals. A complete dependency on one's own senses to obtain the patient's disease information or reflex information on the body surface will be subject to limitations from the sensitivity level of sensory organs (e.g., eyes, nose, and ears) or sensory receptors (e.g., tactile-temperature senses). Especially in patients with hyposensitivity, such as the elderly, people with a weak constitution, or suffering from chronic diseases, not only their general signals of symptoms are vague, but also their reflex signals on the body surface are weak. Therefore, these reflex signals often need to be amplified in advance.

There are several ways to amplify reflex signals. The first is to use specific devices. For example, a specially designed **chemical pain detector** or **pressing pain detector** may be applied to detect quantified difference of the pain threshold or the tenderness level on the body surface. The **electronic point finder** can be used to detect acupoints or reflex points through measuring **electro-permeable points** with a lower electrical resistance. Application of electromyography (EMG) is another example, and it can detect degenerations of nerves and muscles. Actually, most of contemporary medical devices applied for the purpose of examinations possess certain amplifying functions for detected signals of the body. The second way is to apply some additional but simple means, such as combining electrocardiography (ECG) with regular exercise to detect cardiac ischemia during the **stress test**. After a period of exercising at certain intensity, a previous indistinct ischemia of cardiac muscle may be observed more distinctly. When a patient suffers from soft tissue

injuries and it is difficult to locate the pain focus, the patient might be instructed to exercise the affected portion towards a certain direction either to trigger the pain or to expose the tender spots. On colder days, the auricular reflex points might be difficult to be detected some patients due to the coolness of the air. Meanwhile, to detect reflex points in the ear more easily, it is advised to first warm up the ear by rubbing it beforehand.

The **filtration** method is to extract useful signals that truly correlate with the disease from numerous reflex signals on the body surface. Because of the numerous miscellaneous signals that exist on the body surface, they are often intermingled. For example, a tender point could be either physiological or pathological, or its generation could be due to either somatic or visceral reflex. At such times, comparative methods are often the most effective way used to differentiate or "filter" out signals accordingly. When examining a reaction at a certain affected portion, one may first compare it with the symmetrical portion at the contralateral side of the body. Second, one may compare the affected portion with its surrounding tissues. Third, one may compare different kinds of reactions on the same body part but during different times, such as on different days of treatment. Once differences are determined, it will be much easier to make a judgment. Figure 7.1 is the flow chart of collecting and processing of reflex information on the body surface.

7.1 Skin Temperature

The rising or lowering of local skin temperature often indicates a regional inflammation or poor blood

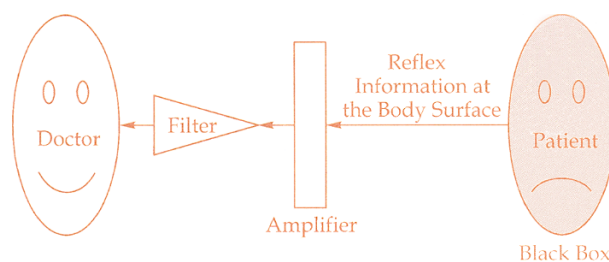


Figure 7.1 Collecting and Processing of Reflex Information on the Body Surface

circulation, respectively. This is the most common and easily acquired reflex information on the body surface when diagnosing and treating somatic diseases. For example, the local skin temperature rises for acute arthritis, while there are cold extremities for poor circulation.

On the body surface, the skin temperature is usually higher at muscular areas than joints. Once the skin temperature of joints is raised, local inflammation is often indicated. The regions of knee, ankle, shoulder, and lumbosacral joints, as well as the dorsum of the foot with many smaller joints are the common locations where a higher skin temperature might appear during inflammation. Nevertheless, in the chronic stage of inflammation, the skin temperature might remain normal or even lowered, which is called **cold arthralgia** in TCM.

In the portions below the elbow and knee joints including hands and feet, there is usually good blood circulation. If these areas have not been exposed to the cold air over a lengthy period before physical examination, their skin should feel as warm as other muscular areas of the body. Once the hand feels chilliness at such areas, it mostly suggests poor local blood circulation, impaired vascular motor innervations, neuropathy, or muscle atrophy in these areas.

However, to utilize the information of changing

skin temperature fully, acupuncture practitioners must have proper understanding on the features of skin temperature in healthy people. For example, for those obese persons, because of the distinct heat-preserving effects of the fat tissues, it is often harder to detect local inflammations through inspecting changes of the regional skin temperature. For the same reason, even for people with normal weight, the skin temperature of those fatty regions (such as the buttock) is normally lower. Furthermore, the normal skin temperature gradually decreases from the lower back areas down to the lumbosacral region. If there is an abnormal raised skin temperature, some local inflammation may be present.

To determine the changing local skin temperature quickly, a simple way is to put a palm on the affected region and other related locations on the body surface to compare the difference of temperature felt, especially the surrounding areas or symmetrical portions of the affected region. Bilateral symmetrical locations or joints often are unlikely to be diseased simultaneously. Meanwhile, the practitioner's palm temperature may serve as a reference when comparing the patient's skin temperature, which may rise or fall during the comparison. Of course, one may use a particular surface thermometer to measure and compare the skin temperature, but using the palm to feel the temperature change is probably the most convenient.

In short, the determination of locations of inflammation and its centers by comparing abnormal changes of skin temperature at the affected area is able to guide subsequent acupuncture treatment. At most of these locations lodge corresponding reflex points that can be selected for needling or other external therapies.

7.2 Appearance and Tension of Local Soft Tissues

Another easily assessable reflex information on the body surface is the changed appearance of local soft tissues, such as their prominence or concavity, or color changes of the skin, that are commonly seen when suffering from either somatic or visceral diseases.

When local soft tissues on the body surface show obvious changes of appearance, they can even be observed with the naked eye. At those originally concaved parts of the body, regional fullness, prominence, or swelling may be exhibited at the points. For example, there may be fullness or prominence at Taiyang (EX4) when suffering from migraine headache, at Bitong (EX65) or Yingxiang (LI20) when suffering from sinusitis, at Xiyan (EX146) or Dubi (ST35) when suffering from knee arthritis, as well as at Qiuxu (GB40) or the lateral side of ankle when suffering from ankle arthritis. Even at areas that were originally full, there may be regional prominence due to slight swelling, such as at the sprained muscles of the neck. On the other hand, the concavity may appear at paralyzed limbs or any long-suffering regions due to muscle atrophy. As a reflex zone for the head or mouth, the region of Hegu (LI4) usually is muscular and exhibits fullness. For examples, we observed a distinct muscle atrophy the Hegu (LI4) region in an elderly patient who suffered from bilateral and severe temporomandibular joint (TMJ). Furthermore, we were able to detect dark purple dots at the lumbosacral regions (or **hemorrhoid spots** known in TCM) of hemorrhoid patients, and **skin peeling** at the auricular lung reflex zones of dermatitis patients.

When local abnormalities cannot be detected by the naked eye, the palpation method (or **palpation of acupoints** known in TCM), may be combined to

perform further examination. However, its searching range are not limited to just acupoints. For example, in the lower back area, when practitioner's fingers are gently touching, pushing, and pressing along the muscles, it is easy to detect small prominences or concavities of local soft tissues. Of course, the premise is to have patients fully relax tissues or muscles of the affected region under a proper body position.

There is a distinct difference in detecting changing appearance of tissues according to various parts of the body. It is generally easier to detect changes around the shoulder and neck areas as long as the patient takes a sitting posture with a slightly lowered head, raised elbows and bended forearms. Taking this posture, the affected region is completely exposed and relaxed. However, both upper limbs should be placed across from each other in symmetry. Otherwise, it might lead to a false impression of dissymmetry in both suprascapular regions, which would interfere with proper assessment of the regional tissue appearance.

When using the fingers to caress the patient's body surface, not only may one find subtle changes of local tissue appearance, but may also detect the abnormality in the tension of local soft tissues, such as subcutaneous **hard nodules** or an "empty" feeling by finger palpation.

Circular or cord-shaped nodules are frequently seen within subcutaneous tissues or muscles. For examples, large-sized nodules are observed at Yifeng (TE17) in patients with tinnitus or deafness^[74], and small-sized nodules are observed at the palm in patients with tenosynovitis of fingers. For some patients with shoulder pain, although there were no distinct changes of local appearances (e.g., prominence) at the lateral side of the upper arm, an increased muscle tension, especially cord-shaped nodules might be detected upon caressing local muscles. For some patients with a lateral type of

sciatica, similar abnormalities could be detected at the posterosuperior border of fibula or the fibular side of gastrocnemius. Such cord-shaped nodules might be composed of enlarged or adhered connective tissues or muscle fibers. Ample clinical studies have shown those locations with distinct abnormal appearances or tensions of local soft tissues often are the optimal stimulation locations for acupuncture, where intense needling sensations and better therapeutic results may be induced.

In normal subjects, the emptiness felt by the finger palpation generally occurs at fatty body parts or locations with little or no muscles. If it is felt in muscular areas, it might indicate a decrease of local muscle tension. If it appears throughout the entire body, it might indicate the patient's weak constitution, which is a sign of **deficiency** in TCM. If it only appears at a specific body part instead of the entire body, then the clinical significance of abnormal local reflexes need to be considered.

The changes of appearance or tension in local soft tissues not only exist in acute and chronic somatic diseases, but also in chronic visceral diseases. For examples, hepatomegaly or chronic gastric disease might have local prominence or small circular nodules within corresponding auricular reflex zones, such as the *Liver* or *Stomach*. Moreover, there was prominence at Yinlingquan (SP9) or Sanyinjiao (SP6) in patients with certain urogenital diseases, such as fibroid tumor of the uterus. Sometimes, node- or cord-like tissues around the 9th~12th thoracic vertebrae could be found in patients with chronic digestive diseases^[185]. From this, it is observed that these types of abnormalities in the appearance or tensions of local soft tissues serve as one of main indicators in the method of **meridian diagnosis** or **auricular point diagnosis**.

In addition to muscles, changes of appearance or tensions of local soft tissues can often occur in

connective tissues of the body surface, such as sarcolemma, aponeurosis, periosteum, and those among nerves, blood vessels, and the lymph.

7.3 Tender Spots

Besides the two kinds of reflex information specified above, the lowering of pain threshold or the emergence of tender spots at certain locations of the body surface is the most common reflex phenomenon. They may appear either in conjunction or alone with the above two kinds of manifestations. Actually, most above reflex points are tender spots.

Reflex information on the body surface often represents the internal state of the body, either pathological or physiological, and must be distinguished carefully. It is especially important for tender spots because of their high incidence on the body surface and the difficulty of setting a gold standard for identification.

It has been known that there are relatively dense nerve endings or sensory receptors distributed within most acupoints, which are especially sensitive even upon a light pressure in comparison with their surrounding or other non-acupoint regions. Under the normal functional states, tender spots also often appear at locations of certain acupoints, such as Zusanli (ST36) and Diji (SP8) of the lower limb, Shousanli (LI10) and Hegu (LI4) of the upper limb. Of course, many other locations of the body surface possess similar sensitivities toward pressing, such as extraordinary points or called **novel points**, but they have not yet been categorized as acupoints. Hence, in order to distinguish them, those appearing under the pathological states are called **pathological tender spots** that pertain to **pathological reflex**

points, while those appearing under the physiological states are called **physiological tender spots** that pertain to **physiological reflex points**.

The physiological tender spots that reside in the same or nearby regions usually have similar degrees of tenderness. However, when they are distributed at different regions or farther apart, they may have a greater difference in the degrees of tenderness. Moreover, their sensitivities have corresponding changes with fluctuations of physiological functions within the normal range. For instance, those acupoints of a close correlation with digestive functions, such as Zusanli (ST36) and Diji (SP8) may have a raised tenderness either before or after meals.

On the other hand, when somatic, visceral, or central diseases occur, certain pathological tender spots or reflex points may emerge on the body surface at the same locations as those physiological tender spots. For example, patients with chronic digestive disorders could have tenderness in Zusanli (ST36) and Diji (SP8) ^[185]. However, pathological tender spots possess at least five characteristics that may be used to identify them.

(1) Raised tenderness. This indicates the degree of tenderness is generally higher when compared with physiological tender spots. Due to the obvious decline of the local pain threshold, pathological tender spots often can be detected upon light touching by fingers. If their sensitivity was only slightly increased, careful comparisons of the degree of tenderness with adjacent acupoints may be required.

(2) Asymmetry of tenderness. This indicates some abnormal tenderness appears only on the unilateral side of the body while most other physiological tender spots are bisymmetrical. These points can be distinguished through a comparison of corresponding symmetrical regions.

(3) Pathological tenderness frequently appears in

combination with other local reactions, such as subcutaneous hard nodules, bulged soft tissues, or raised skin temperatures. The latter is commonly seen when suffering from somatic diseases.

(4) Shortcut to the diseased region or viscera. When pressing tender spots, disorders or referred pains of corresponding organs or body parts may be alleviated. It is precisely why in the West many sensitive tender spots are also called **trigger points**. According to Melzack *et al.*, trigger points correlated with myofascial or visceral pain were often located within referred pain zones while many others were located outside those zones. Furthermore, a brief and intense stimulation on trigger points often could attain a prolonged relief of pain. These properties of trigger points, namely the extensive distribution on the body surface and the ability to relieve pain after being stimulated, strongly resembled those acupoints used for pain control and a remarkable higher correlation (71%) between trigger points and acupoints for pain was observed ^[185]. This kind of close correlation suggests that both trigger points and acupoints represent the same phenomenon and may have the same underlying neural mechanisms, though they were discovered independently and termed differently.

(5) Tenderness level or other reactions of pathological reflex points, such as hardness and size of nodules may vary with changes of corresponding diseases. In our experience, reflective hard nodules at Yifeng (TE17) in patients of tinnitus or deafness may vary with different stages of the disease. For chronic or severe patients, heavier tenderness and harder nodules of greater size are often observed, while for acute or mild patients, vice-versa. Moreover, pathological tender spots could gradually disappear with the recovery of diseases ^[74].

Sometimes, tender spots are difficult to be detected in patients with only soreness, heaviness, numbness,

or paresthesia could be felt upon pressing. However, their clinical significance should be similar to tender spots. We once observed soreness at Sanyinjiao (SP6) in patients with post-partum urine retention (refer to Section 22.1). This phenomenon also often appears in patients of arthritis, rheumatoid arthritis, and fibromyalgia with symptoms of soreness, heaviness, and numbness (refer to Section 13.7). In contrast with tender spots, locations of soreness upon pressing may be referred as **sore spots**.

Besides, it is important to differentiate whether pathological tender spots are resulted from a local somatic pain or from reflexes of distal diseases including a referred visceral pain. This is relevant for those patients who also suffer from the regional somatic pain. In general, distal tender spots for the diseases of viscera, head, or trunk on the limbs may be either unilateral or bilateral, but they mostly occur on the affected side, which the degree of tenderness usually exceeds the healthy side. On the other hand, most adjacent or local reflex points for somatic diseases are on the ipsilateral side, and may be at the same locations as where those spontaneous pains may lodge. When pain exists on bilateral sides of the body simultaneously or if the pain is extremely severe, some reflex points may appear at corresponding locations on the contralateral side. Here is a simple method of differentiation: if the reflex point is due to local somatic pain or diseases, a certain level of pain relief or a comfort feeling might be experienced when the point is gently pressed. If it is from distal pain or diseases, when the reflex point is pressed, local tenderness might be aggravated though there would still be certain instant relief of pain or comfort feeling at corresponding distal portions of the body.

In order to aid the finding of tender spots or comparing the degrees of tenderness more easily, **dolorimetry** devices have been innovated, but

applying finger pressing remains to be the most commonly adopted method. When practitioners apply finger pressing to measure tenderness, the pressing intensity should be appropriate or moderate. Extreme light pressure might lead to no tenderness at all, while an excessive intense pressure might produce tenderness all over the body. The intensity of pressing also should be adjustable according to individual differences of sensitivities or at different locations of the body surface with varying levels of sensitivities.

7.4 Electrical Resistance of the Skin

Another type of reflex information on the body surface is the alternation of **electrical resistance of the skin**. It is also one of the most talked about topics on the essence of meridians. Currently, many types of **meridian explorers**, or devices that measure the electrical resistance of the skin, have been widely applied in the clinic. Some are designed to measure acupoints throughout the body while others are only for micro reflex zones, such as auricular regions. In the past, most of these devices were made with simple technology of semi-conductivity. Recently, however, the artificial intelligence with micro-computer chips has been combined into advanced meridian explorers. Many of these devices not only have a basic searching function on acupoints by exploring their electrical resistance, but also can serve a stimulator to provide electrical stimulation on acupoints.

Through several decades of clinical observations, it has been proven that many **electro-permeable points** with low electrical resistance can be detected

on the skin under normal physiological states. At these points, there are especially intense pain-temperature sensations, as well as distinct vascular responses. Most acupoints pertain to such points (or zones). Under pathological states, the electrical resistance of skin on those points also changes correspondingly and generally becomes much less. Meanwhile, the pain threshold is further reduced.

Plenty of clinical trials showed that certain visceral pathological changes could induce a variance of measured electrical resistance on the corresponding **yuán (source) point**. For example, in a study of 100 patients with hepatitis through the measurement of source-points, it was reported that changes of LR source-points were 78% and changes of SP source-points were 64%. In a study of 683 patients suffering from various pulmonary tuberculoses, it was shown that the level of electrical conductivity was decreased for all source points of the 12 regular meridians, of which the lowering degree was related to the severity of disease. In a study of 60 cases of peptic ulcers patients, it showed that changes of SP source points were 79%, while changes of ST source points came in second at 38.45%. Similar results were also reported in patients of peptic ulcer. In addition, a study of 303 cases with malignant tumors showed that there were abnormalities of TE source points in 230 cases, and abnormalities of GB source points in 211 cases. Apparently, there has been no consensus yet on the criteria of measuring source points and on whether or not it can truly represent pathological states of corresponding viscera.

However, it is difficult to apply this type of reflex information on the body surface to guide clinical acupuncture. Because its acquisition is susceptible

to impacts of many internal or external factors, oftentimes true or false information cannot be easily distinguished. For instance, normal functional changes of the body, such as visceral (eating and excretion), mental (mood swing, or before and after sleep) activities, as well as exercise or perspiration, also can induce a change in electrical resistance of the skin. In addition, any change in the environmental humidity or the pressure of probing electrodes may bring significant **testing errors**.

In general, there is a higher level of reproducibility in measuring the electrical resistance of the skin on micro reflex zones, such as auricular reflex points or zones, which play a significant role in guiding the auricular point diagnosis and treatment. According to Chen *et al.* of Nanjing, China, in selected cases that might have immediate therapeutic results within 20 min, stimulation on auricular points with good-conduction reactions could greatly increase therapeutic effectiveness, including improvements of symptoms such as pains, pseudomyopia, hoarse voice, nasal congestion, or urticaria ^[187]. There are several reasons behind the reliability of measured electrical resistance within auricular points. First, the dryness or humidity within a small region of the auricle is easily controlled and kept consistent during the measurement. Second, identical tissue structures and their thicknesses exist in local probed areas of the auricle. Third, the probing pressure is easily kept consistent at the small region. Thus, the data gauged on the auricle are more reliable than that of the whole body surface.

For acupuncture practitioners, the above are the most important reflex information that needs to be collected from the body surface.

Input of Intervening Information of Acupuncture

From the perspective of acu-reflexology, the effectiveness of acupuncture therapy is realized through stimulation on the body surface to intervene the automatic control system of the body. Until now, the process of conveying, converting, and processing acupuncture information inside the human black box is still unclear. How can we control the process of acupuncture therapy to attain optimal therapeutic effectiveness? According to cybernetics, there are mainly two approaches. The first is the **input/output test**, where one attempts to collect every diseased output (changes of symptoms or signs) corresponded to every acupuncture input in repeated treatments, and seek the optimal input (e.g., point selection, stimulation intensity) that may improve the diseased output. Through accumulated experience, the goal is to establish a controlled pattern of patient's black box gradually. The second is to apply the principle of feedback to adjust the control of black box. In this chapter, we will analyze the first approach, including selection of points, types, intensities, and durations of stimulation, as well as intervals between courses of treatment. These are all key items of acupuncture therapy that are required therapeutic procedures for every acupuncture practitioner. As for the feedback principle, it will be discussed in the subsequent chapter.

8.1 Optimal Stimulation Locations

As one kind of external therapy, intervening (therapeutic) information of acupuncture is inputted via certain locations on the body surface. Selection and determination of stimulation locations are often the first step of acupuncture therapy. Since more than one acupoint or reflex zone exists for every single disease, most acupuncture practitioners either associate points as outlined in textbooks or draws from their own experiences. The distribution rules of reflex zones proposed in Chapter 3 are useful in summarizing and sorting functions of classical meridians and their acupoints, which may help the acupuncture practitioner to ease the difficulty in point-selection. Here we will specify the selection of optimal stimulation locations in treating three main types of diseases, namely somatic, visceral, and central.

For most somatic diseases, such as soft tissue injuries or arthritis, it is suitable to stimulate either tender spots within the **diseased (affected) region** or adjacent/distal acupoints within corresponding somatic reflex zones.

In ancient China, **tender spots** emerged at the affected region were referred as *Ashi* points. Actually, two types of tender spots may be stimulated

directly. The first type is more typical where the patient feels local or radiating pain at a certain location upon finger pressing. The second is where the patient has spontaneous pain at a certain location without any pressing. When needling these two types of *Ashi* points, the center of the point needs to be stricken to generate intense needling sensations and produce a longer-term of pain relief after stimulation.

In Section 2.3, we have already mentioned that there might be several tissue layers at a single acupoint, and each layer has different sensory receptors. In treating somatic diseases, it is important to note the characteristics of tissue layers at stimulation locations and deliberately stimulate the layer that corresponds to the disease. For example, directly stimulate the sciatic nerve trunk distributed at Huantiao (GB30) and Yinmen (BL37) for sciatica, and stimulate the periosteum at Liangqiu (ST34) or articular sensory receptors inside Xiyan (EX146) for knee osteoarthritis. The needling method on the surface of periosteum is also called **using the needle to grind the bone**.

It may be noted that when compared to medications, one of the greatest merits of acupuncture is that it may directly stimulate diseased regions of the body surface, besides the well-known fact that it has less side effects. Such regions often cannot be reached by medications, or even when reached, there may not be sufficient level of concentration in the region. Thus, accurate finding and needling of the diseased region, its corresponding layers, and pain centers are crucial in attaining quick effects when treating somatic diseases with acupuncture.

Somatic reflex zones are categorized into three sub-zones: anterior, lateral, and the posterior. Most somatic pain and diseases or paralyses frequently occur at the lateral or posterior zone (*yang* side) of the body. When selecting distal points to treat

somatic diseases, a general principle is to select within the same sub-zone where the disease is manifested. It is identical to classical method of **point selection along the meridian**, which has been proven useful and effective by numerous acupuncture trials. For example, incision pain during surgical operations could be a type of somatic pain. Many effective acupoints for acupuncture anesthesia lie on the course of the same meridian as surgical locations, such as Sanyangluo (TE8) for thoracic surgery, Futu (LI18) for thyroid surgery, Zusanli (ST36) for gastrointestinal surgery, and Guangming (GB37) for ophthalmologic surgery. **Better missing acupoints than the meridian** is a classical TCM statement that emphasizes the importance of point selection along the traveling course of the meridian on the body surface.

In the corresponding somatic reflex zones, there are two types of distal points available for choosing. First, those related to the affected region, such as the location where radiating pain exists. For instance, certain sciatica patients may have pain or other positive reactions radiated to somewhere on the lateral side of the leg, where there may be intense soreness or tenderness upon pressing. Second, those lodge on courses of classical meridians with a higher sensitivity in comparison with that of the surrounding areas, though it seems like they are not related to the disease at all. These two types of sections pertain to the **point selection within the reflex zone**, which obviously is an expanded version of the **point selection along the meridian**.

When local points are difficult to be punctured due to various reasons, one may select adjacent points for puncture, which may also play a distinct therapeutic role. For examples, when applying acupuncture for patients with bone fractures, if it is inconvenient to puncture local points due to casting, other adjacent points can be punctured. Moreover,

when treating a swelling region with unknown causes, since it is not advised to stimulate the affected area directly without knowing the cause of the swelling, adjacent points may be punctured instead. Of course, the distance between the selected point and the affected region might affect the acupuncture effects. It was reported that the effects of acupuncture on thyroid functions seemed to correlate with the distance between the stimulated point and the thyroid, while not correlated with different meridians stimulated. When EA was applied at various acupoints adjacent to the thyroid in rabbits, all of them had significant inhibitive effects on the thyroid function. However, when EA was applied at other acupoints of the same meridian located at a distance from the thyroid, they had no obvious difference of effects comparing with those in the control group without EA [188]. Although the thyroid pertains to endocrine glands, it lodges at the superficial area of the body and may have a close relationship with the soma, which might explain why stimulating its adjacent somatic reflex points can significantly affect its functions.

Adjacent acupoints or reflex points may be selected around the affected region, or along traveling courses of the meridian or within the reflex zone identical to the affected region, which is similar to the selection of distal points mentioned above. Comparing with stimulation on distal points, stimulation on adjacent points can achieve effects of AQDR (arrival of *qi* at the diseased region) more easily, of which therapeutic effectiveness has been documented. Therefore, the method of adjacent point selection should not be disregarded.

When treating visceral diseases, the optimal stimulation locations are often reflex points within adjacent or distal reflex zones. Positive reactions emerged on visceral reflex zones are mainly tender spots or subcutaneous hard nodules. In general, they

are frequently found within adjacent reflex zones of the back, such as Feishu (BL13) for asthma, Ganshu (BL18), Geshu (BL17) and Danshu (BL19) for liver or gallbladder diseases. Distal visceral reflex points are often found below the elbow and knee, such as Zusanli (ST36) for gastrointestinal diseases, Neiguan (PC6) for angina pectoris. In addition, the referred pain of visceral diseases is popular, such as the pain on the right scapula around Tianzong (SI11) for biliary colic, or on the forehead around Yintang (EX2) for gastric disorders. However, the visceral referred pain needs to be distinguished from pain induced by local somatic diseases, which might coexist occasionally.

According to our experience, reflex points on the back should be first selected when applying adjacent points for visceral diseases. This is because they are located near the corresponding viscera and have reliable positive reflexes. In addition, most of these locations have a certain degree of muscle thickness, so that not only the detection of reflex points is convenient, but also the stimulation is more easily controlled. On the contrary, for reflex points on the anterior chest and abdominal wall, their application may be limited by the inconvenience of baring skin in female patients for detection of reflex points and by the local thinner muscle structures. In the chest region, due to the difficulty of controlling proper depth of insertion, the generation of ideal needle sensations is challenged.

To detect reflex points, first determine an approximate range of the reflex zone for searching, and then use fingers to caress the skin in locating slightly bulged locations within the range. If a combination of distinct tenderness and prominence is felt, then the detected reflex point is reliable. After several reflex points are found, mark them with pen, and then determine if their locations are identical to classical acupoints. Note that classical acupoints are

only used as a reference for locating and naming reflex points. If there are indistinct positive reactions such as tenderness appearing at the location of an acupoint, it should not be considered as a reflex point. Meanwhile, one may compare them either with adjacent acupoints at the ipsilateral side or with symmetrical locations at the contralateral side through various intensities of pressure applied, from light to heavy. Then, the most hypersensitive points are selected as stimulation locations.

In fact, when applying distal acupoints to treat visceral diseases, many of them are not required to be reflex points. For example, most *yuan* (source) points of the 12 regular meridians are relatively sensitive locations, where stronger needling sensations can be generated and propagated to the surroundings. Their effects might be realized through the propagation of needling sensations that can act on adjacent reflex zones or points. Therefore, even if the stimulated point is not a visceral reflex point, it still may attain some effects as long as its stimulation intensity reaches a certain degree. Of course, if corresponding reflex points can truly be stimulated, then optimal therapeutic effectiveness can be attained. Meanwhile, there might be AQDR and certain sensations of corresponding visceral activities (e.g., gastrointestinal motion), as well as instant relief of symptoms.

For diseases of CNS, their positive reflex points (mainly tender spots) mostly appear on the head and the midline of the back, where the degree of tenderness is often higher than the adjacent region. These central reflex points can be easily detected either by finger pressing or with a burning moxa stick during moxibustion therapy due to their hypersensitivity to the mechanical and thermal stimulation. Besides, the border areas of *yin-yang* sides on both hands and feet are also frequently selected. Although they might not be pathological reflex points of the central

disease, most of them might still pertain to the physiological sensitive spots. When they are stimulated, intense needling sensations can be generated, which indicates a close connection between the hand or foot and nervous centers. As the Chinese proverb stated, **ten fingers are connected to the heart**. The concept of the heart in TCM includes the human mind or spirit.

Another issue closely related to the optimal stimulation location is the association of points, including combination styles, numbers of points and stimulation order for each point. According to our experiences, in order to achieve optimal results, it is better to stimulate several reflex points, which allows acupuncture information to be inputted into the body through different pathways for each point (refer to Section 11.7). This may ensure at least one of them achieve effects. On the other hand, given the unclear interaction between various stimulation locations, a strategy is to select as few points as possible. For information about the relationship between various stimulation orders and locations, refer to Section 10.8.

8.2 Types of Stimulation

After determining the stimulation locations, the next step is to choose proper types of stimulation. During ancient times, interventions used by acupuncture practitioners on the black box of the patient mainly consisted needling and moxibustion, as well as acupressure, *tuina*, cupping, *guasha*, and external applications with Chinese herbs. With the advancement of modern science and technology, there are several new types of stimulation invented, such as electric, magnetic, electrothermal, and photic. Today,

almost all Western medical modalities could be used to stimulate acupoints or in conjunction with acupuncture therapy. Accordingly, many novel therapies and apparatuses such as EA, laser acupuncture, infrared ray lamps, electric massagers, have emerged. Together with classical acupuncture, the acupuncture practitioner may choose all available types of stimulation.

Briefly, there are mainly five types of stimulation that can be applied on acupoints or reflex zones of the body surface: mechanical, electrical, thermal, magnetic, and photic (refer to Section 2.2). Classical manual needling and acupressure pertain to the mechanical stimulation; EA or TENS pertain to the electrical stimulation. Moxibustion and infrared radiation pertain to the thermal stimulation. Some pellets used in **auricular pellet-pressuring method (AAPM)** are made from permanent magnetic materials. Those pellets or other stimulators, which produce electromagnetic effects, pertain to the magnetic stimulation. Laser acupuncture, namely, the application of lasers on certain acupoints, pertains to the photic stimulation. Clinically, needling, moxibustion, as well as EA and electro-thermal therapy are the most prevailing. In this book, we also focus on these types of stimulation. Because we have discussed the needling method in the preceding text, here we will focus on analyzing the thermal stimulation such as moxibustion.

The reason that ancestral Chinese favored the use of moxa floss in moxibustion might be due to its low burning rate and its ability to keep relative constant temperature for longer duration, as well as due to its particular fragrance. When burning moxa cones or sticks, which are made from the moxa floss, the thermal stimulation can be applied at a small area. In addition, the skin temperature at stimulated regions gradually rises, which is usually tolerable and comfortable. These features of moxibustion, in

addition to its distinct effectiveness have made it popular. Over the years, moxibustion has been prevailing with extensive clinical applications in Japan, which may be categorized into two types: **moxibustion with marks** (or **direct moxibustion**) and **moxibustion without marks** (or **indirect moxibustion**). The former includes the most common forms of **heat-penetrating moxibustion** (refer to Section 11.5), **burnt moxibustion**, and **fester moxibustion**. Burnt moxibustion burns certain superficial tissues including the skin at a certain degree, which is often applied to treat corns and warts. Moxibustion without marks, which is similar to the indirect moxibustion in TCM, includes the **warming moxibustion**, **substance-separated moxibustion**, and the **sparrow-pecking moxibustion** ^[189].

Currently, in addition to moxibustion, other common forms of thermal stimulation are infrared radiation, cupping, wet heating pad, as well as Chinese herbal applications of fumigation, washing, soaking, or dressing. An example of **herbal dressing** is the external application of shredded raw garlic, which is a traditional and popular therapy in China. When it is used to treat tennis elbow, wrap the garlic paste with a cloth around the affected elbow for a few minutes until the local skin becomes irritated and hot. However, if it is retained for a longer period, it may induce superficial crusts similar to moxibustion with marks.

With different stimulation types, not only different sensory receptors may be activated, but also they may have large differences in therapeutic mechanisms. For example, moxibustion is obviously different from needling. The effects of moxibustion on the entire body are mostly dependant on its thermal stimulation that activates functions of ANS through thermal sensory receptors located on the skin and subcutaneous tissues. Moxibustion may

also have certain local effects, which may be related to the improvement of local blood circulation and subsequent clearance of the locally accumulated pain-inducing materials, such as lactic acid and K^+ . In addition to thermal effects, it was also reported that the reactions of indirect moxibustion include the clearance of chemical radix caused by moxa and moxa-tar. Indirect moxibustion was shown to be associated with the decrease of lipid peroxidation and increase of superoxide dismutase (SOD) in the skin of mice. Histological findings after indirect moxibustion showed an increase in the number of mother hair cells and hypertrophy of the cells [190,191].

Because of the varied impacts from different types of stimulation on the body, their clinical applications may be emphasized differently. For example, either needling pertained to the mechanical stimulation or EA pertained to an electric stimulator has direct effects on somatic nerves and skeletal muscles. Thus, they are often the first choice to be used for somatic diseases, especially EA, which has better results when used to alter muscular tones, either to relax or strengthen it, such as for cases of stiff or paralyzed muscles. Moxibustion as a kind of thermal stimulation may have more distinct effects on ANS than that of needling, so it has a unique role in treating visceral or vascular disorders.

Although needling and moxibustion may have similar functions under certain situations, their features of actions can be vastly different with individual causes of mechanisms. For example, looking at the analgesia and regulatory functions, needling activates a short and rapid neural reflex arc and attains effects quickly, but they could only be sustained for a short while in comparison with moxibustion. As for moxibustion, it mostly depends on the activation of ANS, as well as the involvement of humoral factors, the effects are attained slower

but can be sustained longer. During needling, in order to attain sustainable effects, a more intense or longer stimulation is required to activate the release of humoral factors. Another situation is applying auricular acupuncture. Although it is also one kind of mechanical stimulation, its effects may differ from those of body acupuncture. Due to the direct distribution of vagus nerves on auricular points, auricular acupuncture can be used to treat visceral or vascular diseases through its direct impact on ANS.

In the human body, there are large differences in the generation of **adaptability** to different types of stimulation on the body surface. For instance, signal parameters of mechanical stimulation such as needling are often non-uniformed while those of electrical stimulation are uniformed, thus the generation of body adaptability to manual needling is slower than that to EA. Accordingly, under most clinical situations, manual needling is the most convenient and effective type of stimulation, and should not be replaced by EA at will. However, when applying EA, its parameters are kept constant during the entire process of treatment so that the reproducibility of its effects is comparatively higher than that of manual needling. Thus, when it is necessary to retain the needle for a lengthy period and to maintain an intense stimulation during that period such as acupuncture anesthesia, applying EA is the most suitable. Besides, the human body usually is more difficult in adapting to EA that has often altered frequencies and intensities than EA with unchanged frequencies and intensities. Therefore, when applying electrical stimulation for a lengthy period, it is best to change stimulation parameters frequently to reduce the generation of body adaptability, which we first named **needling-resistance** in 1976.

When selecting types of stimulation, one may consider various states of diseases and sensitivities

of the body surface in different patients besides the above characteristics. For those patients with short disease courses, mild conditions of diseases, or high sensitivities of the body surface, additional electrical stimulation is generally required unless there are difficulties in generating needling sensations with manual needling alone. However, for those of hyposensitivity and fewer body responses to manual needling, it would be better to combine with electrical stimulation or other types of stimulation. For those points showing obvious signs of *qi* deficiency or cold syndrome, moxibustion or another thermal therapy may be applied.

8.3 Intensity and Duration of Stimulation

After determining stimulation types, the next step is to select proper stimulation parameters, such as the intensity, frequency, duration, and the interval of stimulation. Here we will analyze the intensity and stimulation duration. As for the frequency and interval of stimulation, refer to Sections 8.4, 11.4, and 8.7.

According to Zhu ^[10], a modern acupuncture pioneer, needle-manipulation techniques may only be categorized as two types of stimulation, weak and intense. The **weak stimulation**, otherwise known as **excitation method**, may facilitate excitation levels of tissues, while the **intense stimulation**, otherwise known as **inhibition method**, mainly has tranquilizing or inhibitory actions. Actually, the weak stimulation defined by Zhu has the same intensity level of needling sensations as that of the intense stimulation with the only difference being stimulation duration. When the weak stimulation is

applied, a quick needle-manipulation including intense and sharp twisting and swirling is performed to generate brief needling sensations of soreness, heaviness, or numbness. The needle is immediately withdrawn without retaining. It is suitable for diseases or symptoms of shock, prostration, flaccid paralysis, hypomyotonia, dysesthesia, anesthesia, and so on. As for the intense stimulation, after the needle has been inserted, it is slowly twisted and trusted, which can be repeated every few minutes during a longer needle-retaining period. This manipulation emphasizes a persistent and slow stimulation with a gradually increasing intensity and lengthy needle-retaining period. It is suitable for pain, spasm, nervousness, anxiety, and so on.

Strictly speaking, for every acupoint or stimulation location, the stimulation amount is the product of intensity and duration of stimulation as below.

Amount of Stimulation =

Intensity of Stimulation × Duration of Stimulation

The **stimulation intensity** depends on two aspects. First is the stimulation itself. For mechanical stimulation on points, such as needling, it is manifested as the intensity of needling force. As long as the **amplitude and frequency of needling** (twisting, thrusting, and lifting) remains high, the stimulation intensity will remain intensive. When turning a needle all the way to the end at one direction, it may produce intensive needling sensations similar to those induced by pinching the fingers. This is indeed one of commonly used needle-manipulation methods to increase the stimulation intensity. Intensity of electrical stimulation can be observed directly from the voltage of electric current, while intensity of thermal stimulation may be measured with the level of heat exerted or through changes of the skin temperature at the stimulated location. According

to studies by Chiba *et al.* of Japan, the maximum temperature change by indirect moxibustion should be about 65°C on the skin, and 45°C in the subcutaneous layer ^[190]. Moreover, thermal effect of indirect moxibustion was mainly dependant on the spacing distance between the moxa and skin, not just on the moxa weight ^[191].

The second is the sensitivity of the patient, of either the whole body surface or just the stimulated region. Different patients have individual sensitivities of the body surface toward external stimulation. When the sensitivity is low, even with an intense stimulation, the patient may only have little sensation. Conversely, when a stimulation location is very sensitive, the patient will have strong sensations even with a weak stimulation. Therefore, when assessing the stimulation intensity, its such two aspects should be considered conjunctionally.

The **stimulation duration** required for each type of stimulation or each stimulated location may vary along with different stimulation intensities. For needling, the stimulation duration includes the **needle-insertion time**, **needle-manipulation period**, and **needle-retaining period**. The needle-manipulation period consists of required time for instant manipulation including twisting, lifting-thrusting, or scraping needle after needle-insertion, as well as each repeated manipulation (called *jiao-zheng*) during and/or after the needle-retaining period. The importance of needle-retaining period may be considered as to ensure the input of a certain stimulation amount. Needle-retaining also allows repeated stimulation at the same stimulation location within the same tissue layer to increase the stimulation amount. During the needle-retaining period, the pain threshold of the region punctured or corresponding distant portions of the body may be further raised, and soft tissues with originally higher tension or spasms may be relaxed, as well as

nervousness or anxiety of the patient may ease. Meanwhile, patients often feel very relaxed with their mind falling into a deep quiescent state, and certain skin redness around the needle, especially at areas with a white skin or abundant blood supply, may be observed.

In general, to achieve the same amount of stimulation, the duration may be extended for weak stimulation, or shortened for intense stimulation. In the 1960s' China, there was a popular needling method called **novel acupuncture therapy** that emphasized the application of intense stimulation without retaining the needles. Although that method did produce some excellent results, many patients disliked it due to the intolerable intense needling sensations generated by the method. Presently, the most welcomed and prevailing needling methods are those with moderate and tolerable stimulation intensity with a reasonable length of needle-retaining period.

On the other hand, a lengthy period of persistent stimulation after *deqi* is unable to ensure induction of better effectiveness. It was observed that the threshold of pain tolerance first increased with a persistent needling stimulation, then reached its maximum after a certain period of time ^[109], which is called **induction period** in acupuncture anesthesia. As demonstrated by a number of applications of acupuncture anesthesia, the induction period for analgesic effects is usually between 30~40 min. Such induction period prior to surgery is required for EA to eliminate the surgical pain, which is important in making sure that the inputted needling signals are amplified to the maximum. In other words, needling signals inputted prior into the body require a period of 30~40 min to be amplified, and then to compete with surgical pain signals, which are inputted subsequently. However, a lengthy induction period is unnecessary. The needling signals no longer

increase after reaching the maximum. Moreover, with longer stimulation duration, certain adaptability of the body to the needling may be produced, so that the input of needling signals will be further reduced. Such case is particularly significant during EA. The intensity or frequency of electrical current should often be changed to minimize the body's adaptability to electric stimulator and maintain a sufficient intensity of needling stimulation.

Applying the experience of acupuncture anesthesia in treating various pains, the ideal needle-retaining period should be around 30~40 min. Nevertheless, clinical acupuncture may have its own features different from acupuncture anesthesia. Under most circumstances, needle-manipulation techniques are commonly used while electrical stimulation is not always needed. A persistent stimulation can be easily carried out with EA, but more difficult with **manual needling** (twisting and lifting-thrusting needles). Moreover, even if the practitioner may be capable of manipulating the needle persistently, the patient may not be able to tolerate a lengthy period of needling. Thus, the most frequent method in clinical acupuncture is applying *jiaozheng* during the needle-retaining period. That is, needle-manipulation techniques repeatedly applied at certain intervals determined by the attenuation rate of needling sensations.

During the needle-retaining period, if the stimulation is not strengthened, most needling sensations may attenuate gradually, yet certain needling effects may remain or even increase continuously. Such needling effects obviously have the involvement of humoral factors. An example is the local skin redness around the needle, of which the diameter is about 1~2 cm, and usually is not remarkable until the needle has been retained for 20~30 min. Indeed, this type of needling effect is independent from needling sensations (refer to Section 8.6). Sometimes, regional

dilated blood vessels was observed, even with bleeding from the punctured spot after the needle was withdrawn that may require several minutes of pressure for hemostasis. This type of phenomenon might indicate the improvement of local micro-circulation, or a significant response of ANS. Its mechanisms may consist of the local release of histamine, and the inhibition of sympathetic vasoconstriction on the local skin (refer to Section 9.4). Another example is the change of skin temperature during needling. Zhang *et al.* of Beijing, China observed the relationship between the needle-retaining period and needling effects on the nose temperature in patients with peripheral facial paralysis by the thermographic method. Results showed that the nose temperature lowered instantly with needling, then rose and reached to the maximum 20 min later, and subsequently lowered again. In the groups without needle-retaining, with needle-retaining for 10 or 20 min, the temperature rose again during the 30th to 40th min. In the group with needle-retaining for 30 or 40 min, however, there was no such phenomenon. The general tendency was that the change of temperature was larger but sustained shorter in groups with a longer period of needle-retaining ^[192].

Besides, the required needle-retaining period is also closely related to many other factors, such as the body sensitivity of the patient as well as different locations and layers of the points. The body sensitivity is the main factor influencing the parameter of feedback amplification and transmission of needling signals inside the body. For those patients with a hypersensitivity, if puncturing points with the highest sensitivity in the corresponding reflex zones, effects of analgesia may be realized instantly or only through a few minutes of needling. As reported by Shanxi Medical Univ., China, puncturing certain sensitive points within the

point regions without needle-retaining, namely, withdrawing the needle immediately after *deqi*, can maintain the optimal effect of anesthesia for a surgery lasting between 7~8 hours. The surgery started after the induction period, however, during both the induction period and surgery, needle-retaining was not required. Accordingly, the degree of needling sensations generated may serve as an indicator to determine the length of required needle-retaining period. As long as needling sensations are sufficiently intense, the needle-retaining period becomes unnecessary. As for those with less needling sensations, it is necessary to have a needle-retaining period of about 30 min. The wrist-ankle acupuncture is a type of needling that mainly focuses on stimulation of the subcutaneous tissues. Because needling sensations are not required, it usually requires a longer needle-retaining period (about 1 hour) to achieve results ^[193].

8.4 Stimulation Features of Basic Needling Methods

Lifting-thrusting and twisting needles at points are two basic needling methods. Since ancient times, many special needle-manipulation techniques have been derived from the integration of these two methods. All of them have varying stimulation frequencies and amplitudes, as well as different depths of the points. The following are the stimulation features of these two basic needling methods.

For the needle lifting-thrusting method, suppose stimulating a certain sensory receptor (e.g., the muscle spindle) located at the deep muscle of acupoint (Figure 8.1 a, b). With a needle inserted and

depressed into a deep portion of the point perpendicularly, the needle tip is gradually approaching the sensory receptor. It causes an increasing “squeezing force” on the sensory receptor, resulting in an increasing mechanical transformation of the receptor. Accordingly, electrical impulse signals are produced and gradually strengthened, which are inputted into nervous centers via afferent neurons. When the needle tip is striking the sensory receptor, which mechanical transformation reaches its peak, the most intense needling sensations are induced, namely the stimulation intensity of needling reaches its maximum. Therefore, there is an increasing process of stimulation intensity during the thrusting of the needle. Moreover, the changing rate of stimulation intensity is correlated with the rate and amplitude of needle-thrusting. With a higher rate or greater amplitude of needle-thrusting, there is a faster change of the squeezing force from zero to the maximal. Accordingly, the mechanical transformation of the stimulated sensory receptor becomes more significantly, so that stronger stimulation intensity is attained. This is the feature of stimulation for the needle-thrusting method and vice versa for the needle-lifting method. When combining needle-thrusting and needle-lifting together, namely practicing the **needle lifting-thrusting method**, alternations of stimulation intensity are the continuous pattern of weak → strong → weak → strong → weak.

The above is actually a simplified case assuming that there is only one sensory receptor within the acupoint and the needle tip strikes it directly. In reality, there are many sensory receptors distributed inside the acupoint, and at least a group of sensory receptors can be stimulated. Moreover, some of them may not be stricken by the needle tip directly, instead, may actually be squeezed by the nearby needle body. Thus, although the entire process of

needle-thrusting is similar to the above-described, the stimulation amount attained should be the sum of stimulation activated from sensory receptors.

For the **needle-twisting method**, suppose the needle body or tip is inserted until the near side of the sensory receptor (Figure 8.1c), when the needle is twisted at one direction, it can drag the tissues that surround the needle body to turn together, the greater the degree of twisting, the larger the coverage area by stimulation force. Not only it generates stronger stimulation toward the nearby sensory receptor, but also it can activate more surrounding sensory receptors to strengthen the stimulation. When the needle body is twisted all the way to the end and cannot be twisted anymore, the stimulation reaches its maximum. This is similar to the strong sensation felt by pinching some muscles on the body surface. As for the motion of surrounding tissues driven by the needle, its might be resulted from the needle body “stuck” by the reflexive contraction of surrounding muscle tissues, or by the fibers that

wrap around the needle. When twisting the needle in a reverse direction, the surrounding tissues of the “stuck” needle body also turn in reverse. Meanwhile, the tissue fibers that wrapped the needle body first release, then wrap over the needle again in the reverse direction. These stimuli likewise activate the nearby sensory receptors. Thus, regardless of turning the needle clockwise or counterclockwise, during the needle-twisting process, there is an alternation of increasing stimulation intensity.

From the above, whether lifting-thrusting or twisting the needle at both directions continuously, there is a continuous alternation of weak → strong → weak → strong → weak stimulation intensity. In generally, with greater amplitudes or faster rates of thrusting, lifting, or twisting the needle, there is more intense stimulation inputted along with more intense needling sensations generated.

However, when practicing the needle lifting-thrusting method continuously, the striking spots within the acupoint are somewhat difficult to be

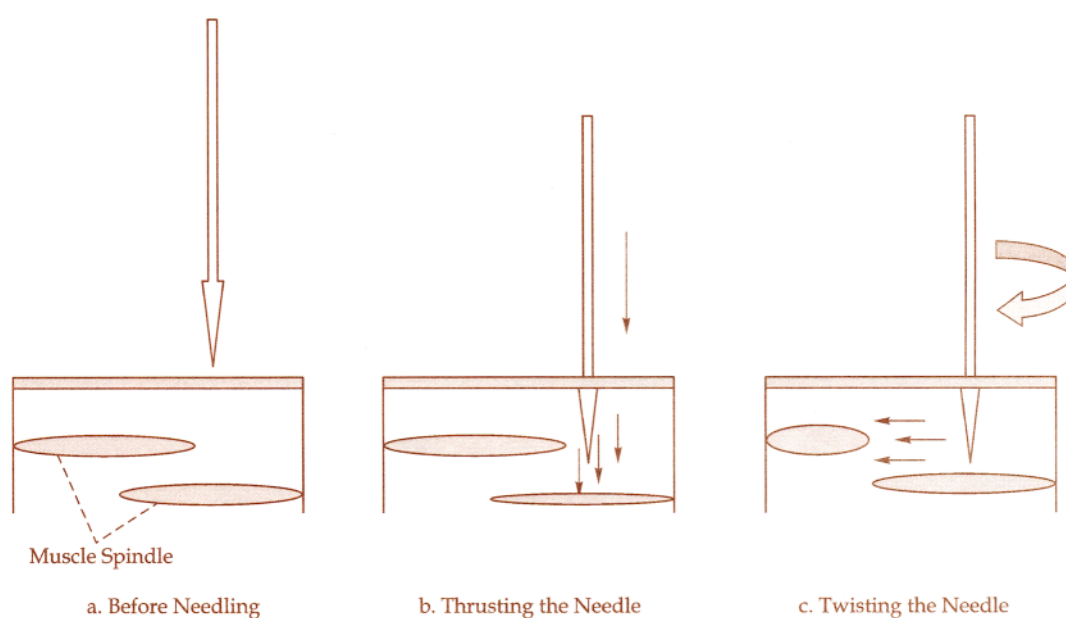


Figure 8.1 Characteristics of Lifting, Thrusting, and Twisting Needling Methods

fixed for each thrusting comparing to that during the needle-twisting method. There may be certain displacements of the needle tip due to different distances or angles of each thrusting, especially with greater amplitudes or faster rates of lifting-thrusting. Therefore, alternations of stimulation amount do not always follow the above-stated rule. Experienced practitioners may have fewer displacements of the needle. Moreover, when a displacement occurs, the needle may strike other groups of sensory receptors located somewhere else, so that the induced stimulation amount might be the sum of stimulation activated from multiple groups of sensory receptors.

More importantly, when practicing the needle lifting-thrusting method, one could often see the entire acupoint region including the skin dragged along by the needle in an up and down motion. This phenomenon is especially evident when lifting-thrusting the needle with different amplitudes or rates, or when PNSAM is present, or when lifting-thrusting is combined with twisting. This indicates the stimulated receptor no longer limited to that one or that group activated by the needle tip. Instead, other sensory receptors in a broader range of the acupoint also can be activated.

Hence, by applying lifting-thrusting or twisting techniques alone or in combination, and intentionally moving the needle at a certain rate and amplitude on different layers of the point, one can derive miscellaneous combinations of stimulation. This is the essence of varied needle-manipulation techniques since the ancient time (refer to Sections 12.8 and 12.9). Not only they can dramatically increase the stimulation amount, or induce special needling sensations such as warmth or coldness, but also they can help to generate a distant propagation of needling sensations. Over time, these needling methods have been proven in the clinic to raise the effectiveness of acupuncture therapy remarkably.

8.5 Properties and Generations of Needling Sensations

The needling sensation is a complex feeling generated in higher nervous centers. It is based on afferent impulses activated by puncturing sensory receptors or nerve branches within acupoints. There are varied needling sensations, of which common ones are soreness, distension, heaviness, numbness, and others include electric-shock, warmth, coolness, water-flowing, twitching or pulsating sensations. These sensations often represent the activation of different sensory receptors or the receipt of different amounts of stimulation. In other words, they may represent various types of needling signals. Thus, different needling sensations often may have different effects and suitable applications.

Generally, the commonly seen soreness and distension are suitable for treating general diseases, while other needling sensations might have certain specific functions. For example, electric-shock sensation is often used to treat neuralgia and rheumatic pain due to its stronger actions of analgesia and inhibition. Warmth can improve local blood circulation and treat many diseases such as paralysis, muscle atrophy, and ecchymoma. Coldness is suitable for fever and acute inflammation. Twitching has good results in treating abdominal ptosis, myasthenia. Therefore, it is crucial to generate suitable needling sensations by understanding their varied properties and mechanisms of formation.

There have been abundant pioneering studies on the properties of needling sensations and their generation mechanisms. It was reported that systematic observations on the incidence of needling sensations with varied properties were conducted in about 20 000 times of puncturing acupoints. The incidence of numbness, soreness, and distension was 29.4%, 17.3%, and 11.4% respectively, while that of

electric-shock sensation and heaviness both was 10.8% [90]. However, needling sensations often are complex, such as soreness-distension, heaviness-distension, soreness-distension-numbness, etc. Moreover, needling sensations are subjectively determined, and individual patients might have varied descriptions for the same needling sensation. Therefore, it is difficult to set an objective standard to distinguish varied needling sensations. In most cases, the top reported needling sensations are soreness, distension, heaviness, and numbness.

In studies on the generation of varied needling sensations, the relationship between needling sensations and tissues punctured is particularly evident. For examples, pain appeared when the needle strikes nociceptors at the skin or blood vessels walls. Twitching is observed when the needle strikes motor spots within muscles. Numbness or electric-shock sensation appeared when the needle strikes the nerve trunk or branches. Soreness is felt during puncturing of superficial subcutaneous tissues. Heaviness is experienced during puncturing of muscular tissues. When puncturing fleshy acupoints deeply, it has been demonstrated that the contractions of local muscle spindles due to stimulation is closely related to TDSAN (tenseness and dragging sensation around the needle) felt by the practitioner and the electromyophic appearance at the stimulated acupoints. However, there have been arguments on the muscle spindles involved in the generation of needling sensations. Some researchers suggest there is a close relationship between soreness and the activation of muscle spindles because when TDSAN was attained, the patient mainly experienced soreness, and occasionally heaviness and distension. Most researchers, however, believe needling sensations are mainly induced by sensory receptors other than muscle spindles. For instance, heaviness and distension sensations are mostly caused by

tactile-pressure sensory receptors such as Pacinian corpuscles that are distributed within the muscle.

However, another argument lies on whether or not the generation of needling sensations is related to particular sensory receptors. Some studies indicate that there are no specific sensory receptors for needling sensations of soreness, distension, heaviness, and numbness. Its proof is that puncturing the same tissue structures of the same acupoint region could induce varied sensations with various incidences, while stimulating different tissue structures of different acupoint regions might generate same needling sensations.

One of the most convincing facts is the laboratory experiment on the generation of needling sensation by Lin *et al.* Tissues exposed through surgeries were directly stimulated and the generation of needling sensations were observed. It was found that when the needle strikes blood vessels, the patients felt pain, and when neural trunks or their branches were stimulated, the patient felt numbness. However, when the muscle, muscle tendons, and the periosteum were stimulated, all induced needling sensations consisted of mainly soreness and distension. Further studies showed that even when the same neural trunk was stimulated with different stimulation intensities or frequencies, varied sensations could be induced, such as soreness sensation by puncturing, heaviness sensation by finger rubbing, and tingling sensation by touching of surgical instruments [92]. Moreover, when applying EA at the common peroneal nerve, the vibration sensation were mainly caused by the stimulation frequency of 2~4 times/sec, distension and heaviness sensations by 10~20 times/sec, while the numbness sensation was mainly induced by a stimulation frequency that is greater than 50 times/sec. These experiments demonstrated that the generation of varied needling sensations does not always depend on the activation

of specific sensory receptors.

In a study of afferent discharges from the medial nerve unit at the elbows, Wang *et al.* found that properties of needling sensation mainly depend on types of afferent fibers in addition to actions of sensory receptors^[18]. For example, the numbness and soreness were conducted by type II and IV nerve fibers, while the heaviness and distension were mainly conducted by type III nerve fibers. Clinically, there also was a relationship between needling sensations and needle-manipulation techniques observed. When twisting or lifting-thrusting the needle with great angles or amplitudes and high rates, the distension sensation was easily generated and vice versa to generate the soreness sensation. As for the generation of warmth and coldness, they might be induced based on sensations of soreness, distension, heaviness, and numbness, and may be closely related to specific needle-manipulation techniques (refer to Section 12.8). These facts also support the notion that varied stimulation intensities may result in different needling sensations as different needle-manipulation techniques mainly represent the variation of stimulation amount.

All of the above arguments are supported by certain laboratorial studies or clinical observations. According our clinical experience and knowledge, the generation of varied needling sensations is indeed through the activation of specific tissue structures including sensory receptors. Specifically, sensations of soreness, distension and heaviness are mainly generated by the stimulation on nociceptors and tactile-pressure receptors (e.g., free nerve endings and Pacinian corpuscles) located on the skin, subcutaneous or other dense connective tissues, as well as the muscle. The generation of numbness and electric-shock sensation might be mainly induced by the stimulation on afferent nerves fibers or nerve trunks containing both afferent and efferent nerves.

When puncturing a superficial point, the needle tip may only strike certain superficial sensory receptors or nerve fibers without stimulation of muscle spindles, so the generated needling sensations are not accompanied with TDSAN. While puncturing a muscular point, the needle tip may strike all tissue structures and encompassed receptors or nerves along the stimulation route. When the muscle spindle is stricken, it could not be felt, but it could trigger the stretch reflex resulting in regional muscle tonus, which might activate even more sensory receptors or afferent fibers around the needle. As the result, certain needling sensations of soreness, distension, and heaviness may be further strengthened.

Distension is one of most common needling sensations felt by the patient when needle is inserted into the muscle, and it is very similar to heaviness. The difference between them might be due to the localization in their scope and precision. Distension mostly is a type of sensation with regional inflation and distinguishable localization while heaviness is an oppressed or sinking sensation with a slightly larger scope and vague localization. Tightness is mostly generated by the activation of Pacinian corpuscles and other nerve endings as well as muscle spindle distributed in muscles. When sensory receptors for deep-pressure including the fine-tactile along with muscle spindle were activated, the needling-recipient would experience distension.

TDSAN is one of main components of *deqi*. As described by ancestral Chinese, TDSAN literally describes a feeling felt by the practitioner *as if the fish was swallowing the bait* during the needle-manipulation, indicating the occurrence of *deqi*. Here the needle is symbolized as a fishing pole, and the practitioner as an angler. In addition, *deqi* also includes the most frequent sensations of soreness, distension, and numbness felt by patients. In a study

of 1 000 times of puncturing acupoints, it was found that 73.6% for the coexistence of TDSAN by the practitioner along with soreness, distension and numbness sensations by the patient, 22.5% for only TDSAN without soreness, 2.3% for soreness, distension and numbness sensations without TDSAN, and 1.6% for other situations. TDSAN is mainly from the reflective contraction of muscles due to the activation of muscle spindle. Yet when twisting the needle in a large angle or with a fast rate, TDSAN sometimes may also be due to the tissue fibers wrapped the needle body. Meanwhile, coexisting or separated needling sensations of soreness, distension, and numbness might be induced by stimulation of the regional tactile-pressure sensory receptors and nociceptors as well as their afferent nerves.

On the other hand, the properties of needling sensations are also related to the variation of stimulation intensity. It is particular evident when tactile-pressure sensory receptors and nociceptors or their afferent nerves of acupoints are punctured. With weak stimulation, usually only few tactile-pressure and nociceptors or tiny nerve fibers could be activated, in which the needling-recipient might merely feel soreness. It is like the feeling of a “sore tooth” when suffering from a mild and superficial tooth decay, or like the “sore knee” when standing too long. With an intense stimulation, more tactile-pressure sensory receptors and their afferent fibers could be activated, in which the needling-recipient might feel distension or heaviness. The generation of heaviness might be due to the simultaneous activation of grouped nerve endings or might occur when the needle was very close to nerve trunks or their branches. Likewise, the generation of numbness and electric-shock sensation might be directly linked to the intensity or frequency of nerve-stimulation.

A mild and persistent stimulation such as pressure

on the nerve trunk may cause numbness only, which might be due to only few nerve fibers activated. Whereas an intense and momentary needling usually induce electric-shock sensation, which might be due to the simultaneous activation of more or grouped dense nerve fibers. The experience of funny bone at the elbow is a familiar example. When the ulnar nerve spot located at the elbow was accidentally bumped slightly or heavily, one could feel either numbness or electric-shock sensation. In addition, numbness is often mixed with other needling sensations simultaneously, but electric-shock sensation usually occurs alone. The reason for the latter might be that stimulation intensity of electric-shock sensation is only less than that of pain. Once electric-shock sensation occurs, all other sensations seemed to become indistinct.

Motor spots are the locations where motoneurons enter the muscle. When they were stricken, there would be a twitching of entire muscle fibers pertaining to the same motor unit. It could be seen with the naked eye, while the needling-recipient could also feel twitching and distension. The water flowing sensation might be a slight reflection of numbness. The occasional pain during puncturing are mostly resulted from the activation of nociceptors or free nerve ending that are extensively distributed on the skin, blood vessel walls, and the periosteum. However, pain also can be evolved from any other types of excessive stimulation. This is indeed one kind of effective self-protective mechanism of the body.

Overall, we have discussed the importance of stimulation intensity as well as anatomical structures in generating basic needling sensations. According to clinical experiences of many pioneering acupuncture practitioners, general methods to induce these basic needling sensations may be concluded as below.

To attain soreness, select superficial points or only puncture superficial portions of points, such as subcutaneous tissues, applying a light stimulation by twisting the needle in a small angle, and without **the pressing hand** (or called *yashou*) near the needle.

To attain heaviness, when superficial points or superficial portions of points are punctured, apply an intense stimulation by twisting the needle in a greater angle along with the pressing hand near the needle. When puncturing deep portions of points, such as the mass of muscles, the fascia and the periosteum composed of dense connective tissues, apply a light stimulation, whereas with an intense stimulation, the distension or even warmth could be experienced.

In addition, with a mild and persistent pressure, puncturing superficial portions of certain points with tiny afferent nerve branches might attain the numbness, while striking thick nerve trunks at certain nerve points might induce the electric-shock sensation. If the generated numbness and heaviness were able to sustain for a while, they could be converted to coldness.

The above is the relationship between properties of needling sensations and the stimulation itself. Actually, another factor that may affect the properties is the patient's liability to certain needling sensations. When applying fingers to press the selected point prior to puncturing, if there is soreness upon pressuring, the subsequent needling sensation attained is mostly soreness. If there is a distension or numbness, then the needling sensation will most likely be either distension or instant numbness. In other words, the pressing sensations obtained can often be used to predict subsequent needling sensations on superficial portions of certain points.

Interestingly, when puncturing certain points where there are no sensations upon pressuring, it will also be very difficult to attain *deqi* and generates any sensations of soreness, distension, heaviness, and numbness. If excessively stimulating them to seek *deqi*, pain will probably be induced. As for the reason of this phenomenon, it seems like that needling is one kind of mechanical stimulation of squeezing and pressing that is similar with the finger pressure. The sensations upon pressuring have mostly been able to indicate the characteristics of sensory receptors or afferent nerves distributed on the stimulated points. Their main difference may be the variation of the stimulation scope.

Sometimes, different types of diseases can also affect the properties of needling sensations. For example, for the patient whose main complaint is of distension and aches, the needling sensations were probably mostly distension and pain. For those having symptoms of numbness and heaviness, the needling sensations were probably mostly numbness. For those with burning sensations, as long as the needle was inserted into the region, the patient probably could immediately feel warmth.

These facts indicate that in addition to related sensory receptors and stimulation intensities, the generation of needling sensations is also affected by the sensitivity of the patient's body surface and previous experiences, which requires the involvement of cerebral cortex. Accordingly, variations of the patient's emotions and psychological states may also affect the induction of certain specific needling sensations, which may allow them to become relevant factors to the effects of acupuncture (see Sections 10.3 and 10.4).

8.6 Separation of Effects and Needling Sensations

Ample modern clinical trials and experiments have demonstrated that needling effects are closely associated to the properties, intensity, and the propagation of needling sensations, but they can also be disassociated [195].

When the inserted needle reaches a certain depth inside the acupoint, all sensory receptors located at various tissue layers along the needling course could be stimulated, either alone or together. Most of their afferent impulses can be sensed when they arrive at the cerebral cortex. Such is the generation process of needling sensation. These subjective sensations of the patient in conjunction with TDSAN felt by the practitioner were referred as *deqi*. Generally, the more intense needling sensations, the better the needling effects. Thus, ancestral Chinese concluded the notion of **effects upon *deqi*** during acupuncture, one of the most important experiences passed down from generations. However, this is not saying that effects always accompany *deqi*. For instance, when the action of cerebral cortex was removed by incision or anesthetics, needling effects were actually still present though they might have been weakened or unstable [29].

Under certain clinical circumstances, a mild needling stimulation might not be sufficient to generate needling sensations, but through a longer duration of needle-retaining, it still could have therapeutic effectiveness. With either general body acupuncture or certain micro acupuncture, some patients had no obvious needling sensations, but their symptoms could still be markedly alleviated or eliminated. In addition, the wrist-ankle acupuncture is a typical example of such case.

The wrist-ankle acupuncture is a novel therapy, which needling information is inputted through

subcutaneous tissues, and usually does not require generation of needling sensations. In its operation, any occurrence of needling sensations such as soreness, distension, heaviness, and numbness actually should be avoided through timely adjustments of the needling area or depth. Otherwise, results cannot be generated. The effects of this therapy have already been proven through numerous clinical trials. Because the wrist-ankle acupuncture does not generate any needling sensations, the patient may not have any uncomfortable feeling, thus it is widely accepted by those who are afraid of the needles.

Moreover, the separation of effects and needling sensations is also found in acupuncture anesthesia. When stimulating certain distant acupoints, as long as the location was kept at the same longitude line with the surgical area, there would be good analgesia results even without the arrival of *qi* at the surgical region. An example of such case is needling Shuigou (GV26) and Chengjiang (CV24) located at the midline of the face, which could attain excellent analgesia actions on the incision at the midline of abdomen.

Actually, there are no conflicts between these facts and the conclusion of **effects upon *deqi***, both of them may suggest that the association and disassociation of needling sensations and effects are coexisting. When needling sensations are sufficiently intense or propagated to the diseased area, it signals the intervening information of acupuncture has been inputted into the body or reached the diseased organs with subsequent results to be expected. However, the stimulation without needling sensations or propagations does not mean there is no needling information inputted, actually, it is mostly due to weakness of the stimulation intensity per unit so that it is difficult to be felt by the nervous centers. If such weak stimulation sustains for a certain period to reach a certain stimulation amount, its effects also

can be expected. This is crucial in determining the length of needle-retaining period (refer to Section 8.3).

During the needle-retaining period, if the stimulation intensity is not strengthened by repeated needle-manipulation (*jiaozheng*), then initially attained needling sensations will subside gradually. However, it is generally observed in the clinic that after approximately 20 min of needle-retaining period, a ring of skin redness around the needle gradually appears, even though no needling sensations are generated in the meantime. This phenomenon is assumed as the results of dilating blood vessels due to local release of histamine. Although it does not always accompany with the occurrence of needling sensations, it is usually an objective indicator of acupuncture effects (refer to Section 9.4).

On the other hand, when *deqi* or needling sensations occur, is it still possible to have no effects? The answer is affirmative. As described before, acupuncture intervention is a non-specific type of stimulation, of which indications are extensive but still limited. Under many circumstances, even if the inputted needling information was sufficiently intense, it was still unable to alter the intractable pathological state of the patient. However, the generation of needling sensations usually indicates that the needling information has been inputted into the body.

Therefore, when treating diseases with acupuncture, not only acquiring needling sensations or its propagation is relevant, but also it is important to consider other types of stimulation that may achieve similar results without needling sensations. Moreover, it is advised to combine needling sensations with other kinds of indicators, such as the skin redness around needles to indicate effective stimulation.

8.7 Treatment Course and Intervals between Sessions

When treating most indications of acupuncture, only one or two sessions of treatment is usually not sufficient to maintain stable results. Instead, one or more treatment courses of acupuncture are often required. One treatment course of acupuncture usually consists of set of regularly scheduled treatment sessions, and a certain interval should be between two consecutive sessions. This raises a series of crucial questions: How many consecutive treatment sessions are the optimal for one treatment course? How many treatment courses are required to attain stable results? What is the optimal interval between two consecutive treatment sessions or between two consecutive treatment courses?

In order to prepare an optimal acupuncture treatment plan that is tailored to the individual patient or disease, these questions must be answered, however, in order to do so, one must clarify how to determine the required numbers of treatment sessions or courses.

In Western medicine, especially in pharmacotherapy, there are similar considerations on the treatment courses and intervals between consecutive applications of medications. However, it is much clear for pharmacotherapy, as both the pharmacodynamics and pharmacokinetics of medications have been clarified. However, the same cannot be said for acupuncture that pertains to alternative medicine. Not only the mechanisms of acupuncture have not yet been understood completely, but also its actions and sustainable relief periods may vary depending on many factors, both of the patient and of the acupuncture stimulation itself. For instance, it is difficult to determine the length of the sustainable relief period from each acupuncture session.

In China, a treatment course of acupuncture

generally consist of 7~10 sessions for chronic diseases at once daily. After one course, if the disease is not completely recovered, then take a break of 3~7 days and continue the next course of treatment. When treating acute diseases, such as acute appendicitis, occasionally 2~4 sessions of treatment daily are required, this is similar to the oral-intake of antibiotics for infections.

Currently in the USA, due to the high cost of healthcare and the lack of medical insurance coverage for acupuncture, the number of acupuncture sessions and courses are greatly limited by certain artificial and financial factors. Since most acupuncture patients have to pay out of their own pockets, they often cannot afford an intense treatment plan consisting daily sessions as that in China. In our clinic, chronic patients are generally advised to have at least two sessions of treatment weekly at the beginning. The interval is usually 3~4 days apart between each session. This treatment plan is followed for several weeks until the disease is relieved or at least the symptoms subsided, then reduce the frequency of treatment to once weekly for several additional weeks to stabilize the results. From our experience, such treatment plan worked well for the patient's budget while achieving the maximal therapeutic results similar to the daily treatment practiced in China. Although the interval between two sessions in the USA is slightly longer, it may provide a period for the recovery of the disease and allows one to observe any changes of symptoms since the preceding session. The latter is a relevant feedback information for the practitioner to timely adjust the treatment plan (refer to Section 9.3).

In general, the length of interval between two consecutive sessions or courses of acupuncture should be determined according to the individual differences of the disease, the constitution of the patient, and their responses to each session of

treatment. For acute diseases or those with excruciating pain, acupuncture can be applied once or even twice daily if possible. For chronic diseases, usually once every other day or twice weekly is sufficient. For those either with a good constitution or less responses to acupuncture, it is better to have frequent sessions in a short period and conversely for those with a weak constitution or more responses. In certain patients, the needling sensations or certain local reactions are sustained at the stimulated region long after acupuncture. In this case, subsequent sessions should not be scheduled until those needling sensations or other local reactions are gone completely. In addition, the length of interval for moxibustion could be shorter than that of the needling, as the stimulation of moxibustion is generally much weaker than needling. For most indications, moxibustion is recommended twice daily. Of course, for the direct moxibustion techniques that may cause distinctive marks on the skin, a longer interval should be adopted (refer to Section 8.2).

As for the necessity and length of interval between two consecutive treatment courses, it may be considered from two aspects. First, check to see if the patient has been exhausted through the preceding treatment course. Second, check to see if the patient's therapeutic results have reached a plateau and are no longer improving. The latter is often explained as the occurrence of needling-resistance. As long as one of the two above aspects present, it is suitable for the patient to take a break of one or two weeks from acupuncture. Otherwise, one may complete consecutive treatments of acupuncture in spite of treatment course until the full recovery from the disease.

The last question concerns when a specific treatment plan should cease if most symptoms have subsided. This is also related to types of diseases and

incidences of recurrence. For those difficult to be cured or easy to recur, such as intractable pain, even though the patient is near full recovery, it is advised for the patient to continue with the treatment for a certain period to stabilize results and prevent

possible recurrence. Of course, the frequency of sessions could be reduced to once weekly or monthly. The latter is often depicted as a “tune-up” of the body similar to that of automobiles.

Feedback Principle of Treatment

Feedback is a fundamental principle in the automatic control process. Any control system with abilities of self-regulation, self-adaptation, and self-organization relies on feedback actions of the information outputted from the system. The application of feedback concept in studies of human physiology has been introduced in Section 2.1 of this book. However, the feedback principle we will discuss in this chapter is actually a method to control acupuncture therapy. In the coupling system composed of the acupuncture practitioner and patient's black box, in order to achieve optimal therapeutic effectiveness, it requires the acupuncture practitioner to carefully examine and compare any change of disease information outputted from the body before and after each session of treatment, and timely make certain suitable revisions of treatment plan to direct subsequent acupuncture. This is the feedback principle crucial in the acupuncture therapy.

9.1 The Assessment of Acupuncture Effectiveness

The assessment of clinical effectiveness is essential when applying the feedback principle of treatment

during acupuncture therapy. It is crucial to have medical doctors accept and integrate this form of oriental external therapy into the evidence-based mainstream medicine. During the past five decades, due to efforts of acupuncture practitioners and scientists globally, acupuncture therapy based on the meridian theory has made a series of achievements in preventing and treating diseases. The scope of acupuncture indications has been broadened, and the rate of effectiveness in treating various diseases with acupuncture is greatly raised. However, through a systemic survey of most clinical reports on acupuncture, there are at least the following three main shortcomings in the assessment of acupuncture effectiveness.

9.1.1 A lack of high-quality designs in clinical trials

To assess the objective effectiveness of acupuncture for a particular indication, clinical trials need to be conducted with randomized groups of a large sample pool, double-blinded or single-blinded. For many years, the designs of most clinical trials documented in the TCM literature lacked such strict and comparative controls. Although there have been much improvement over the recent years, including well-designed clinical trials (refer to Part Three), there remain great challenges that need to be

overcome.

The importance of having high-quality designs in clinical trials at least manifests in the following two aspects. First, it is aimed to determine if any placebo effects existed in acupuncture therapy. In other words, it is capable of verifying whether the improvement of disease came from acupuncture or other factors such as placebo and self-recovery effects. It is particularly relevant when a long-term of acupuncture therapy is applied to treat certain chronic diseases. Many diseases have the trend of self-recovery, especially over a lengthy period. If unnoticeable effects of acupuncture are appearing gradually, then the cure of the disease by acupuncture might be suspected. Until now, most medical doctors in the West still consider acupuncture as a placebo therapy, and deem it “medical unnecessary” because the essence of meridians and mechanisms of acupuncture remain vague. In fact, numerous laboratory studies and clinical trials have demonstrated that effects of acupuncture are mainly realized by regulation of physiological and pathological processes of the body. Though there are certain proportions of psychological actions, they may only possess a minor proportion among the entire scope of acupuncture effects. Thus, only with strict and comparative studies of high-quality designs, it is possible to clarify whether there are placebo effects in acupuncture.

Second, it identifies the type of therapy that is playing the primary effect when more than one therapy is applied simultaneously. Clinically, acupuncture is often used as an adjunct therapy to assist Western medicine in treating many serious diseases, such as cancers. Even for pains, the most frequent indication of acupuncture, medications or other alternative therapies such as physical or chiropractic therapy may be combined with acupuncture simultaneously. Accordingly, it is often

difficult to determine the exact proportion of the effects pertains to acupuncture.

Therefore, when assessing the therapeutic effect of acupuncture for a particular disease in the clinic, one must establish strict and comparative studies between the acupuncture group and the control group to clarify the effectiveness of acupuncture. There are several settings for the control group, such as **sham** (otherwise referred to as **mimic**, **pseudo** or **mock**) **control**, **baseline control** and **self-control**. The sham control usually applies subcutaneous needling or EA at non-acupoints to simulate real acupuncture on acupoints. The baseline control does not involve any simulated needling techniques. The self-control is used to compare the pre- and post-treatment pathological information. It can measure the short-term or instant effect of acupuncture in treating a single patient and is suitable for directing rapid feedback revision of the treatment plan (refer to Section 9.4).

Although the sham control is one of the popular methods employed in the high-quality designed studies, it is an imperfect control ^[25,26]. In a review summarizing the use of acupuncture in the management of asthma and pulmonary disease, 11 out of 13 blinded randomized controlled trials showed positive effects. Three of the 11 positive results, however, showed acupuncture to be better than sham acupuncture, but both were better than baseline control. This suggested that sham acupuncture had a positive effect, and hence is not an appropriate control ^[467]. Many of these studies were of low-quality despite their blinded randomized controlled design. In an earlier criteria-based Meta-analysis of 18 studies, it was concluded that only eight studies scored above 50 (out of 100), and that the more rigorous studies showed the poorest results ^[197].

The reason for certain effects of sham acupuncture

may be understood that there may still be stimulation information inputted into the body through subcutaneous tissues or non-acupoints as mentioned in Section 2.6. Moreover, many newly discovered reflex points are located at non-acupoints. In 2001, in a newly designed feasibility study, Fink *et al.* found that not only were there occurrences of *deqi* phenomena within the regular acupuncture group (nearly 84%), there were also nearly 34% within the sham acupuncture group^[198]. Thus, merely based on the non-significant difference between acupoints and non-acupoints or real and sham acupuncture, any negative conclusion on acupuncture effects is worth to be questioned (refer to Sections 15.4, 21.3, 25.2, 25.3, and 25.4). Instead, such results may only suggest there were no significant differences of acupuncture effects between the selected acupoints and non-acupoints. Alternatively, acupuncture on these diseases or symptoms may be concluded as no significant specificity in actions of acupoints (refer to Section 4.1).

Then, what is a perfect control for 'true' sham acupuncture? It is indeed a great challenge because acupuncture itself is a type of non-specific stimulation. In general, as a control without acupuncture, any needle-insertion or stimulation on the body surface should be avoided. To exclude the possible placebo effects or psychological factors, the sham control group may only mimic the setting of the treatment environment, the body postures, pre-acupuncture preparations including exposure, examination, and sterilization of the body surface.

9.1.2 A lack of objective criteria

Due to the simplicity of practice, most acupuncture clinics do not equip with state-of-art diagnostic devices. Therefore, the practitioner performs most comparisons of pre- and post-acupuncture effects

manually. Moreover, for most indications of acupuncture, functional improvements such as pain relief are primarily observed from patients' self-evaluation. The **visual analogue scale (VAS)** is often applied to assess one's own pain levels, mental states, life quality, and so on (refer to Sections 13.4, 13.5, and 25.5).

To set certain objective criteria in assessing acupuncture effectiveness, some advanced technologies or medical devices are already being used clinically. The infrared thermograph and fMRI are two such examples. The former has been applied in the field of TCM including acupuncture to detect changes of thermal fields in the diseased region of the body^[192,676]. It provides a visual criterion to determine pains due to inflammation and reveals the properties, degrees, and the scope of the inflammation. Besides, it can demonstrate the blood circulation throughout the entire body. The fMRI, as one non-invasive measurement, has a great potential in assisting clinical studies of brain functions during acupuncture^[97,110,111,403].

9.1.3 A lack of consistency in methodology

At times, contradictory results are presented from two separate clinical studies of acupuncture that involves similar methods, same points and the same disease. Of course, it is possible to have inconsistent results within a small sample. However, further investigation may suggest that the cause for such results might be due to a lack of consistency in treatment methodology.

For example, there are contradictory results (increase or decrease of motions) reported on the impact of acupuncture on the gastrointestinal motion when Zusanli (ST36) is punctured. It is known that regulatory effects of acupuncture on the gastrointestinal tract are bi-directional that greatly depends on its preexisting functional state. However, not only

these studies did not describe the preexisting state of gastrointestinal motion, but also did not exuberate details on the stimulation of Zusanli (ST36), such as the needling angle, properties and the propagation of acquired needling sensations. These factors are closely related to the effectiveness of acupuncture. Indeed, even when the needle is inserted at the same point with different depths or angles, anticipated sensory receptors and induced acupuncture effects could be completely different. Thus, if these methods are inconsistent during needle-manipulation, irreproducible or contradicting results may be generated. Furthermore, when puncturing several acupoints within a treatment session, other questions such as the order of stimulation, properties, and propagation of needling sensations of each acupoint, need to be considered. Obviously, the results from two separate studies or two consecutive treatment sessions cannot be compared unless the methods are kept consistent.

9.2 Time Models of the Effectiveness

Intervention of acupuncture is a type of nonspecific stimulation on the body, the extent and rate of body reaction might present great individual differences. It is difficult to estimate the effectiveness for a specific patient, number of sessions required to reach that effectiveness, how soon to obtain improvement, and the duration of which it lasts. Even for a veteran acupuncture practitioner, it is difficult to make correct assumptions at the initial stage of the treatment. In general, there are at least five types of time models (Figure 9.1) of the effectiveness.

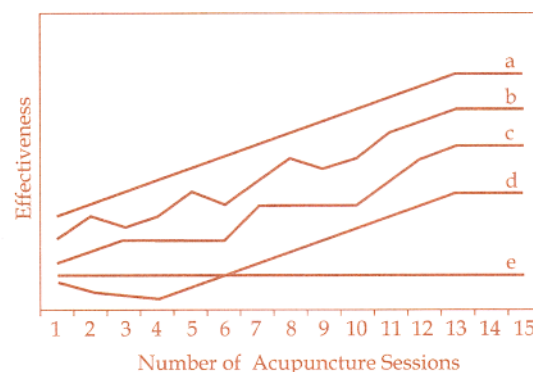


Figure 9.1 The Relationship between the Effectiveness and Number of Acupuncture Sessions

(1) **Linear rising:** Immediately showing the effectiveness, the patient recovers quickly to the normal state. This is the ideal model. Many patients required only a single session of treatment and showed improvement immediately. Some fully recovered after only several treatment sessions. This model is commonly observed among patients of acute and mild cases.

(2) **Fluctuation rising:** The effectiveness fluctuates upward and becomes more stable. This model mostly appears after appropriate sessions of quality acupuncture treatment for chronic cases. The causes for the fluctuation could be traced to either the difficulty of breaking through the stable pathological state, or other factors such as physically exhaustion (fatigue), emotionally stress (nervousness), or environmental disturbances (temperature and humidity changes). Moreover, a longer interval between two consecutive sessions of treatment sometimes may also be a cause. However, through the immediate feedback revision of the treatment plan, the fluctuations of the effectiveness eventually will subside. In other words, there is an increasingly longer duration of relief for symptoms until a normal stable state of the body is reached. For instance, after one session of acupuncture, certain chronic pains might only have several hours of relief before the

pain returns. However, after two or three sessions of treatment, the painless duration can be prolonged to 1~2 days, but the pain is not completely eased, and is especially excruciating when recurring. After revising the stimulation techniques or points or reducing the treatment intervals, continue the treatment for about two additional treatment courses (20 sessions), the pain will be completely relieved for good. In clinical acupuncture, this model is frequently observed. To improve this model, we need to minimize or eliminate as much fluctuations as possible, prevent or reduce the negative effect of needle-resistance, and strive for a stable state of effectiveness.

(3) **Stairway:** Plateaus of effectiveness often occur in this model, and are often broken through after application of a new round of treatment where the situation turns better once again, like a stairway rising upward. This model is similar to the fluctuation rising model, but there are several plateaus in its rising process. Further improvement would not be attained after reaching a certain plateau of effectiveness unless a timely feedback revision is made to the treatment plan. Patients with this model showed certain effects but they have not yet been cured. Many serious apoplexy patients often have this type of effectiveness.

(4) **Fall and rise:** First, symptoms seemed to be temporary worsened, then gradually turned better after a period of treatment. The cause was most likely due to the pathological course of the disease. Occasionally, in some patients suffering from pain, an overly intense stimulation of acupuncture may cause local upsets that may be mixed with original symptoms. This type of model can be seen in a proportion of intractable cases with chronic diseases, especially those with pain. The temporary setback before getting better sometimes indicates that the stable state of disease was broken through. Once

effective treatments are applied in time, the pathological situation will be improved quickly. This model is common when applying the method of **contrary therapy** in TCM ^[3].

(5) **Baseline:** No any change was observed after treatment when compared with that before treatment. This model indicates that patients did not receive any results from acupuncture. Acupuncture indications are extensive but still limited. This model is mostly seen in many organic diseases that pertain to acupuncture non-indications. Even functional diseases that pertain to acupuncture indications have a certain probability to failure. However, before making a final judgment call that voids the acupuncture effectiveness for a specific case, one should first review if all available means have been attempted. To attain the desired effectiveness, it is critical for the acupuncture practitioner to have a rich clinical experience. Moreover, it is still rather obscure as for what exactly constitutes the true indications of acupuncture. The innovative clinical practice of acupuncture practitioners has the potential to broaden the current scope of acupuncture indications.

On the other hand, for common indications of acupuncture, if no obvious improvements occur after careful and elaborate treatment over time, the patients should be advised to seek further examinations to find other possible causes. For example, we treated a female patient who had severe pain in her feet. She did not get any relief after five consecutive sessions of EA. We immediately recommended her to receive a MRI scan of lumbar vertebrae. The results showed the pain was caused by an epidural tumor pinching nerves at the lumbar level. After the surgical removal of the tumor, her pain was relieved completely. Even though she did not get any help from acupuncture, this patient deeply extended her gratitude to us for timely

advising her to go forth with the surgery that alleviated her pain quickly and permanently.

When acupuncture reaches certain effectiveness, many patients frequently ask such a question: “How many more sessions do I need to have until I no longer need acupuncture?” This is indeed a difficult question to answer. For many cases, there are often recurrences of symptoms after the completion of the initial stage of acupuncture treatment (refer to Sections 15.1 and 21.3). Therefore, to stabilize the effectiveness, it is usually necessary for patients to sustain certain periods of continuing treatment after most of the symptoms subside. According to our experience, for most chronic pain-related diseases, it is best to treat until most pathological reflex points (e.g., tender spots) of body surface disappear. The duration of these periods is individual, and depends on many factors, such as the history and severity of disease as well as the body sensitivity of the patient. Of course, the interval between two consecutive sessions can be gradually prolonged, from once weekly, to once two weeks, or once monthly. Many Westerners like to refer this type of consolidate treatment as “tune-up of the body”, similar to that of a car. We call this **preventive acupuncture regulation**.

9.3 Indicators of Revising Treatment Plan

Clinically, the feedback revision of treatment plan mainly relies on changes of disease information outputted from the patient’s black box before and after acupuncture. Such information is manifested into two types. The first is the information about general symptoms and signs of diseases, i.e., changes

of disease conditions used by medical doctors to evaluate therapeutic effectiveness. The second is the special reflex information on the body surface of the patient, namely the information of properties and changes of reflex points or acupoints within reflex zones, for which acupuncture practitioners must pay special attention.

The information of symptoms and physical signs directly represent internal changes from the patient’s black box. It can be used to direct further treatments. When symptoms have improved after the initial session of acupuncture, the same intervention of acupuncture can be repeatedly inputted without sequential changes. Otherwise, the points or stimulation parameters used in the initial session of treatment might need to be changed at the second session. Through such continuous feedback, choose a revised stimulation until the improvement of patient’s disease symptoms and signs.

The information of symptoms usually is subjective. Assessing its changes is dependant on one’s self-evaluation. In the clinic, patients in the West often use the word “difference” to express any changes they sense. During continuous sessions of acupuncture, patients may describe the treatment as “I felt some difference” rather than admitting its effectiveness directly, indicating slight improvement might have been felt. Thus, the word “difference” usually represents a form of self-evaluation about changes of symptomatic information and may appear at the early stage of treatment to guide subsequent treatments.

The reflex information of the body surface can represent internal changes of the body to a certain extent, but it is often overlooked in the contemporary medicine. In this field, TCM practitioners have accumulated thousands of years of experiences (refer to Chapter 6). At the initial stage of treatment for a certain disease, changes of symptomatic information

might be difficult to be detected. Yet there might be certain significant changes of reflex information at certain reflex points on the body surface, such as the reduction and elimination of tenderness level, the shifting of sensitive spots and the recovery of their symmetrical relationship, as well as the emergence of skin redness around the needle. Such changes are easily detected as long as the body surface is carefully examined. This also can be used to take full advantage of the effective timing of treatment guide by making timely feedback revision on the treatment plan without the need to wait for changes of symptomatic information. By utilizing the reflex information of the body surface in guiding the feedback revision on the treatment plan, it is indeed a feature of acupuncture therapy that is vastly different from the Western medicine.

The feedback principles should be throughout the entire process of acupuncture therapy, from point selection and location, needling techniques, retaining of the needles, until the removal of the needles. Acupuncture practitioners should timely collect any objective findings and subjective feelings from the patient as indicators to guide the feedback process. Try to obtain slight positive effects (or improvement) toward diseases in each session. This is especially important for patients who are skeptical about the effectiveness of acupuncture. Otherwise, the patients may not stay committed to the acupuncture treatment.

The feedback process in locating and stimulating a pathological reflex point is approximately as below. One should first caress and press the body surface within a range where acupoints or reflex points often appears. With the continuing inquiring of the patient's sensations, the finger pressure may be increased from light to heavy gradually. It is finally adjusted to a proper intensity based on individual sensitivities of the patient. Note the intensity should

be kept consistent in order to compare the sensitivities among each detected sites. Through careful comparison, choose the most sensitive spot or the central reaction point as the location to be stimulated. Next step is to seek optimized needling sensations through feedback control of the needlemanipulation. Gradually push the needle downward from the superficial layer to the deep portion, and adjust the needling angle as needed, until the needle tip strikes the center of the central reflex layer (refer to Section 12.1). In addition, the feedback revision of acupuncture process also may include selections of point-association, intensity, duration, and timing of stimulation, as well as property and propagation of needling sensations, the needle-retaining period, and so on. In short, apply any procedure that is necessary and beneficial to the treatment as needed.

To speed up the search process in locating reflex points and striking reaction centers, the cooperation of the patients is very important, especially when communication with the patients about their detailed subjective sensations. Such importance should be clearly explained to the patient at the initial visit so that a conscious behavior can be instilled in subsequent treatments. Actually, the feedback of the patient is always important for any therapy, but it is especially true for acupuncture because the needling sensations relevant to the effectiveness are mainly subjective. Various types of feedback information from the patient, along with the acupuncture practitioner's own examination findings are the primary evidences for the acupuncture practitioner to adjust subsequent treatment plans.

In summary, the feedback revisions of treatment methods and plans based on symptoms, physical signs, and the reflex information on the body surface establish a multi-feedback control system of acupuncture therapy (Figure 9.2). When treating diseases with acupuncture, the practitioner should

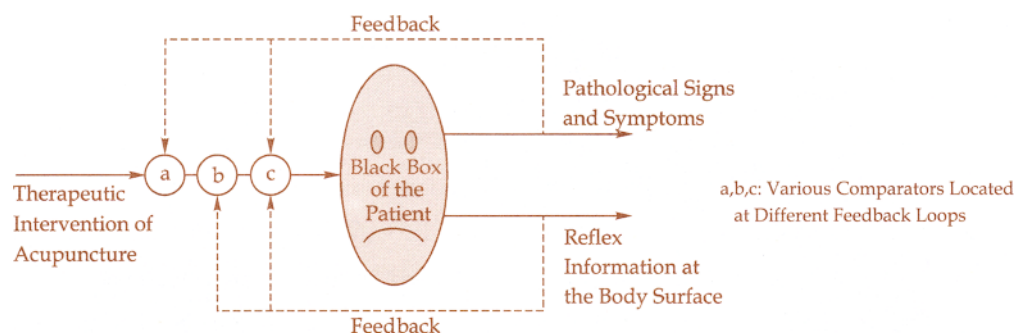


Figure 9.2 Multi-Feedback Control System of Acupuncture Input

fully utilize both types of information outputted from the patient's black box concurrently as they may complement each other in making feedback adjustments of treatment plans. The feedback principles should also be applied in the entire process of acupuncture since it is often the quickest way to achieve an optimal outcome of acupuncture.

9.4 Self-Control and Instant Responses

Self-control, applies the patient's pre-treatment condition as control to compare with post-treatment changes of symptoms, physical signs, and reflex information on the body surface. Of which changes occurred immediately right after treatment is the most reliable. Although the instant effects from self-control cannot exclude any probability of acupuncture as a placebo, it is sufficient to eliminate the possibility of self-recovery or co-effect from other therapies.

When treating visceral diseases with acupuncture, there are at least three types of instant responses used to assess or predict the effectiveness. The first is the immediate relief of symptoms, such as the ease of

gastrointestinal spasms or asthma. The second is the **arrival of *qi* at the diseased region**, such as the needling sensations at Zusanli (ST36) may propagate directly to the stomach region, or the warmth of moxibustion at Sanyinjiao (SP6) may propagate directly to the lower abdomen. The third is the local **skin redness** (or sometimes known as red clouding) **around the needle**. It often occurs after retaining the needle for a certain period (usually 20 min or so). Sometimes the area of redness could be as large as 1 cm² or more. This phenomenon is especially noticeable in Caucasian patients or patients with light skin color. Often times, it easily appears on bilateral sides of the spinal column as well as on the medial side (*yin* side) of the limb, which may suggest that the patient will have therapeutic effectiveness.

The skin redness around the needle could also indicate the improvement of local microcirculation. Its mechanism might include the release of histamine and the inhibition of sympathetic tone in the local skin blood vessels. Reported by Rico of USA, 18 out of 22 cases of cancer patients had the skin redness around the needle when receiving EA to relieve their pain [199]. In another clinical trial of acupuncture anesthesia, researchers were able to predict the analgesia effect of acupuncture by observing the changes of microcirculation. As long as the needling of points could improve the microcirculation, the

outcome of acupuncture anesthesia would be satisfactory. Thus, the skin redness around the needle at least can be considered as a positive sign for acupuncture analgesia.

However, when using instant responses of the body as the outputted information for the feedback revision, one should note that occasionally this information might be unreliable, namely it does not represent the true responses of the body. For instance, under certain conditions with an intense stimulation, a patient might have regional upset or exhaustion in the body, or even experience temporary worsening of symptoms, which would subside in 1~2 days. This phenomenon generally is the normal response of the body induced by an intense needling stimulation, instead of the change of disease condition per se. Conversely, a greater instant response after needling usually indicates that more intervention information is being inputted into the body with better therapeutic results. After the response is diminished, the patient often feels particularly relaxed and comfortable. Of course, an overly-intense response may raise some complaints. Patients might feel being “hurt” by the needle, and then reject any subsequent sessions.

Therefore, any possible form of short-term responses from acupuncture therapy should be announced to all patients in advance so that they can be mentally prepared. Meanwhile, practitioners should be aware of the lagging effects of effectiveness. Once it occurs, do not revise the treatment plan immediately. Unless such lagging effects (or false information) disappear entirely, it is not advised to make feedback revisions for subsequent treatments. Otherwise, it is possible to aggravate and prolong the exhaustion, resulting in the patient's rejection of further acupuncture treatments.

9.5 Rapidly Revising Treatment Plan

Most medical therapies are based on therapeutic responses or effectiveness of the patient to revise the initial treatment plan continuously. Due to individual differences, there is never a common method, which can suit every patient, disease, or stage of disease. However, it is especially true for acupuncture therapy. To achieve the optimal outcome, acupuncture therapy need to conduct the feedback revision of treatment plan rapidly based on the responses of the patient. This is because the acupuncture information inputted into the body is nothing more than non-specific stimulation on the automatic control system of the body. The body can very easily adapt to external stimulation such as acupuncture. In order to obtain the maximum results, one may need to select optimal acupoints for stimulation, or to input sufficiently intense stimulation through pathological reflex points with shortcuts to corresponded neural networks. Of course, it is not easily realized, and multi-feedback revisions are generally needed. The following is an example of a sciatica patient to illustrate the rapid feedback revision of the treatment plan applying self-control.

When treating a sciatic patient with acupuncture, the practitioner might apply following three indicators to assess instant responses of the treatment: locations and levels of spontaneous pain, the positive finding of Lasegue test, and dynamic alternations of tender spots on the affected limb. Before and after each session, these symptoms or signs were checked and compared carefully. The most frequent tender spots for this patient might be located at points of Huantiao (GB30), Yinmen (BL37), Weizhong (BL40), Fengshi (GB31), Yinshi (ST33), Yanglingquan (GB34), Feiyang (BL58), Xuanzhong

(GB39), Kunlun (BL60), and Qiuxu (GB40). Usually, levels of tenderness could be categorized into slight, moderate, and severe. Severe tenderness was induced by a light finger pressure and often could not be tolerated while the moderate tenderness was induced by a medium finger pressure and could be tolerated. Slight tenderness was induced only by a heavy finger pressure. To ensure reliable results of tenderness level, a consistent finger pressure should be applied throughout the entire process of measurement. The method of finger pressure could also be substituted by a specific device, which was called a **tenderness detector** that applied a spring scale to secure and lock-in several levels of pressure.

For the treatment, first, one might choose three most sensitive tender spots for needling, such as Huantiao (GB30), Fengshi (GB31), and Yanglingquan (GB34), where there was severe tenderness. The initial stimulation intensity might be set at the medium level so that the patient could tolerate it. Needling sensations of the patient might be a slight soreness and numbness, which propagated down along the entire lower limb. The needles were retained for 30 min, and twisted for three consecutive minutes every five minutes to strengthen the stimulation.

After the needles were removed, any instant response should be collected and compared. If the pain was reduced or that the affected leg could be lifted higher, then it indicated that the initial treatment was effective, the same treatment can be reapplied in subsequent sessions without revision of point-selection and other stimulation parameters. Sometimes, significant changes do not appear until several days after the initial treatment, in that case, it is necessary to wait until the day of the follow-up to determine if the preceding treatment had succeeded and to administer a new session. If the preceding treatment did not result in any changes,

then the initial therapeutic methods, point-selection, and other stimulation parameters might need to be revised. Through several continuous feedback revisions, it is hopeful that one could find a suitable therapeutic method or plan for the specific patient and could help to reach optimal effectiveness.

After the patient's spontaneous pain was mostly relieved and the Lasegue test showed negative, certain tender spots might remain. Meanwhile, subsequent treatments of acupuncture might be aimed at the elimination of tender spots. Ultimately, this way could be beneficial for stabilizing the therapeutic results. The interval between two consecutive sessions might be prolonged gradually, from once daily or once every other day to once weekly or once every two weeks.

9.6 The Flow Chart of Acupuncture Therapy

Through the preceding text, a systematic analysis of the entire process of acupuncture therapy can be summarized in Figure 9.3.

Communicating with the patient's black box, the practitioner first uses one's own sensory organs or receptors to collect data from the patient. The patient's symptomatic and reflexive information on the body surface are delivered through the stated main complaints and physical examinations. Of which, weak signals can be amplified through an **amplifier**, and miscellaneous signals can be clarified through a **filter**. The amplifier and filter can be a series of special methods or devices. Afterwards, the brain of the practitioner, as an **analytical device**, may begin to process these types of information as they are being received, including analyzing disease

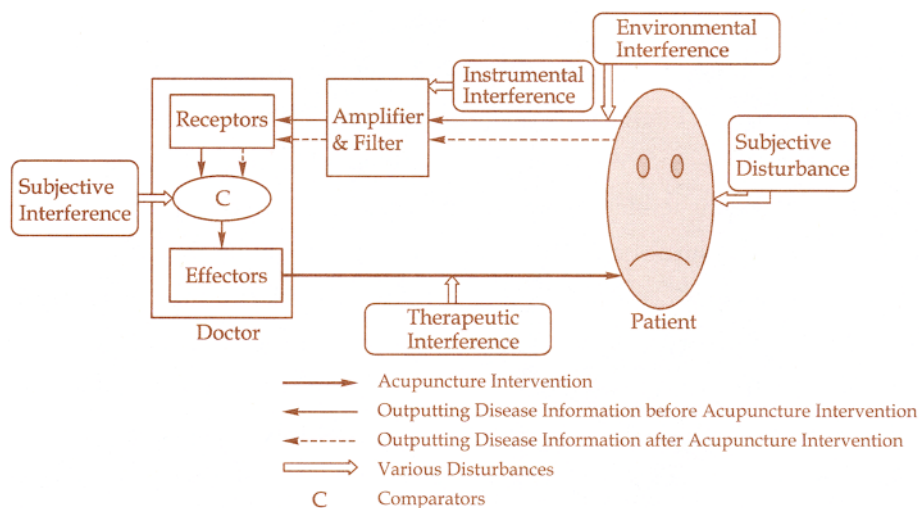


Figure 9.3 Flow Chart of Therapeutic Process of Acupuncture

conditions, assuming the causes of disease, determining the initial treatment plan, and outline therapeutic objectives or methods for different treatment stages. Sequentially, acupuncture or other interventions controlled by the practitioner's effectors are inputted into the patient's black box, indicating the beginning of the treatment. These types of intervening information are inputted via acupoints or reflex points on the body surface, and then acted on corresponding neural networks of the automatic control system. It can result in the conversion of the pathological state to the normal state.

In the process of acupuncture treatment, disease information outputted from the patient's black box may change correspondingly with changes of the disease condition inside the black box. The practitioner collects this altered information, and uses his/her brain as a **comparator** to compare it with the original information received before the treatment. The difference between both types of information is considered as the evidence of revising previous treatment method or plan, and a newly revised method or plan is applied in subsequent sessions of treatment accordingly. Repeat such

feedback revisions until the patient is completely recovered. As shown in Figure 9.3, if there were no such feedback revision, this coupling system between the practitioner and the patient could not form a closed-loop. In other words, unless the practitioner consciously completes such procedures, acupuncture therapy could not be administered in an effective and efficient way. Obviously, when the more timely feedback revisions are made, the faster and more accurate controls on the patient's black box can be applied, which can ensure the optimal therapeutic results regardless of various interferences.

Inevitably, similar to other controlling processes, acupuncture therapy is subject to various interferences. There are at least four types of interferences: environmental, subjective, therapeutic, and instrumental.

The information outputted from and inputted into the patient's black box can be both interfered by the environmental factors. The environmental interference generally includes the external air temperature, humidity, noise, and lighting condition during the treatment period. It is known that a cold or damp weather may worsen patients' chronic rheumatic pains. In TCM terms, they are referred as

cold pathogen and **damp pathogen**, respectively. In addition, the misdiagnosis of tongue coating color often occurs due to chewing a colorful gum or drinking artificial flavored drinks prior to the diagnosis. To eliminate possible interference from improper environmental factors in the treatment room, the suitable setting of treatment room become crucial (refer to Section 10.7).

The subjective interference can be from either the practitioner or the patient. From the practitioner's side, they include insufficient clinical experience, misdiagnosis, improper treatment plan or therapeutic habits, and a lack of confidence in the recovery of the patient. From the patient's side, they include anxiety/nervousness, emotional fluctuations, and a lack of confidence in the practitioner or acupuncture therapy (refer to Section 10.4). When either the practitioner or the patient have a lack of confidence in the treatment, therapeutic effectiveness could be distinctly affected, which is especially true in treating chronic, intractable diseases. Either subsequent treatments may be interrupted in the middle of a treatment plan or the accompanied anxiety of the patient may worsen the disease condition. Therefore, when treating a patient suffering from a chronic distress, the practitioner, in addition to one's self-confidence, should pay attention to the psychological aspects of the patient. It is relevant to encourage the patient to cooperate with the treatment and to complete all required sessions or courses of treatment (refer to Section 10.3).

The therapeutic interference may come from other combined therapies received by the patient, such as certain medications or surgeries. Taking analgesics prior to diagnosis may lower the sensitivity of the entire body surface, which may result in the difficulty of determining reflex points or affecting the generation and propagation of needling sensations during the treatment. Patients with post-surgical

lumbago may have much less needling sensations at the surgical region and unsatisfactory acupuncture outcome. It is mostly due to the surgical destruction of normal neural structures at the region. Sometimes, excessive exercise of the affected body portion after acupuncture also could induce recurred pain in the injured soft tissues. In addition, the acupuncture stimulation itself also might become a kind of therapeutic interference. When applying multiple needles on several points to treat a patient, the second point may strengthen or reduce the effect of the first point, or the subsequent needling may have an antagonistic action with the preceding needling. This is the reason why the question about stimulation order will be raised for discussion in Section 10.8.

When collecting disease information from the patient, various modern diagnostic devices such as CT, MRI, or infrared thermograph are often applied. In the collection of reflex information of the body surface, the commonly used is **the meridian explorer** or **ear point finder** that aims to seek **electro-permeable points**. These instruments all have the functions of filtration and amplification for the collected signals, but sometime they may become a source of interferences due to the amplification of certain false signals or incomplete filtration. This is called the instrumental interference.

Clinically, there are some simple methods of signal amplification and filtration without the need for equipment. For example, when applying the **resistance-needling method (RNM)**, a specific posture of the affected body portion can facilitate the probing process of tender spots through the alteration of regional soft tissue tensions (refer to Section 12.7). This measure is similar to adding an amplifier in the process of collecting signals of the body surface, which makes originally slight tenderness signals amplified. Moreover, the specific

posture may also expose originally hidden deep tender spots, similar to the function of a filter.

In short, when a patient is receiving acupuncture treatment, he/she is not isolated from the internal and external environments. There are always various interferences accompanying the diagnosis and treatment. Careful identifications and preventions

of these interfering signals may require of the usage of filters and amplifiers. In the following text, we will discuss in detail on how to eliminate or avoid common interferences and practice regular or advanced controlling techniques to raise therapeutic effectiveness.

Factors Influencing Effectiveness of Acupuncture

In the process of controlling the patient's black box with acupuncture, many factors may influence its outcome. Not only acupuncture intervention itself is a non-specific stimulation on the body surface, but also there is great randomness in acupuncture techniques due to a lack of standardization. Accordingly, even for the same indication, in different patients or treated by different acupuncture practitioners, the results may vary. Influencing factors may arise from three aspects, the practitioner, the patient, and the external environment. From the practitioner's aspect, there are different levels of experience and skills in clinical acupuncture besides the selections of stimulation locations, means, and parameters. In the patient's aspect, there are individual differences of body sensitivity, psychological or mental states. Different settings of the treatment room pertain to the aspect of external environment.

10.1 The Sensitivity of the Body Surface

The intensity of needling sensations is an important criterion that reflects the amount of information inputted into the body. It not only depends on the

stimulation intensity of acupuncture, but also is related to the body sensitivity towards the mechanical stimulation of needling or the thermal stimulation of moxibustion.

Clinically, it has been demonstrated that a large individual difference exists in the generation of needling sensations. At the same point, applying same-sized needles with the same needle-manipulation method, different patients may show individual needling sensations and responses. The time spent to generate needling sensations, as well as the properties of generated needling sensations, such as soreness, heaviness, numbness, tingling, or warmth, also may vary. Similar to needling, patients' responses to thermal stimulation of moxibustion also have individual differences. For example, under the same regional thermal stimulation, one might be at ease, another might only feel slight warmth or itching, while someone else might feel hot and not able to withstand it at all. Moreover, the time it takes from the beginning of the moxibustion to the generation of warmth or heat may also vary significantly.

Differences of body sensitivity toward acupuncture may be manifested regionally or onto the whole body. Their causes may be either physiological or pathological. Different physiological sensitivities of the whole body may be related to ages, genders,

constitutions, and personality traits, and so on. In general, females, persons with a weak constitution, or slim persons are more sensitive. Among these influencing factors of the body sensitivity, aging appears to be the most dominant.

In general, elderly patients have a low sensitivity and slow reactivity of the body surface. They have fewer pathological reflex points that appear more slowly than that of normal adults. Moreover, it is difficult for them to generate adequate needling sensations when punctured at moderate stimulation intensity. Therefore, when treating the elderly patient, it is especially important to put forth effort in point selection, seek one or more sensitive reflex points, and then carefully explore the sensitive center of the point to attain the maximum needling sensations. If the needling sensations generated are weak, certain adjunct techniques such as electrical, thermal, and nerve trunk stimulation (refer to Section 12.4) may be used in combination. During the moxibustion or thermal stimulation, the practitioner must regularly check the temperature to prevent possible burns of the skin. Due to the low sensitivity and slow reactivity, elderly patients often are incapable to respond timely when the temperature reaches a certain skin burning level.

Conversely, pediatric patients have a high sensitivity of the body. Because these patients are generally afraid of the needles and might be uncooperative with acupuncture treatment, acupressure could be substituted instead. For many pediatric patients, good results can be attained even with a light finger acupressure. Acupressure techniques and related point selection methods may also be taught to the parents or guardians of the pediatric patient, so that the patient can receive frequent acupressure at home or where convenient. When needling is applied, the needle-insertion should be swift and painless, such as our own

JPNM (Jin's painless needle-shooting method) (refer to Section 10.6), but do not puncture the needle too deeply. Results may be achieved as long as the inserted needle is able to 'stand' on its own while providing a gentle stimulation.

Similar to elderly and pediatric patients, there are some hyposensitive and hypersensitive adult cases. For the former, despite the efforts of the practitioner, seldom could *deqi*, including soreness, heaviness, or numbness, be generated. The patient might merely experience minor needling sensations, which could even turn to pain if the stimulation intensity was greatly increased. For these cases, it is suitable to adopt the same therapeutic strategy for elderly patients. For the hypersensitive cases, it may be difficult for them to distinguish pathological reflex points from physiological reflex points. Moreover, these patients often experienced pain shortly after the needle-insertion, so that the practitioner could hardly complete the required needle-manipulation techniques to acquire ideal needling sensations or their propagations. For these cases, it is suitable to adopt the same therapeutic strategy for pediatric patients.

The body sensitivity of women often is significantly correlated with their menstrual cycles. For example, in a case of 30-year-old female, almost all of acupoints within the medial side of the lower limbs were very sensitive just before her period. Even a light needle-insertion could trigger sudden twitching of the leg. However, on the 6th day after her period, she was able to withstand moderate stimulation intensity at the same acupoints that were unbearable before. Apparently, her sharp change of body sensitivity is related to her internal hormone level.

Moreover, on the same person, there are regional differences of sensitivity at different portions of body. For example, the *yin* side is more sensitive than

the *yang* side, which is more important for persons with a less sensitivity of *yang* side. In a case of a male patient, there were almost no tender spots found in his *yang* side, and no needling sensations were generated despite efforts of exploring points with needles. Meanwhile, it was surprised to find that *deqi* was attained rapidly when puncturing points of his *yin* side. Therefore, when points of the *yang* side are less sensitive, points of the *yin* side may be chosen instead. In addition, the sensitivity is higher in the distal than the proximal and trunk portions. It is also higher in the more flexible or muscular than that are less flexible or plump portions. This may explain why most sensitive acupoints are located at distal portions below the elbows and knees, especially around flexible joints.

Table 10.1 has summarized factors that may affect the body sensitivity to acupuncture.

A proper sensitivity of the body surface is ideal for acupuncture. Either hypersensitive or hyposensitive body surface may affect therapeutic effectiveness by influencing the generation and sustaining of needling sensations or heat sensation of moxibustion. The hypersensitivity is frequently seen in some patients of hyperalgesia. They often immediately felt pain or burning, even just received

gentle needling or moxibustion, so that further manipulations could not be applied. For patients of hyposensitivity, despite the efforts of exploring points with needles, only minor needling sensations or even pain could be generated. Accordingly, to raise the effectiveness of acupuncture, it is important to change the sensitivity of patients, particularly those of hyposensitivity.

Fortunately, the body sensitivity to acupuncture can also be altered with repeated applications of stimulation. The original hypersensitivity may be gradually declined while the hyposensitivity may be gradually raised. This might be caused by the adjustment of pathway thresholds in the neural networks of the body. When the body becomes diseased or shows dysfunction, the sensitivity of reflex points usually reflects the functional state of corresponded body parts or viscera. Its alternations with the treatment usually indicate the improvement of the disease condition or dysfunction.

For example, when moxibustion is applied at reflex points, the regional thermal sensation could be altered through different stages of a disease. It was reported in the acute disease, patients might feel warmth at the initial visit, but they might feel increasingly hot with the recovery of disease, namely, there was a gradual increase of thermal sensitivity. For patients with chronic diseases, most of them might feel hot at the initial visit, but in subsequent sessions, the hot feeling was first weakened and then gradually intensified. In short, the thermal sensitivity of acupoints can be altered along with repeated thermal stimulation, and the amplitude of alternation might be related to the degree of original sensitivity. The original hypersensitivity may be declined while the hyposensitivity may be gradually raised to the normal state. This can be considered as a kind of regulatory action of moxibustion on the thermal sensitivity of the body.

Table 10.1 Factors Influencing the Body Sensitivity

High Sensitivity	Low Sensitivity
Female	Male
Menstrual period	Non-menstrual period
Children	Elderly
White collar	Blue collar
Slim	Obese
Medial (<i>yin</i>) side of limbs	Lateral (<i>yang</i>) side of limbs
Chest and abdomen	Back
Terminals of limbs	Trunk
Articular region	Non-articular region

However, note that the alternation of the body sensitivity to acupuncture cannot occur in a short period merely through a few sessions of needling or moxibustion.

In addition, a decrease of body sensitivity to acupuncture not only can take place under the condition of original hypersensitivity, but also under the condition of originally normal sensitivity. The latter may be resulted from the body adaptability generated by repeated needling or moxibustion. Such adaptability may reduce therapeutic effectiveness and we refer to it as **needle-resistance** or **moxibustion-resistance** [3].

10.2 Proper Body Postures

The selection of optimal body postures for acupuncture can be considered from two main aspects. First, the body posture should be comfortable for the patient. For most situations, patients receiving acupuncture are required to maintain a certain posture for over a period (e.g., 20~40 min). If a body posture was improperly selected, the patient might feel uncomfortable, including numbness or stiffness of the extremities. This might be one of therapeutic interferences, so it should be avoided during acupuncture. In order to make patients more comfortable and relaxed, a simple way is let each part of the body maintain their natural curves, such as cervical and lumbar curves or slight bending of elbows and knees. A comfortable posture can be fixed by using cushions of various shapes and sizes.

Second, the body posture should be convenient for the practitioner to perform examination and treatment. To detect reflex points or other abnormal appearances on the body surface, it is important to

have the patient fully expose the body part as necessary, under a relaxed state. Many reflex points or acupoints cannot be precisely punctured unless proper postures are selected. For example, a sitting posture with the head dropped forward and both shoulders adducted forward is especially suitable for stimulation of certain points at the neck, upper back, particularly in the area between the scapula and spine, such as Dazhu (BL11), Feishu (BL13), Jueyinshu (BL14), Xinshu (BL15), Jianwaishu (SI14), Quyuan (SI13), Pihu (BL42), Gaohuangshu (BL43), and Shentang (BL44). Moreover, Xiyan (EX146) under the kneecap cannot be easily punctured through the articular cavity, unless the knee is slightly bent. When puncturing Qingling (HT2), it is necessary to have the forearm slightly abducted. Even though suitable postures of most acupoints have been documented, the importance of selecting proper body posture has not yet been emphasized fully.

The impact of improper body postures on treatment are also manifested in controlling the propagation of needling sensations. According to Dr. Zheng, Kuaishan, an acupuncture pioneer in China, the curled extremities might block *qi*. For example, when puncturing Sanyinjiao (SP6), if the lower limb was not straightened, needling sensations were mostly propagated toward the foot. Even when advanced needle-manipulation techniques were applied, they were still difficult to be propagated to the abdomen. When puncturing Neiguan (PC6), if the forearm was adducted excessively, the propagation of needling sensations to the chest could be blocked. Zheng also observed that needling sensations could not easily pass through an obstructed region due to an oppression of specific body posture (e.g., lateral recumbent) or excessive tightness of the clothes.

When the body posture is relaxed, not only does

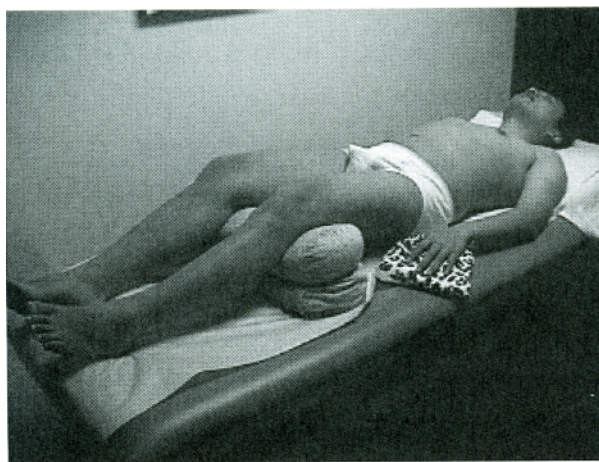
the patient feel comfortable and able to maintain the posture longer, it is also beneficial for the practitioner to detect tension changes in the relaxed part of the body. For many somatic diseases or visceral dysfunctions, there are either increases of tension at the affected soft tissues or show local nodules or prominences on the body surface. These abnormal appearances are unable to be detected unless local soft tissues are relaxed. However, there is an exception, namely resistance-needling method (RNM) which requires an increase of local soft tissue tension to detect reflex points and apply subsequent treatment (refer to Section 12.7). Of course, this method is not commonly employed after all. Under most situations, the relaxed muscles of extremities are relevant for stimulation, especially for pulsating points that can induce muscular twitching (refer to Section 12.5). On the other hand, sudden reflex movements of the body should be prevented during acupuncture. It is critical to prevent acupuncture accidents. When intense stimulation is applied, or if a patient cannot withstand acupuncture, sudden jerks of the body may occur upon stimulation, which could lead to accidents such as bent or stuck needles, or the burnt skin. The incidence of such acupuncture accidents will be greatly reduced as long as proper

postures can be selected and stabilized with several cushions in advance.

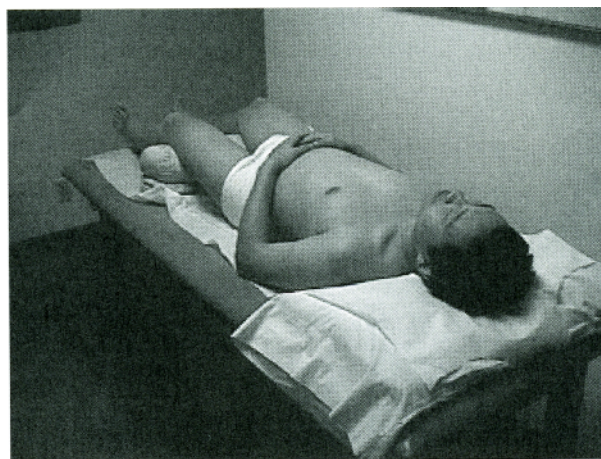
The following are main postures commonly used in clinical acupuncture as well as their applicable circumstances.

Supine is usually one of the most relaxed or comfortable postures. The patient may place both hands by side or crossed on top of the abdomen (Figure 10.1 a, b). This is suitable for examination or treatment on the head, face, trunk, and the anterior and lateral sides of extremities.

With a prone posture, slide a small pillow or cushion under the forehead and another one under ankles. Put both hands besides the head or the hips. Palms should be facing downward for the former, and upward for the latter (Figure 10.2 a, b). It is suitable for examination or treatment at the hind head, trunk, and posterior sides of extremities. It is also suitable to turn the head or face to one side, which allows the lateral side of the head or face to be stimulated concurrently. Occasionally, it may cause or increase the discomfort of the neck, so this posture should be avoided for patients with neck pain. Often times, a ring-shaped pillow can be employed to avoid pressures on the head when facing downward. Of course, some cushions can be

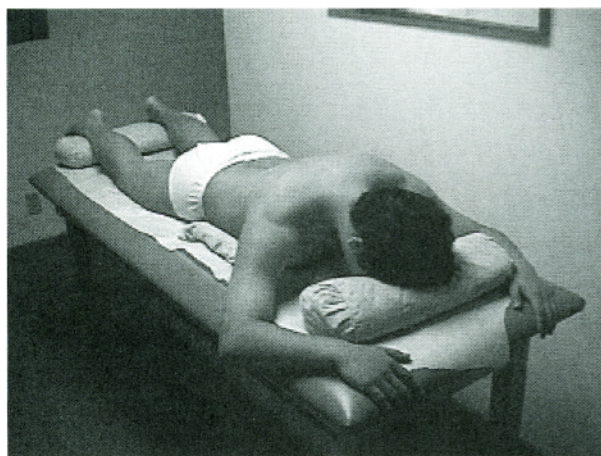


a

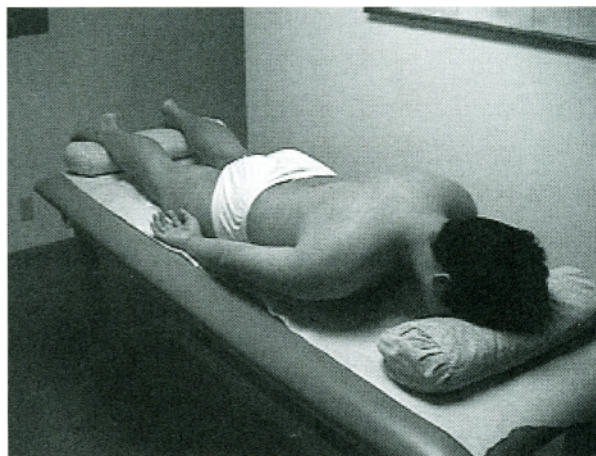


b

Figure 10.1 Supine Posture



a



b

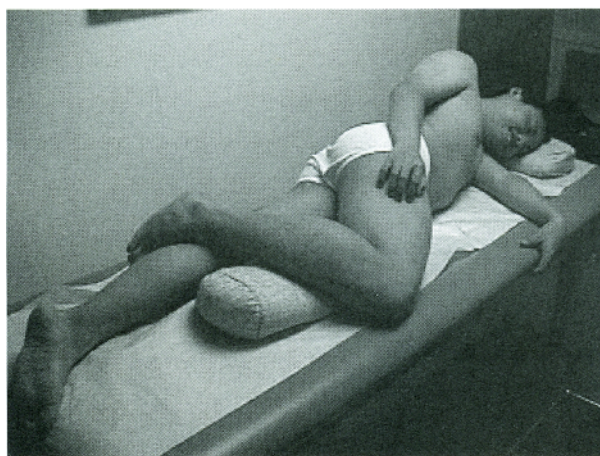
Figure 10.2 Prone Posture

also placed under the chest or have the patient's head extended beyond the edge of the treatment table.

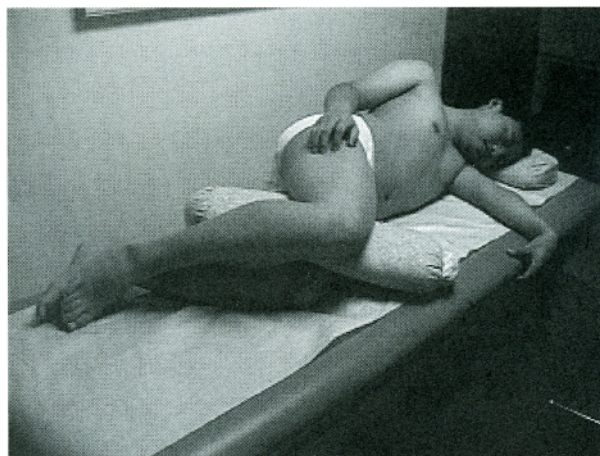
With lateral recumbent, the pillow should be high enough so that the head is level. Both lower limbs can either separate, one in front of the other, or just put together. For the former, slide a cushion under the front bent knee. For the latter, slide a cushion between the knees (Figure 10.3 a, b). This posture not only can make the patient comfortable but also reduces the possibility of body movements when an intense stimulation is applied. This is suitable for examination or treatment at the lateral side of the

head, face, trunk, and limbs. For patients who cannot take the prone posture due to back pain or stiffness, this posture can be used instead.

Under the sitting posture, the head can lean forward and downward on a cushion in front of the chair, use only the forehead to lean against the cushion, and hang the face empty or with the head turned to one side and lean on the padding support. At this time, both hands can be levelly placed on either side of the cushion with palm facing downward (Figure 10.4 b). This posture is especially beneficial for the examination and treatment of hind

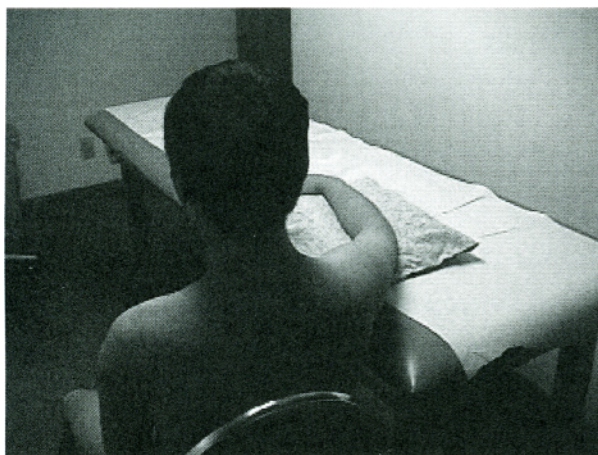


a



b

Figure 10.3 Lateral Recumbent Posture



a



b

Figure 10.4 Sitting Posture

head, neck, and upper back. Depending on different circumstances, a chair with or without armrests and seatback could be used (Figure 10.4 a). However, chairs without seatback should be avoided, as it might not allow the patient to sit steady at a longer period in a relaxed mode.

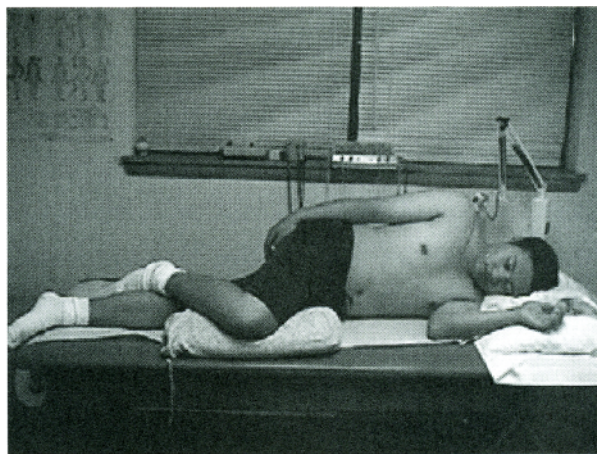
When treating diseases on the medial side of the arm (such as bowling elbow), in order to fully expose the diseased region, the forearm valgus posture can be used in conjunction with either supine or lateral recumbent (Figure 10.5 a, b).

Because only one posture can be selected each

time, point associations often can be limited by the chosen posture. For example, acupoints at the chest and belly cannot be associated when the patient is in prone posture and vice versa when the patient is in supine posture. Therefore, the practitioner also must consider the impact of body postures in determining point associations. Of course, sometime two different postures can be applied consecutively within one treatment session. As an example, when treating a case of lower back pain, the patient first took the prone posture, and needles were inserted on the lower back and the posterior side of lower



a



b

Figure 10.5 Forearm Valgus Posture

limbs. After 20 min of needle-retaining period, the needles were removed and the patient was switched to the supine, then corresponding points of the abdomen were punctured without a needle-retaining period.

10.3 Psychological Factors

Although the analgesia effects of acupuncture have been widely recognized, some studies still suggest that they are merely psychological effects. Lewith *et al.* performed a single-blinded, randomized controlled study of auricular and body acupuncture compared with placebo (**mock transcutaneous nerve stimulation**) in 62 patients with post-herpetic neuralgia. The results showed that seven patients in the placebo group and seven patients in the acupuncture group experienced significant improvement in their pain at the end of treatment, but there was no significant difference in the degree of pain relief recorded in the two groups during or after treatment^[201]. This indicated that analgesic effect of acupuncture appeared to be the same as the placebo for post-herpetic neuralgia.

In fact, due to the complex nature of pain generation process, the involvement of some psychological factors is inevitable. It is suffice to state that the mechanism of acupuncture analgesia may include some psychological effects but their exact proportion should be identified. From our experience, about 30% of tough chronic pain cases are related to psychological factors besides main physiological functions in acupuncture analgesia. The proportions of psychological factors vary between individual patients or diseases.

During acupuncture, a patient's psychological

factors may manifest as one's belief or confidence in the effects of acupuncture therapy or in the practitioner. Norton *et al.* of Canada once observed the effect of belief on the acupuncture analgesia. Twenty-four undergraduates who had indicated either a high or a low level of belief in acupuncture-induced analgesia received either acupuncture or a pseudo-acupuncture treatment before a 60 sec cold-pressor test. They also completed the State scale of the State-Trait Anxiety Inventory at the beginning of the experiment and provided ratings of pain intensity during the cold-pressor test. Results showed those who held positive beliefs about the effectiveness of acupuncture and received actual acupuncture reported less pain than those with negative beliefs and received pseudo-acupuncture. Anxiety ratings did not differ between groups. The ratings of belief in acupuncture shown by the two groups tended to converge after treatment. Results suggest that the differences in the analgesic effects of acupuncture are influenced by expectancy effects and the degree to which expectations are confirmed during the treatment procedure^[202].

The belief also includes the specific trust of the patient to the practitioner. In clinical acupuncture, it is common to notice the influence on therapeutic effectiveness resulted from the trust of the patient to the practitioner. For example, when an intractable case specifically sought a treatment from a famous practitioner, better results usually could be attained even if the famous practitioner used same techniques as other practitioners employed before. The reason for such phenomenon might be due to the therapeutic psychological factor generated by the patient's trust in the famous doctor, in addition to other intangibles such as skills of the famous practitioner that may be superior to others.

The degree of trust of patient-doctor can be gradually built or changed. Even though acupuncture

is a form of traditional Chinese medicine (TCM) that is mostly familiar to Chinese people, to date, there is still a relative large difference in degrees of trust toward acupuncture compared with TCM in China, as people tender to flock to a TCM practitioner instead of an acupuncture practitioner of equal stature when ill. This is much different from the West. Since acupuncture is not part of the traditional Western medicine, therefore, most people in the West are unfamiliar with acupuncture and no such thing as a degree of trust for acupuncture has yet been established. Therefore, it is necessary to provide introductory explanations about acupuncture for most new patients in the West. For patients from a higher education background, a more detailed scientific explanation can be provided to illustrate the fundamentals of acupuncture and its working mechanisms. This can inform the patient on acupuncture and gradually foster the patient's interest and trust into the therapy of acupuncture.

When seeing a new patient, the acupuncture practitioner's primary job is to eliminate any possible "needle fear". Most new patients have never seen acupuncture needles before, therefore whenever the word "needle" is mentioned, they automatically assume it is the same as a hypodermic needle with a large injection head. If necessary, before the treatment, have the patient see a brand-new acupuncture needle from close. Moreover, at the initial treatment, for those who are afraid of the needles, use as thin (e.g., No. 32 size) or as few needles as possible while utilizing painless needle-insertion techniques. The stimulation intensity should also be mild. In addition, use pre-sterilized and disposable needles to ensure the safety of the patient.

In TCM, the practitioner always pays attention to one's attitude toward the patient. It includes having a caring style of conversation that shows concern and kindness, which may help ease the tension or

nervousness of the patient. While the patient's disease pertains to an indication of acupuncture, the practitioner should show the confidence in one's experience, and make a best possible estimation on the treatment results. This will help raise the patient's belief to both acupuncture effects and the practitioner. Acupuncture stimulation is relatively weak in comparison with medications. Acupuncture information cannot be inputted efficiently into the body and play its maximum role unless the patient is fully relaxed and believed in acupuncture. Of course, in order to help build patient's trust level in acupuncture, the best way is to have instant results after the initial session. Another way is to have the patient hear about the effectiveness of acupuncture from words of other patients that suffered from similar diseases. Words of mouth among the patients usually are more convincing in comparison with those from the practitioner.

To recap, acupuncture practitioners should always value psychological effects of their own behaviors, attitude, language, and conversation styles when dealing with patients. These factors may eliminate patients' skepticism, help them to believe in acupuncture effects, as well as to encourage them to cooperate with their acupuncture practitioners and complete the treatment plan. Because most diseases require a certain number of sessions to see results, these are premises to ensure patients to follow their treatment plan. Actually, they are aimed at eliminating the subjective interferences from the patient's psychological state (refer to Section 9.6).

10.4 Mental State of the Patient

In addition to psychological factors, the mental state

of the patient also plays an important role in attaining therapeutic effectiveness of acupuncture. The impact of mental state on acupuncture effects may be twofold: first is the influence on the generation of optimal needling sensations or input of acupuncture information, the second is the interference of recovery process of the body. In the flow chart of acupuncture therapy, it may be expressed as a subjective interference of the patient that may alter thresholds of information pathways within the body (refer to Section 9.6).

Generally, routine needle-manipulation techniques used for generating needling sensations may not be suitable for nervous patients, who are mostly hypersensitive to any kind of stimulation. Sometimes, even a slight manipulation could result in their pain, or a moderate stimulation of acupuncture could induce fainting. Thus, a nervous state of the patient may greatly restrict the application of various needle-manipulation techniques to generate ideal needling sensations.

On the other hand, there is the impact of mental state on recovery process of the body. For example, we treated two pediatric patients similar in age and both suffered from enuresis. During the same treatment course, one child wept loudly and was uncooperative. For him, there were only minimal results after two weeks of treatment. In comparison, the other child was cooperative to the treatment and was able to recover only few days later. Afterwards, to relieve the nervousness experienced by the first child, we decided to change the treatment methods and began applying acupressure on the exact points that were punctured previously. Through another two weeks of treatment, the first child also recovered^[179]. Thus, do not disregard the impact of a patient's mental state on the therapeutic techniques and efficacy during clinical acupuncture.

Likewise, during acupuncture anesthesia, it was

reported that analgesia effects could be affected by preexisting excitations of patients. For example, in patients of hypothyroidism, hypertension, or nervousness, results of acupuncture anesthesia often were poor. On the other hand, in an overly excited patient, pre-administered sedative medications could attain a certain complementary action to the acupuncture anesthesia. These facts suggest that actions of mental factors in the process of acupuncture analgesia should not be disregarded. Keeping patients in a relaxed mental state before and during the treatment period of acupuncture is beneficial in attaining optimal therapeutic results.

There are several ways to eliminate the nervousness of the patient before acupuncture. One way is to explain the procedures of acupuncture in detail to help the patient relieve the needle-fear (refer to the previous section). Another way is to pay attention to the interior settings of the clinic, especially of the treatment room, such as individual quiet room, comfortable temperature, adjustable lights, and playing relaxed music (refer to Section 10.7). Under such environmental settings, the patient is fully relaxed, even weak stimulation of acupuncture may achieve a better result.

In addition, if patients were taught simple meditation prior to treatment, such as how to enter a quiescent state of mind using *qigong* therapy or **hypnosis**, then all the above resolutions may be integrated. It was observed that the **quiescent state of mind** through *qigong* could facilitate the occurrence of PNSAM in patients^[178]. Its mechanism is probably related to the markedly reduced central transmission time during the skin electrical reflexes^[151]. Lu *et al.* of USA reported that the hypnosis could strengthen acupuncture effects and it was especially suitable for patients who fainted easily during acupuncture. It also helped to relieve any needle-fear factors and nervousness that the patient might

have had and allowed patients to follow their treatment plans for further required treatments^[203]. In our experience, many patients entered a quiescent state of mind or fell asleep during the needle-retaining period. These patients often felt soothing or relaxed after the treatment. Of course, it remains unclear what is the proportion of strengthened effects from such integrated approach while the patient is receiving acupuncture under a quiescent state of mind.

10.5 The Finger Strength of the Practitioner

The effectiveness of acupuncture is closely related to the skills of the practitioner. Because classical needling techniques are performed by hand, having a certain level of finger strength or pressure is one of the essential skills that an acupuncture practitioner must master. Its importance is to ensure the completion of required needling or acupressure, such as point selection, sustaining of needle-manipulation techniques, as well as acupressure before and after needling.

Currently, detection of reflex points on the body surface is mainly dependent on the practitioner's finger pressing. An acupuncture practitioner cannot proficiently detect the most sensitive reflex points through finger pressing unless a certain level of finger strength is present. It may not be required for sensitive patients, while it may be required for insensitive patients or those with strong constitution (refer to Section 7.3).

Moreover, there are at least three applications of finger strength in needle-manipulation techniques. The first is in the rapid and painless needle-insertion

technique. The second is during the detection of precise reactions around the needle, such as local muscle tension and twisting. The tenseness and dragging sensation around the needle (TDSAN) felt by the practitioner and needling sensations of the patient are two different aspects of *deqi*. Usually, the TDSAN is more important than needling sensations, and is the basis for the practitioner to speed up the *qi* (*cuiqi*), guard the *qi* (*shouqi*), or implement subsequent manipulations. The practitioner cannot feel the TDSAN unless the practitioner's fingers have tightly held the needle inserted in the patient. The third is in the completion of certain advanced needle-manipulation techniques. In order to input sufficient quantity of acupuncture information into the patient, the practitioner is often required to manipulate needles with both hands simultaneously, or with a continuous twisting, trusting, lifting, and scrapping of needles for 5~10 min, or even longer (refer to Sections 11.9, 12.1 and 12.2). Obviously, the sufficient level of finger strength is necessary to complete these manipulations. In short, a close coupling between the practitioner and the patient cannot be realized unless the practitioner's finger strength reaches a certain degree (refer to Chapter 6).

Furthermore, having a certain level of finger strength is particularly important for acupressure. To raise the effectiveness of acupuncture, acupressure is often integrated before and after acupuncture. For example, acupressure at or near acupoints before needle-insertion can facilitate *deqi*, while acupressure along the meridians after *deqi* can promote the propagation of needling sensations (refer to Section 12.9). Master Jiao, who has a strong level of finger strength, preferred acupressure before acupuncture in nearly all of his treatments. According to his experience, if soreness and numbness sensations were felt after heavy acupressure before needling, then it is easier to attain *deqi* and lessening

the pain of needle-insertion. For patients who were afraid of needles or locations that forbids deep needle-insertion (such as the chest wall), Master Jiao often applied acupressure instead of acupuncture without reduction in results. He often applied acupressure instantly after removal of needles, or even capable of fully utilizing acupressure for the heat-producing and cold-producing techniques. Obviously, this cannot be achieved without a strong level of finger strength.

How can one obtain a stronger level of finger strength? A common way is to practice needling. For students, the textbooks suggested to practice needling on multi-layered paper pads or plastic manikins. For practitioners, their finger strengths can be raised through a lengthy period of needling practice, and this process may be sped up via additional procedures of acupressure before and after acupuncture. Most acupuncture masters, who consistently pay attention to detection and stimulation of tender spots, usually have strong finger strength. Certainly, one can also achieve strong finger strength by intentionally practicing the palm strength. The method of **moving hands while circulating qi** proposed by Master Jiao is such an example that can strengthen the palm force ^[177].

As for what level should the finger strength be practiced until, the fingers should be as if “holding the tiger” according to ancestral Chinese. Dr. Chen, Xinnong, a modern famous acupuncture practitioner, tested his finger strengths by asking his students to take out the needle out of his grip during needling. In our opinion, the practitioner needs to maintain continuous needling for at least five minutes to fulfill the clinical needs of most needle-manipulation techniques.

10.6 Painless Needle-Insertion Techniques

Pain with needle-insertion is a common fear factor for most patients receiving injection of medications. This is mainly caused by the activation of nociceptive free nerve endings on the skin. Acupuncture needles are much thinner than injection needles, but occasional pain with needle-insertion still do exist, especially for hypersensitive patients or when needling the extremities of the body that are easily susceptible to pain. Actually, the importance of painless acupuncture has been recognized extensively. Not only it could help patients to eliminate possible needle-fears and stay committed to their treatment plans, but also it could ensure the therapeutic input of acupuncture information to achieve better results. Generally, the coexisting pain usually is an interference that competes against the inputted acupuncture information. The *deqi* phenomenon or the activation of related sensory receptors located in deep portions of acupoints cannot be induced easily unless the needle-insertion pain is eliminated or reduced.

For a long time, the filiform needles without guided tubes are used, and are still prevalent in China or other countries. Many acupuncture practitioners have exerted themselves to develop techniques that aim at reducing or eliminating the needle-insertion pain. When using the needles without guided tubes, painless needle-insertion is mostly realized through two methods or their combination: increase needle-insertion speed and utilize techniques of the pressing hand (*yashou*) or light scratching near the stimulated points, which may distract the patient from the process of needle-insertion.

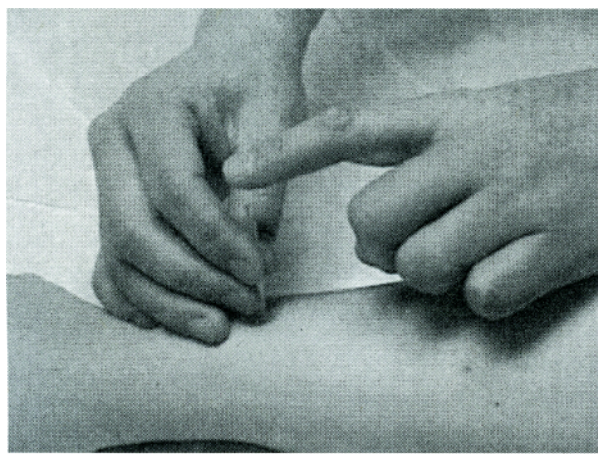
In recent years, however, applications of disposal needles with guide tubes indeed have brought a

revolution of classical acupuncture techniques. In addition to the avoidance of cross-infection risks, the needle-insertion techniques are also improved. Currently, the most popular way to insert a needle with guided tube is by tapping the free end of needle with the index finger pulp (Figure 10.6). Even though this method is convenient, it has an obvious shortcoming, namely its pressing force by the finger pulp is not strong enough for the needle to pierce through certain thickness of the skin, and the needle-insertion speed is still slow. To overcome this shortcoming, we have innovated in the technique through application of the fingernail instead of finger pulp tapping on the free end of the needle as below.

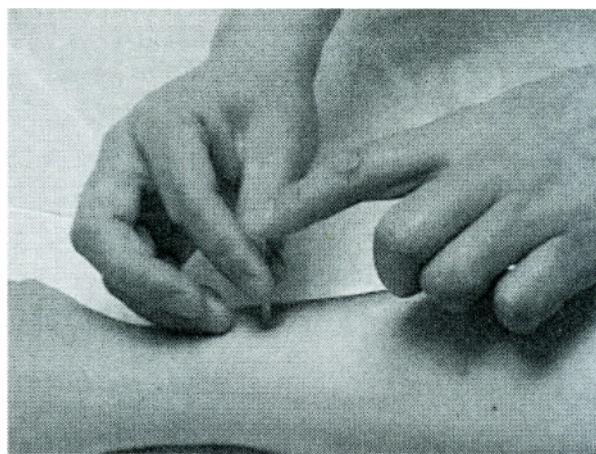
First, remove the plastic tube holder from the tail of the tube (often seen in the filiform needle with the metal handle) or separate the connecting part between the needle handle and the tube (often seen in the filiform needle with the plastic handle). Then, use the left thumb and index finger to carefully hold the tube with a needle horizontally and place the tube end near the needle tip on the surface of the selected point obliquely. After the tube end is tightly pressed on the point surface, the oblique angle of the tube can be adjusted to any needle-insertion degree as desired. At this time, the free end of the

needle should still have 0.1 ~ 0.2 *cun* exposed outside of the tube according its manufacture design. With the left fingers holding the tube, start to tap the free end of the needle by applying the right index fingernail. Before the tapping, the right thumb and index finger should be flexed in an arc with the thumb holding the flexed index finger temporarily and the right index fingernail should be aimed at the free end of the needle. A sudden release of the index finger by the thumb strikes the fingernail on the needle handle perpendicularly, which pushes the needle into the point through the tube (Figure 10.7). Because this method is simple to learn, and can achieve the objective of quick painless insertion as if the needle was shot out of a 'cannon', it has been hailed as **Jin's painless needle-shooting method (JPNSM)**.

Comparing JPNSM with the commonly used finger pulp tapping method, the application of fingernail instead of finger pulp can greatly increase the needle-insertion speed and the inserted depth because the nail is rigid. The suddenly extended index finger can produce an intense pushing force. Moreover, JPNSM allows easy control of the needle-insertion depth by adjusting the piercing force of the needle. When it is applied at the extremities of the

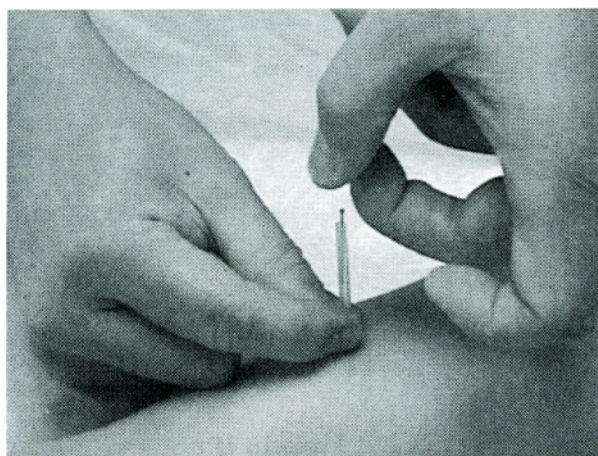


a



b

Figure 10.6 General Needle-Insertion Method



a



b

Figure 10.7 Jin's Painless Needle-Shooting Method

body, such as the sensitive sole or palm with thick skin, select thin needles of No. 30 or 32 sizes and an intense tapping force, needles will be easily inserted without any pain. On the other hand, when JPNSM is applied on the thin chest wall, because there are important viscera inside, any intense or deep needle-insertion should be avoided. Thus, JPNSM is significantly better than the prevalent finger pulp tapping method and is particularly suitable for children or those that are afraid of needles.

10.7 The Settings of Therapeutic Environment

Acupuncture stimulation is a non-specific type of intervention information. Oftentimes, it is not completely certain whether this information can be efficiently inputted into the body to play a therapeutic role. In addition to patients' mental states (refer to Section 10.4), the therapeutic environment is another influencing factor relevant to attaining acupuncture effects. When its settings are improper,

it may become a form of environmental interference mentioned in the flow chart of acupuncture therapy (refer to Section 9.6).

The settings of therapeutic environment include the arrangements of individualized treatment room, comfortable treatment table and interior wall color, proper room temperature and lighting, minimal noise, as well as soft-playing background music, etc.

The air temperature in the treatment room can affect the functional state of ANS of patients, particularly peripheral vasotonic activities that can result in changes of the skin temperature and sensitivity of the body surface toward acupuncture. It is advised to maintain a comfortable room temperature at 25°C year-round with good ventilation.

If without air-condition, in the summertime, a higher room temperature might cause the patient to faint during acupuncture, or the patient may have a hard time tolerating thermal stimuli such as moxibustion or infrared radiation. In the wintertime, with a low room temperature, it is too cold to have the patient expose the body surface for required point detection and acupuncture treatment. Sometime, the patient who was bundled up could only roll up sleeves or trousers to expose affected regions on the

extremities. This might restrict the ability of the practitioner in locating stimulation points, observe abnormal reactions on the body surface, as well as result in unnecessary pressures on the traveling course of meridians that may block PNSAM and ultimately reduce therapeutic effectiveness. In addition, a proper room temperature can help the patient relax easily.

During the entire process of acupuncture, an **appropriate room lighting** and **noise control** is also required. An excessively bright light could make the patient feel uneasy and disturb the quiescent state. In patients of headache, overly bright lights may aggravate the pain. Noises in the treatment room may come from the ringing of the phone or sounds of other persons. An individualized room with good insulation is the ideal setting to prevent or reduce surrounding noises. When there are family members or other accompanying persons in the same room with the patient, excessive talking or phone calls should be restricted. It is also advised to turn off any cell phones or pagers during treatment. The surrounding noises not only may distract the patient's concentration on feeling the needling sensations during acupuncture, but also can disturb the patient's relaxation and meditation states during the needle-retaining period. On the other hand, most patients welcome some soft-playing relaxing music in the background.

In addition, there are influencing factors from other facilities such as comfort levels of the treatment table, shapes and sizes of pads or pillows, which may help the patient to either relax or maintain certain body postures during treatment. Some patients may welcome certain air fragrance that flows through the room. In short, comfortable room settings in an individualized room can ensure the patient's privacy, relaxation, and convenience, as well as the completion of required examination and treatment.

The reasons for environmental factors influencing the effectiveness of acupuncture are regarded as either the competition of **pathway capacity** between coexisting interfering signals and acupuncture signals during the process of the transmission, or as the alternation of thresholds of information pathway. If so, the impact of environmental inference on acupuncture effects is also related to the intensity of acupuncture stimulation. When the stimulation of acupuncture is sufficiently intense, perhaps the impact of external environment could be overlooked temporarily. However, if the stimulation intensity is mild and the needle-retaining period is long, then any environmental interference should be minimized. For instance, according to our experiences, weak stimulation is often applied for patients with anxiety or depression. During the needle-retaining period, it is best to place the patient into a therapeutic environment that is low in light, comfortable room temperature and a background of soft-playing relaxation music. With such settings, the patient can be often put under a relaxed mode during treatment, which may facilitate the optimal outcome of acupuncture.

10.8 The Order of Stimulation

Clinically, it is seldom to use only a single needle or stimulate only a single point during an acupuncture session. In most cases, a set of points, including master and associated points, are chosen and stimulated concurrently according to the particular patient. This is point association. From the perspective of cybernetics, point association ensures acupuncture information can be inputted into the body through multiple pathways connected to the

points (refer to Section 11.7). As long as a set of points are selected, an issue concerning the order of stimulation arises, namely which point is stimulated first, second, third, etc.

In a classical acupuncture book *A Star's Secret*, the order of stimulation using acupuncture were described in detail according to symptoms across different stages of the disease. At the beginning of the book, it was stated: "A star's secret is known to only a very few, needling methods are dichotomized to the order of acupuncture". The books further stated, "If there is consumed food stagnating the stomach, first punctures Xuanji (CV21), and then puncture Zusanli (ST36). If there is abdominal pain due to gas, first puncture Changqiang (GV1), and then puncture Dadun (LR1)". Even until now, these statements are still proven effective when practiced in the clinic. The main needling strategy presented by this book is to first puncture adjacent or local acupoints, and then to puncture distant acupoints.

In fact, considering the proper order of stimulation is based on the possible interaction between consecutive stimulation on two points in succession. For example, what are the effects of subsequent needles acted on the preceding needle? Are their efficacies synergistic or antagonistic? In other words, is it possible for the ineffective stimulation of a needle influence the effects by other needles? Is it necessary to consider the order of stimulation for different parts of the body?

In the modern clinical practice, most acupuncture practitioners already apply stimulation in a certain order, such as from head to toe, or vice versa. However, in addition to certain special requirement, such as to promote the propagation of needling sensations, their main consideration is for the convenience of practice and to allow every selected point to be stimulated orderly. Seldom do they consider the possible interaction between

consecutive stimulation on two points in succession. Until now, there is a lacking of such research even in the modern clinical acupuncture.

Take inserting two needles at two points in succession as an example, in our opinion, there are at least the following several circumstances.

(1) Once the first needle produces partial effects, the second needle produces similar effects, which can together enhance the overall results, i.e., both needles generates a synergized effect. For instance, it is known that the direction of regulatory effects is closely related to the pre-treatment functional state. For some visceral dysfunctions, if the first needle only achieves partial regulatory effects, the second needle will further enhance the regulatory effects until the normal functions are restored. Clinically, applications of bilateral acupoints on the same meridians corresponded to the dysfunctional viscera perhaps have synergistic effects. Likewise, acupoints within the same reflex zones but on different meridians may also have similar effects. It was reported in an experimental hypertension study that puncturing Shenmen (HT7) could markedly reduce blood pressure, which could be further enhanced by subsequent puncturing of Dadun (LR1), but not by puncturing of some KI acupoints. Although Shenmen (HT7) and Dadun (LR1) both reside within central reflex zones, they pertain to HT and LR, respectively. This circumstance often occurs during acupuncture analgesia.

(2) The first needle is already generating full effects while the second needling is completely ineffective, which neither strengthens nor weakens the effect of the first needle. When applying acupuncture to regulate body functions or for analgesia, if the first needle has taken full effects, the second needling may be an ineffective stimulation.

(3) The first needle is already generating full effects, but the second needle weakened the effects

of the first needle. This indicates that the second needle has antagonistic effects on the first needle.

(4) The first needling is ineffective while the second needle is generating effects.

(5) Although the first needle did not generate direct effects, but it could facilitate the effects of the second needle, namely the second needle may not generate any effects or substantial effects unless the effects of the first needle are present. In this case, the first needle is an inductive stimulation for the effects of the second needle.

(6) Although the first needle did not generate direct effects, it could inhibit the occurrence of the effects of the second needle, namely the second needle may generate normal or even stronger effects without the effects of the first needle. In this case, the first needling is an inhibitory stimulation of the effects of second needle.

There have been laboratory and clinical evidences for the last two circumstances. In a study by Wang *et al.* of China^[146], action potentials (AP) of the deep peroneal nerve trunk could be induced by stimulation at the superficial peroneal nerve. The incidence of this AP could be raised or inhibited by a preceding stimulation on the deep peroneal nerve or on the sympathetic nerve, respectively. These similar circumstances often occur in the clinic. For example, the first needle activated a somatic nerve while the second needle activated another somatic nerve related to the first needle. If the first needle altered the functional state of the ANS, then the effects of the second needle that stimulated a somatic nerve might be inhibited or strengthened. As we experienced, in some paralytic patients with regional sensory defects, if it is difficult to generate needling sensations at some points of their lower limbs, first puncture other acupoints of the lower back or buttock, then those same points of their lower limbs will become more sensitive when punctured. This

might be resulted from the inductive effects of the first needle.

Clinically, when considering the proper order of stimulation, it is necessary to pay attention to both the efficacies of each point and the intensity or type of each successive stimulation, as well as to both long-term outcome and instant effects or needling sensations. The following are a few common considerations.

(1) Stimulate the affected region first, then adjacent regions, and finally the distal regions. The experience recorded in the previously mentioned *A Star's Secret* pertains to this consideration. For example, the general order of stimulation for the stomachache is Zhongwan (CV12), Neiguan (PC6), and Zusanli (ST36). For pediatric nocturia, first puncture Zhongzhu (KI15), then Sanyinjiao (SP6). One of the benefits from this stimulation order is to be able to avoid residual needling sensations in the affected region, which could be confused with the original upset feeling. This is especially important for somatic diseases. For example, when treating soft tissue injuries, stimulate *Ashi* points first, then adjacent or distal regions. This often can immediately result in analgesic effects.

Prof. Zheng, Kuaishan in a 1974 letter to us spoken his experience of applying the method of **connecting qi through the meridian** in treating apoplexy (refer to Section 12.9). For the paralyzed upper limb, he first selected Dazhui (GV14), Fengmen (BL12), and bilateral Fengchi (GB20), then Jianyu (LI15), Quchi (LI11), Shousanli (LI10), Waiguan (TE5) and Hegu (LI4). Though not all acupoints were needed, a group of points was selected sequentially, from top to bottom. Prof. Zheng punctured wherever needling sensations might have been propagated previously, until the sensations reached the fingertips. This needling order is obviously beneficial for the propagation of needling sensations to distal portions of

the body.

(2) Stimulate distal regions first, then local or adjacent regions. Like (1), it pertains to the method of *connecting qi through the meridian*. It is often used for visceral diseases by promoting AQDR (**arrival of qi at the diseased region**).

(3) Stimulate the affected side of the body first, then the healthy side. This is mainly used for somatic diseases like (1).

(4) Stimulate the healthy side of the body first, then the affected side. It is applicable when the pain of the affected region is severe, which results in the hypersensitivity of the skin. Meanwhile, first stimulate the health side or distant points until the ease of local pain on the affected side, and then stimulate local tender spots on the affected side.

When treating visceral diseases, the affected side or healthy side is assumed according to the location of the viscera inside the body. If there is only one organ (e.g., the stomach), then it is difficult to distinguish them, but it is advised to have a stimulation order that first stimulate bilateral acupoints of the same name. Do not finish stimulation on all points of one side before starting stimulation on another side. It is reasonable to consider that the effects of bilateral acupoints of the same name are synergistic.

(5) Apply a weak stimulation first, then strong stimulation. There is a clinical perspective that suggests the weak stimulation can attain an excitation effect of the body function, otherwise known as **tonification method**, while the strong stimulation can attain an inhibition, or called **purgation method**. If this perspective was found to be true, these two methods should not be applied simultaneously, otherwise their effects might simply be offset. However, for the sake of point association, there will be times when both weak and strong stimuli are needed. Meanwhile, first apply weak

stimulation, and then apply strong stimulation.

To sum up, under the condition of selecting multiple points at a single session of treatment, the influence of stimulation order on the acupuncture effects might occur. Moreover, when multiple needles are retained, another consideration should be made to the order of *jiaozheng* (namely the strengthened stimulation), which may further complicate the interactions of multiple needles.

Presently, due to the unclear interactions among multiple acupoints, for point selection, **less is more**, namely use as few points as possible for each session. In a classical TCM book of *Primer to Medicine*, it was stated: “Only one prioritized needling required for each type of a hundred diseases, no more than four needling per disease and never allow needling on the whole body.” In order to observe and compare effects of each point or needling, we once applied an innovative method of **successive single needling**, namely only a selected point was stimulated with a single needle successively until certain obvious effects were attained instantly. The subsequent needling was not required unless the effects of preceding needling were insignificant. This method is particularly suitable for patients whose symptoms such as acute pain can be improved instantly with acupuncture. For many chronic diseases, however, it is difficult to judge whether a needle has taken effects so that the application of this method is limited.

10.9 The Area of Stimulation

As we proposed, an acupoint is a zone, not a single spot. In acupuncture therapy, another unclear issue is whether there is a certain area of stimulation for

each acupoint or reflex point. Is there any impact of the stimulation area on therapeutic effectiveness? This issue holds the same importance as the order of stimulation in clinical acupuncture.

For general perpendicular needling, the stimulation area cannot exceed the acupoint area because the filiform needle is thin after all; even the thickest needle is no larger than the standard hypodermal needle. Nevertheless, comparing with a thin needle, a thick needle still has obvious differences in the areas of stimulation, which may result in greater differences for both needling sensations and stimulation effects. This fact raises a new question about the proper selection of the needle size (refer to Section 10.10). Generally, the greater the stimulation area, the more acupuncture information is inputted. In order to expand the total area of needling stimulation, another method is applying **multiple needles at a single point (MNSP)**, besides using thick needles. MNSP is particularly beneficial for stimulation on acupoints or reflex points with a greater area or scope (refer to Section 11.2).

However, for oblique needling, the stimulation area is enlarged along with the increase of the stimulation depth. Both of them help to induce the stimulation volume to be augmented. When applying superficial needling, especially horizontal point-piercing, the distance from any part of the embedded needle body to the skin surface is unvaried. Namely, no matter how far the needle is inserted, the depth of needling remains constant, with only the stimulation area enlarged. This is true for many cases using **point-piercing method** such as piercing Jiache (ST6) into Dicang (ST4), Dicang (ST4) into Yingxiang (LI20) or Sibai (ST2) to treat facial paralysis, as well as piercing Touwei (ST8) into Shuaigu (GB8) to treat migraines (refer to Section 11.3).

As for moxibustion or other thermal therapies, the

area of stimulation probably has more profound impacts on the stimulation effects. The stimulation area of moxibustion is usually equivalent to or slightly greater than the area of an acupoint. A persistent warmth or hot sensation caused by burning moxa may be frequently propagated to deep portions of the body or the diseased region that is similar to AQDR (arrival of *qi* at the diseased region) when applying needling. In many modern acupuncture clinics, infrared radiation, as one type of thermal therapies, have been routinely applied even instead of moxibustion because of its convenience and good results when combined with acupuncture. However, there are certain differences between infrared radiation and moxibustion. First, the range covered by infrared radiation is wider than moxibustion. The radiation of infrared rays not only may overlay multiple acupoints or several nearby sections of the meridian courses, but also may have certain local warmth without AQDR phenomenon. This might be due to its broad stimulation area. Even if infrared effects of improving local blood circulation or alleviating local inflammations are still present, the body often cannot tolerate the intense infrared stimulation at a broad area, even in a short period. In contrast, the body usually can tolerate a longer period of intense moxibustion stimulation applied at a limited area. Accordingly, the reflective effects of infrared radiation on functions of viscera and the whole body may be less than that of moxibustion.

Nowadays, a newly invented electrical moxibustion device also has a limited area of stimulation. It includes a pad made of argyi wool. When hooked to the electricity, the incense of moxa is released from the pad. The device is simply to use but its maximum temperature is far less than that of the regular moxibustion.

Transcutaneous electrical nerve stimulation (TENS) is currently prevailing because it is safe,

simple to use, and requires no needling. In this type of electrical stimulation, whether it is applied on the surface of acupoints or not, the size of the surface electrode determines the area of stimulation. Similar to thermal stimulation of moxibustion, it will not be possible to apply a more intense stimulation unless the surface electrode is small. Otherwise, the total stimulation amount will be too high for the tolerance of the patient.

In addition, varied combinations of stimulation or needling sensations can be generated when applying various needle-manipulation techniques. In fact, they are results from the activation of varied sensory receptors distributed at different areas and depths of the point stimulated (refer to Sections 8.4).

Thus, when stimulating any acupoint or reflex point, always keep in mind that it is a zone, rather than a spot. Clinically, activating this zone and its deep tissues is an important strategy to increase the acupuncture information input.

10.10 The Size of Needles

There are various sizes (diameters) of filiform needles available. Thin needles are 0.20 mm (No. 34) or 0.25 mm (No. 32), and thick needles are 0.35 mm (No. 28) or 0.40 mm (No. 26). The medium sized needles are 0.30 mm (No. 30). There are also three sizes (large, medium, small) of auricular embedded needles. When selecting the size of the needle, attention needs to be paid at two areas of consideration: distinguishable stimulation areas that may lead to different stimulation amount, and the impact on needle-manipulation techniques.

The diameter of the needle is closely related to the area and stimulation intensity. It is known that a thin

needle has less painful needle-insertion, and may cause milder needling sensations, or a weaker stimulation. On the contrary, a thick needle may cause intense needling sensations or stimulation, but may accompany some needle-insertion pain. These differences are obviously due to distinguishable areas of stimulation. The greater the area of stimulation, the more intense the stimulation is. Obviously, a thinner needle may only activate less sensory receptors distributed within a smaller area and deep portions around the needle body, but a thicker needle may activate more sensory receptors distributed within a larger area. Meanwhile, a thicker needle can also strike the sensitive center of the point more easily, namely it does not require a strict and precise point location.

Accordingly, thicker needles often lead to better therapeutic effectiveness. When needling sensations are not ideal or that the expected effects of acupuncture are not present, switching to thicker needles may be a wise choice. This is particularly applicable to patients with hyposensitivity or those who have a robust constitution and are not afraid of the needles. Not only thicker needles of No. 28 or No. 26 sizes can be selected, even one of the thickest needles around called *Chiyi* needles, prevalent in 1960s' China, might be employed.

However, if the needle was overly thick, then some needle-insertion pain is inevitable, which might lead to the patients' rejections of treatment or decreased incidence of *deqi* caused by the activation of muscle spindles within acupoints. For patients with hypersensitivity of the body or those who have a weak constitution and are afraid of the needles, thinner needles are more easily accepted. Besides, as thicker needles may cause a certain degree of tissue pulling at the stimulated region, they are not typically recommended for exploration of sensitive centers or for stimulation with the method of *repeatedly*

needle-thrusting within acupoints.

On the other hand, the needle cannot be overly thin, otherwise the normal needle-manipulation techniques and their effects might be affected. For instance, when twisting a thin needle, it is more difficult to form a dragging force to twist together the nearby surrounding tissues of the needle. When applying needle lifting-thrusting method, it is also difficult to drag tissues surrounding the needle up and down, even with a heightened lifting-thrusting frequency. Accordingly, the effects generally possessed by these needle-manipulation techniques are hardly attained. Besides, for a filiform needle, its length and size should also be considered synthetically. When a longer filiform needle (e.g., over 3 inches) is applied, its size should be thicker (e.g., greater than No. 30), otherwise it is difficult to manipulate the needle due to its infirmness. In Japan, moxibustion therapy is more popular than acupuncture, and may be because most filiform needles employed in Japan are overly thin; oftentimes the diameter of the needle is only the half of a No. 30 needle. This makes them difficult to be manipulated by practitioners smoothly ^[189].

From the perspective of the coupling relation between the practitioner and the patient, the needles have dual functions. They are either the intervening tool that inputs acupuncture information into the body, or the medium that receives local responses (e.g., TDSAN) from the stimulated region of the body. If the applied needle is overly thin, not only its stimulation amount is mild, but also it cannot accurately complete the conductive tasks for perceptible responses around the needle.

Therefore, most of the times, to minimize or eliminate any needle-insertion pain, we prefer to use No. 32 or No. 30 filiform needles, especially when combining with **Jin's painless needle-shooting method**. Moreover, these sizes of needles have

appropriate hardness so that they not only can conduct the practitioner's finger strength deeply into the points, but also can help the practitioner to better sense the dragging feeling of *deqi as if the fish is swallowing the bait*.

10.11 The Angle, Depth and Direction of Needling

In acupuncture therapy, selecting accurate point locations, proper degrees of angles, and depths of insertion are three key items in promoting the generation and propagation of needling sensations. In Sections 8.1, point selection has been discussed. Here we will focus on the angle and depth of insertion. Actually, for most acupoints, the angles and depths of their needling have been advised in textbooks of classical acupuncture. However, these suggestions are often generalized or incomplete. For instance, there are multiple choices of the needling angle for each acupoint, and the suggested depth of insertion often has a certain range. Besides, the depth of insertion allowed varies with different height or weight of the body individually. All these reasons can result in the randomness in clinical needle-manipulation techniques and in the difficulty of reproducing previous effects.

In many clinical reports, when needling methods are mentioned, there are often two pairs of confusing concepts. One is the angle of insertion and the needling direction. The other is the depth of insertion and the length of needle body inserted into the point. They must be clarified as below.

The **angle of insertion** refers to an angle formed by the needle and the skin surface as the needle is inserted. According to the angle, it can be categorized

as **perpendicular, oblique, and horizontal (or transverse) needling**. The **needling direction** refers to any direction of the needle-thrusting after the needle has been inserted, namely the direction pointed by the needle tip within a point. The commonly used needling directions are proximal, inferior and towards the diseased region or other particular portions of the body. In the point-piercing method, the needling direction is set towards a particular location of point to be pierced (refer to Section 11.2), and the initial angle of needling is the pre-set needling direction. After a needle has entered, oftentimes it is continuously depressed more deeply at the same angle or direction along with other manipulations (e.g., twisting, scrapping). Of course, the needling direction can be adjusted during the manipulation as needed. During adjustment, slightly withdraw part of the needle body but leave the needle tip beneath the skin, change the direction pointed by the needle tip and thrust the needle toward a new direction.

When applying the needle-thrusting technique, the direction pointed by the needle tip within a point is often consistent with the direction of stimulation force. When puncturing distal points, the needle tip pointed to the diseased region may promote the propagation of needling sensations toward the diseased region. These phenomena indicate that the needling direction is one of important factors to determine the direction of stimulation force during manipulation, but it is not completely equivalent to the direction of stimulation force that has broader meanings (refer to Section 12.9).

The angle of insertion is closely related to the depth of insertion. For example, only perpendicular needling or oblique needling at a small dip angle can reach a certain depth within a point and achieve a deep stimulation. Transverse needling along the skin or oblique puncturing at a large dip angle only

can achieve a superficial stimulation. On the other hand, the depth of insertion within a single point should be adjusted based on the needling direction. Various depth of insertion are often required or allowed at different needling directions.

Nevertheless, according to the definition of depth of insertion, it refers to the perpendicular distance from the location reached by the needle tip to the needle-insertion spot on the skin. It is not equivalent to the length of the needle body embedded inside the point unless perpendicular needling is applied. For example, when applying the oblique needling, even though the needle body has entered the point completely, the depth of insertion is still less than the entire length of the needle, where the needle length and the depth of insertion are corresponded to the hypotenuse and an orthogonal of a right triangle, respectively. In other words, with a needle of certain length, the greater oblique the angle, the less depth it can reach. When applying transverse needling, the distance from all portions of the needle body embedded into the point to the body surface, namely the depth of insertion, is almost consistent in spite of the length of the needle being inserted. Of course, the stimulated area may increase along with the needle-insertion process (refer to Section 10.9).

Based on modern anatomical knowledge about acupoints and fine needles made by stainless steel, restrictions on depth of insertion of many acupoints mentioned in classical textbooks have been removed. Take Fengchi (GB20) as an example, its depth of insertion suggested by most classical TCM textbooks was only 0.3~0.4 *cun*. However, when inserting a needle pointed at the inferior border of contralateral zygomatic bone (avoid pointing upward), its depth of insertion could reach 1~1.5 *cun*. In this way, needling sensations generated could spread to the forehead from the hind head. Numerous clinical

trials have demonstrated that deep needle-insertion can generate intense needling sensations or show particular therapeutic effectiveness that could not be achieved by superficial needling. Deep needle-insertion of Yamen (GV15) in treating deaf-mute is such an example. These effects of the deep needle-insertion may be induced from simultaneous activation of more sensory receptors located at different layers of the point, which may result in a greater amount of stimulation inputted. Moreover, it is impossible to reach the reflex layer located in the deep portion of the point unless a deep needle-insertion is applied. In 1960s' China, there was a prevalent novel needling method that featured deep needle-insertion, strong stimulation, and without needle-retaining. Although many patients could not tolerate this brutal method, it still created historical miracles due to its positive results for certain intractable disorders.

However, it is not required to apply deep needle-insertion for every point or every case. As stated in a classical acupuncture book of *Suwen*, "Disease may be either exterior or interior, and needling may be either superficial or deep accordingly." From the perspective of acu-reflexology, various reflex points, or sensitive spots on the body surface have distinct layered features corresponding to different somatic or visceral diseases (refer to Section 3.9). Some of their sensitive centers are located at deep portions on the points, while some are very superficial, so the depth of insertion must be chosen properly according to the depth of sensitive centers. At a reflex point or acupoint, when its sensitive centers or reflex layers reside in the superficial tissues, the effects of deep needle-insertion will be not as obvious as with superficial needling. Even at the same point, the sensitive centers may appear at different depths according to different diseases. Take Yifeng (TE17) as an example, when it is used to treat chest pain or

for anesthesia of thoracic surgeries, the needle should point downward with a depth of 1~1.5 *cun*. However, when it is used to treat tinnitus, hearing loss or other ear disorders, superficial needling within local reflex points (e.g., the subcutaneous hard nodule) is required. Therefore, even at a point that can be deeply punctured, the selection of depth of insertion should be based on the location of the reflex layers or sensitive centers within the point, which may vary with individual cases and diseases.

Generally, the depth of the reflex layers or sensitive centers within a point can be determined by carefully touching the point (refer to Section 7.2). Of course, it may need to consider the type or property of the disease being treated as well as the location of sensory receptors being stimulated. For example, local reflex points for diseases at superficial tissues of the body such as the skin and muscles are usually superficial, thus superficial needling is suitable for their stimulation. Whereas local reflex points for diseases at deeper tissues such as the nerve or joints may be deep, thus deep needle-insertion can be applied. Furthermore, the nerve stimulation technique targeted at nerve trunks or branches may mostly require the deep needle-insertion.

To raise therapeutic effectiveness, it is often required to have a proper depth of insertion and a suitable needling direction simultaneously. Clinically, the commonly used **point-piercing method** is such an example, namely the needle first pierces through an acupoint through the skin, and into another acupoint. This may result in the effects of **two acupoints with one needle** or even **multiple acupoints with one needle**. The point-piercing destination determines the direction and depth of needling. Most acupoints that can be used for dysfunction of muscles or joints are around the joints. They are often stimulated by deep needle-insertion, such as piercing Quchi (LI11) into Shaohai (HT3),

Hegu (LI4) into Houxi (SI3), and Yanglingquan (GB34) into Yinlingquan (SP9) (refer to Section 11.2). When these reflex points (layers) at different depths or portions of the body are selected for concurrent stimulation, a method of association of piercing points is developed for this purpose (refer to Section 11.7).

In short, to raise the reproducibility of acupuncture effectiveness, we have analyzed the coupling relation between the practitioner and the

black box of the patient, the related information processes, and controls, as well as random factors that may influence therapeutic effectiveness. Actually, these contexts are of principal in the technical theories of clinical acupuncture, and most practitioners have encountered such challenges in their practice. However, due to the lack of strict scientific verifications, their experiences have not yet transformed into evidences.

Strategies to Raise Therapeutic Effectiveness

Clinically, there are many intractable patients do not respond well to the standard acupuncture treatments though their diseases still pertain to indications of acupuncture. Under this circumstance, the practitioner should timely revise the present treatment plan and adopt specific strategies to raise therapeutic effectiveness. These strategies may include increasing the stimulation amount, choosing and combining multiple stimulation pathways, and altering preexisting functional states of the patient, as well as applying advanced needling techniques (refer to Chapter 12).

Increasing the amount of acupuncture information inputted is of foremost importance in enhancing the effectiveness of acupuncture. As mentioned in Section 8.3, the total amount of stimulation depends on the intensity and duration of stimulation. Namely, increasing stimulation intensity or prolonging stimulation duration can generally increase the stimulation amount. However, typically, the body is unable to tolerate a single excessive stimulation, either needling or moxibustion. Any overly intense needling sensations might transform into pain, so that the stimulation becomes ineffective. Accordingly, the stimulation intensity cannot be increased infinitely. Likewise, prolonging the needling duration infinitely may have little role in raising the stimulation amount

because most needling effects reach the maximal state after 20~40 min of initial stimulation (refer to Section 4.3). Therefore, the practitioner often has to consider other synthetic ways to increase the stimulation amount, such as the selection of tender spots, application of **multiple needles at a single point (MNSP)** or **single needle through multiple points (SNMP)**, combination with electrical stimulation (EA) or heat-penetration moxibustion, and other stimulation methods of long duration.

11.1 Selection of Tender Spots

In the ancient TCM book *Yellow Emperor's Internal Classic's Taishu*, it was stated: "The key to treat arthromyodynia is by **selecting the tender spot as acupoint**". The term **arthromyodynia** in ancient China refers to modern rheumatic arthritis, rheumatic myositis, rheumatoid arthritis, neuritis, neuralgia, and so on. Because most of them have somatic pain, directly puncturing the pain location or tender spot (a type of reflex point with more remarkable tenderness) at its local or adjacent region often can immediately alleviate the pain or other symptoms. In addition, these stimulation locations

are not limited to classical acupoints. This principle is suitable not only for arthromyodynia, but also for most indications of acupuncture that show tenderness on the body surface.

The concept of *Ashi* points in TCM is a primitive recognition and an alternative name for the tender spot. The naming of *Ashi* is derived from the phonics of Chinese when a tender spot is pressured or stimulated suddenly. This is similar to the sounds of “Ouch” or “Yuck” in English phonics when sudden pain is felt upon pressing the tender spot. Thus, in the West, *Ashi* point can also be referred to as “Ouch” or “Yuck” point.

Sometimes, for patients of hypofunctions or arthromyodynia patients with only symptoms of somatic soreness, heaviness, and numbness but without marked pain, it is hard to detect reflex points with tenderness. Instead, their reflex points merely show soreness, distension, numbness, or dysesthesia of the skin upon pressing, and the property of the reflex points usually correspond to the property of symptoms. Selecting these reflect points as stimulation locations is also called **selecting the soreness spot as acupoint, selecting the distension spot as acupoint, or selecting the numbness spot as acupoint**, which possesses the same clinical significance as **selecting the tender spot as acupoint**. Generally, however, the reaction of tenderness is frequently observed, so selecting the tender spot as acupoint has most extensive applications and serves as the representative of these methods.

According to the theory of acu-reflexology, reflex points within the corresponding reflex zone have a shortcut to the diseased region, i.e., their connection pathway is particular smooth. AQDR (arrival of *qi* at diseased region) is much easier attained by stimulating them compared to stimulation on non-reflex points, so that it can effectively relieve pain and related symptoms in the diseases region. Due

to the large individual difference of sensitivities, different patients may have varying levels of importance in applying reflex points. For sensitive or moderate sensitive patients, stimulation of common acupoints at a certain level of intensity might be sufficient to take effects. Whereas in hyposensitive or insensitive patients, commonly used acupoints are often not sensitive enough to achieve the desired effects, thus it is advised to locate reflex points carefully prior to the treatment.

The examination can be conducted throughout the entire body surface especially within corresponding reflex zones. Mark each detected reflex point, and then compare their differences in the intensity of reactions such as tenderness. Finally, select several most sensitive points as stimulation locations. To save the time of searching reflex points, the practitioner may ask the patient or their relatives to perform self-examinations and mark all tender spots in advance. When the patient comes for the treatment, the practitioner then can check these marked spots to verify the point-selection. For pain of soft tissues due to sports injuries, the locations where the tender spots or spontaneous pain occur may shift with changes of the body posture, so it is advised to locate and stimulate these tender spots under a particular body posture (refer to Section 12.7).

Numerous practices of acupuncture anesthesia have demonstrated that a better analgesia effect could be achieved by stimulation at points of hypersensitivity than those of hyposensitivity, even at the same stimulation intensity. Moreover, acupuncture anesthesia could succeed through stimulation at reflex points or sensitive spots, even without any needle-retaining period. This is because of the hypersensitivity of reflex points, which can evoke intense needling sensations, even upon a slight stimulation. In other words, stronger needling

information can be inputted when the same intensity of manipulation technique or parameters of electrical stimulation are applied at reflex points. Meanwhile, not only does the patient feel less uncomfortable and can tolerate the stimulation more easily, the needling sensations may also sustain longer.

In short, selecting tender spots with hypersensitivity as the stimulation locations can achieve the goal of raising stimulation amount without any specific needle-manipulation techniques.

11.2 Multiple Needles at a Single Point

Another strategy to raise the stimulation amount is the augmentation of stimulation area. For needling therapy, select thicker filiform needles is an effective method (refer to Section 10.10), but one of its shortcomings is the pain from needle-insertion and subsequent needle-manipulation techniques, thus it is more difficult to be accepted by patients. Alternately, the application of thinner filiform needles with the method of **multiple needles at a single point (MNSP)** can attain the same purpose to increase the total area of stimulation.

The method of MNSP, refers to several needles inserted into a single point, which was originated from *Ling Shu of Yellow Emperor's Internal Classic*, a classical TCM book. There were also several similar

needling styles presented in the book such as *Bangci*, *Qici* and *Yangci*. In the modern age, another needling style called *Weici* (**encircling needling method** or **ENM**) is developed from the basis of *Yangci* [90]. We have grouped all of these similar needling techniques into a unified name, i.e., MNSP, in which each acupoint or reflex point is thought to have a certain area, and the center of the point is most likely a reflex structure of a certain volume.

When MNSP is applied clinically, usually 5~7 needles are inserted at a single acupoint or reflex point. The alignment of needles can either be linear (Figure 11.1a), or in circles (Figure 11.1b, c, d). For the former, several needles are placed in parallel with each other in a line or several lines. For the latter, only a single needle is inserted into the center and the rest are placed around the center in a circle (ENM).

The directions pointed by the needle tips are mostly perpendicular to the skin when needling in line, but they also can be either perpendicular or aimed at the center of point when using ENM. Regardless of which needling method, the depth of every insertion can be same or different. The latter is especially suitable when reflex points of disease appear at different depths of layers of tissues.

When using ENM, there are two different needling methods. First, needles can be inserted from all sides around the point with needle tips aimed at the center of the point, resulting in a converging style of needle placement. Its main stimulation strikes the portion above the intersection of needle tips inside the point

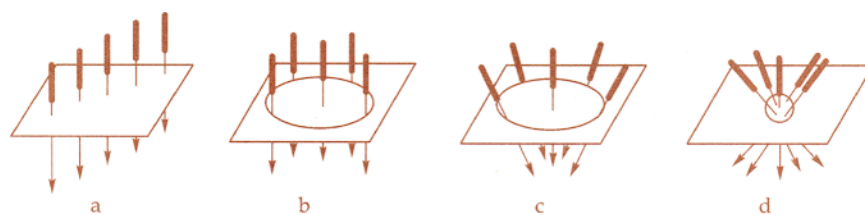


Figure 11.1 Multiple Needles at a Single Point

(Figure 11.1c) and is suitable for stimulation of a larger scope. Second, several needles are inserted from a small scope of the center of the point with needle tips aimed outward toward the surroundings, resulting in a radiating style of needle placement. Its main stimulation strikes the portion below the intersection of needle tips inside the point (Figure 11.1d) and is suitable for stimulation of a smaller scope. These two styles of ENM can stimulate various layers of tissues inside the acupoint or reflex point including its entire reflective center from different angles. Thus, one can choose a desired ENM style that best suits the individual situation with regard to actual areas, depths, and locations of stimulated acupoints or reflex points.

Clinically, MNSP is often used to treat diseases that have a regional lump, such as ganglia, goiters, or swollen lymph nodes. We experienced that MNSP is also applicable for those acupoints or reflex points with a broader range, especially for regional reflex points (e.g., tender spots) with a certain volume (e.g., subcutaneous hard nodules). It has been demonstrated that there is a direct correlation between the recovery of disease and the reduction of positive reactions in reflex points. When MNSP is applied, those positive reactions such as hard nodules or tenderness can be reduced quicker while the therapeutic effectiveness is raised. When necessary, it can also be combined with an electrical or thermal stimulation (moxibustion or infrared radiation), which could help take effects more easily.

It has been observed that MNSP is especially needed for tall or large patients. Because these patients usually have a broader surface area of acupoints, the method of one needle per point is not sufficient to stimulate all sensitive centers of the point. Besides, regional swelling often can enlarge the volume of regional points, such as the bulged and swollen Xiyan (EX146) when suffering from

knee arthritis. Meanwhile, if several needles were inserted at a single point, better therapeutic effectiveness could be attained. Our experiential points with MNSP include Yifeng (TE17), Taiyang (EX4), Shaohai (HT3), and tender spots at the lateral epicondyle (refer to Section 13.10).

On the other hand, sometimes, the area of many acupoints or reflex points is limited. Stronger needling sensations or effects cannot be generated unless a tiny center of the point was stimulated, as evident in most auricular reflex points. Due to the tiny center, a slight difference of point locations or stimulation may lead to a large discrepancy of effects. It is often observed that when puncturing the same selected sensitive point, the needling sensations may vary greatly even with a slight shifting of the needle tip in the point. Under these situations, applying MNSP can increase the probability of striking the center of the point. Authors of the TCM book *Auricular Acupuncture* appears to have had similar experience: "It has been demonstrated that choosing thicker needles, such as size No. 28 has better effect than that of size No. 30. Sometimes when we applied multiple needles at a single auricular point, the effects are even more remarkable" [95].

When acupoints or reflex points with similar functions are grouped into regions or zones, MNSP transforms into **multiple needles at a single zone (MNSZ)**. Some of our experiential zones are suprascapular area including Jianjing (GB21), Tianliao (TE15), Bingfeng (SI12), Quyuan (SI13), Jianwaishu (SI14), Jianzhongshu (SI15), that could be used for cervical spondylopathy or chronic myofascial cervical syndromes (refer to Section 13.3); the inverse triangle area of lumbar sacral region at Dachangshu (BL25), Guanyuanshu (BL26), Ciliao (BL32), Shiqizhuixia (EX111), Yaoyangguan (GV3) (refer to Sections 13.4, 22.4); the inner region of the knee including points such as Ququan (LR8),

Shangyinling (EX155) used for prostate disorders (refer to Section 21.5); the inner region of the heels including points like Shuiquan (KI5), Rangu (KI2), 1 *cun* below KI5 used for Achilles tendonitis or heel pains with or without spurs (refer to Section 13.9).

In short, either MNSP or MNSZ can be useful in raising therapeutic effectiveness in clinical acupuncture. Not only they can reach a larger total area of stimulation, but also they can simultaneously activate almost all of reflex layers or spots at various depths of a single point or zone to attain an optimal amount of stimulation. Moreover, their advantages lie in the replacement of thick needles with thin needles that may reduce pain of needle-insertion or needle-manipulation, and the simplification of probing process for needling sensations within a point. Besides, stimulation of plum-blossom needles or seven-star needles is actually one of alternative MNSZ methods. However, plum-blossom needles or seven-star needles may only stimulate the surface layers of points or zones, namely activate sensory receptors at the skin, while MNSP or MNSZ with filiform needles can reach and stimulate any depth of tissue layers inside the point, and have more extensive clinical applications.

11.3 Single Needle through Multiple Points

Single needle through multiple points (SNMP) refers to the method of using only one filiform needle to stimulate two or more acupoints or reflex points concurrently. It is also known as the **point-piercing method**. One of its advantages is to reduce the number of needles so that there is less pain of needle-insertion. Moreover, when a needle pierces through

points, more sensory receptors at different layers of tissues may be stimulated. In other words, it can activate multiple pathways to input a greater amount of acupuncture information into the body, and may achieve better therapeutic results.

When piercing one point through another point, if these two points are located across from each other, the direction of needling should be perpendicular with the insertion spot on the skin, such as piercing Neiguan (PC6) into Waiguan (TE5), and Sanyinjiao (SP6) into Xuanzhong (GB39) (Figure 11.2a). However, most of time, oblique needling is used. After the needle pierced through a point, deeply depress the needle into the opposing point (Figure 11.2b, c). For example, piercing Yanglingquan (GB34) into Zusanli (ST36) obliquely is an experiential point-piercing technique of Master Jiao, commonly used for constipation. When applied, needling sensations would propagate downward through GB and ST located at the dorsum of the foot or toes.

After a needle entered the point through different angles, different sensory receptors might be stimulated. This might produce a great difference of both needling sensations and therapeutic effectiveness. To raise the reproducibility of acupuncture effects, it is relevant to provide clear descriptions on the direction or angle of each needling. The formula of point-piercing method is such an example; namely, it has implied the information about needling directions or angles. When piercing Hegu (LI4) into Laogong (PC8), after the needle pierces the skin at Hegu (LI4), the needle tip is inserted until Laogong (PC8) at the center of the palm is reached. Meanwhile, the needle body is leaning against the side of index finger, so the index finger may be twitched along with needling sensations generated. Contrarily, when piercing Hegu (LI4) into Yuji (LU10), the needle body is leaning against the side of the thumb, so that the thumb may be twitched along

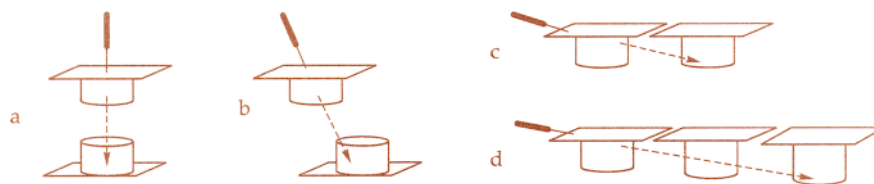


Figure 11.2 Single Needle through Multiple Points

with needling sensations generated. It is evident that the reactions around the needle and therapeutic effectiveness of these two formulas are completely different. The former is often used to treat paralysis of the fingers while the latter is often used to treat policies tendinous sheaths in fingers.

A famous Chinese acupuncture practitioner Dr. Wang, L.T. once systematized point-piercing method and proposed a series of effective formulas, including the following 12 sets formed in the 1960s^[90].

- (1) Piercing Jianyu (LI15) into Binao (LI14).
- (2) Piercing axillary fold into scapula fold.
- (3) Piercing Quchi (LI11) into Shaohai (HT3).
- (4) Piercing Waiguan (TE5) into Neiguan (PC6).
- (5) Piercing Hegu (LI4) into Laogong (PC8).
- (6) Piercing Yangchi (TE4) into Daling (PC7).
- (7) Piercing Huantiao (GB30) into Fengshi (GB31).
- (8) Piercing Xiyangguan (GB33) into Ququan (LR8).
- (9) Piercing Yanglingquan (GB34) into Yinlingquan (SP9).
- (10) Piercing Xuanzhong (GB39) into Sanyinjiao (SP6).
- (11) Piercing Qiuxu (GB40) into Shenmai (BL62).
- (12) Piercing Taichong (LR3) into Yongquan (KI1).

Their main functions are to lubricate joints and alleviate stiffness of shoulders, elbows, wrists, hips, knees, and ankles, especially suitable for various types of rigid paralysis (i.e., hemiplegia or other sequelae from apoplexy, encephalitis, or cerebral trauma) over half year. It is also suitable for patients of intractable arthromyodynia with stiff joints.

Among these formulas, sets 1, 3, 5, 7, 9, 11 are master points while the remaining sets are association points.

The point-piercing method is often applied via deep needle-insertion (Figure 11.2a, b). The stimulation amount of deep needle-insertion is greater than general needling methods, thus it generates better therapeutic effectiveness, or a good outcome in acupuncture anesthesia. For example, piercing Diji (SP8) into Zusanli (ST36) for gastrectomy has good results. However, because of the greater stimulation amount, overly intense needle-manipulation should be avoided during the point-piercing, especially for patients of a weak constitution or those diagnosed with deficient syndromes. Attain *deqi* in the initial point is first attained, pierce the desired point without further needle-manipulation techniques. For patients of strong constitution, directly pierce the desired point through the initial point, and then manipulate the needle to attain *deqi*, and apply tonification or purgation manipulations accordingly^[90].

The point-piercing method also can be applied via superficial needling (Figure 11.2c), such as piercing Shuigou (GV26) into Dicang (ST4), Sibai (ST2) into Yingxiang (LI20), and Zanzhu (BL2) into Sizhukong (TE23) for facial paralysis (refer to Section 14.6). Although sensations of superficial needling are not as strong as that of deep needle-insertion, its stimulation amount can still be raised by increasing the area of stimulation. Deep needle-insertion for point-piercing is only able to stimulate two opposing

points, one per each side of the limb, while superficial or horizontal needling may stimulate more than two acupoints at the same side of the body simultaneously (Figure 11.2d).

SNMP realized through superficial point-piercing may explain distinct effects of the wrist-ankle acupuncture where horizontal needling is applied via a weak stimulation without requiring *deqi*. If the concept of acupoints were substituted by reflex zones, then SNMP becomes **single needle through multiple zones (SNMZ)**, which can be categorized into three types.

First, the point-piercing is applied through adjacent reflex zones. This is particularly suitable for micro reflex zones such as ear and nose reflex zones. Because most micro reflex zones are located in close proximity with each other, a slight deviation of the needling direction could reach the adjacent zones (Figure 11.3a).

Second, the point-piercing is applied through overlapped reflex zones, which may consist of central, somatic, and visceral reflex zones, or other same or different reflex zones (Figure 11.3b). This may explain why many important acupoints are located at the overlapped area of several reflex zones, and have better results.

Third, the **point-piercing method (PPM)** is applied through opposed reflex zones, one per each side of the limb (Figure 11.3c). This is the most

commonly used SNMZ method. For example, when deeply needling is applied at areas below the elbow and knee, the needle can easily pierce through either the *yin* or the *yang* side into the opposite side. Not only it could activate different somatic reflex zones at either *yin* or *yang* side, but also it could activate partial visceral reflex zones. Because various reflex zones or points are densely distributed below the elbow and knee instead of the trunk, it is more convenient and secure to select this type of SNMZ. Nevertheless, occasionally, some deep point-piercing are used at the lumbosacral area, such as piercing Zhibian (BL54) into Shuidao (ST28) to treat chronic prostatitis where a single needle pierces lumbosacral area into the lower abdomen (refer to Section 22.4). However, this method should be done with extreme caution due to risks of viscera puncture. This method suggests that the general needling methods on a single point may become either SNMP or SNMZ as long as the needle tip deviates to an adjacent or opposite point, which has deep tissue structures.

Obviously, SNMP and SNMZ are not identical. Because there are multiple points within a single reflex zone, the point-piercing within the same zone pertains to SNMP instead of SNMZ. For example, most of the facial point-piercing formulas within the somatic reflex zone pertain to SNMP.

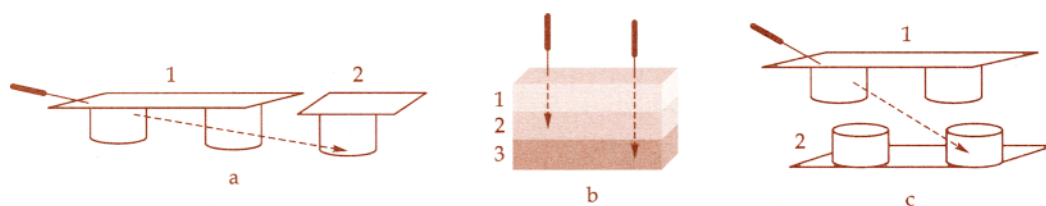


Figure 11.3 Single Needle through Multiple Zones

11.4 Integrating with Electrical Stimulation

In the modern age, the integration of electrical stimulation and acupuncture (electroacupuncture, EA) is no doubt a giant step forward in the development of acupuncture. In addition to its particular physiological actions, the electrical stimulation is continuous, stable, and quantified. Its parameters of stimulation include waveform, amplitude, frequency, and duration, which can be consistently maintained in the treatment. This can increase the reproducibility of experimental studies or clinical trials. When long stimulation duration is required, EA is an ideal choice because it can strengthen the stimulation during the needle-retaining period without requiring a continuous needle-manipulation. This may save the practitioner's time and efforts. However, the electrical stimulation also has its weaknesses. Compared with manual acupuncture, EA could be easier adapted by the body and its intensity would gradually attenuate with the passing of time. This is why either intensity or frequency of electrical stimulation must be slightly adjusted to sustain its effects during acupuncture anesthesia.

The effects of EA are multiple, and can be used to treat almost all acupuncture indications including somatic, visceral, and central diseases. Ulett *et al.* of Columbia Univ., USA have enumerated that EA can achieve therapeutic effectiveness for pain, depression, anxiety, spinal muscular spasms, strokes, gastrointestinal disorders and drug addictions of various types^[116].

For the commonly seen somatic pain, its first and most recognized effect is analgesia, of which mechanisms may include two aspects of neural and humoral factors (refer to Section 4.3). The application of EA contributes to the success in most cases of

acupuncture anesthesia. In addition, direct EA may quickly alleviate the muscle spasms and related pain. However, the impact of EA on muscles is closely related to the preexisting state of stimulated muscles, namely EA might relax those originally tensed or spastic muscles and raise those originally lower muscle tones.

In fact, this effect of EA also applies to manual needle-manipulation but it is generally more intense and can last longer after integrating with EA. According to our experience, when treating pain, whether additional electrical stimulation is required should be based on the needling sensations or responses of the patient post needle-insertion. When needling sensations could be generated quickly and significantly, additional electrical stimulation was usually not required. However, if the needling sensations were mild, or there were merely limited responses even after intense needle-manipulation techniques, then it would be suitable to add electrical stimulation. In general, elderly patients have lower body sensitivity, and their needling sensations often are disproportion with the stimulation intensity applied. For them, it is advised to integrate an electrical stimulation into acupuncture to raise therapeutic effectiveness.

The second effect of EA is to promote rehabilitation of neuromuscular functions. With a lower frequency of EA on fleshy points, there are often continuous muscle twitches, which frequency is in accordance with that of the electrical stimulation. When applying EA on the extremities, passive motions of fingers, toes, or entire hands and feet can be observed. This kind of passive muscular exercise can help prevent muscle atrophy, facilitate the neural control of muscular activities, and increase the muscle strengths, so it is beneficial for the rehabilitation of hemiplegia/apoplexy, multiple sclerosis, Bell's palsy, or other paralysis due to

peripheral nerve injuries. Moreover, chilliness and numbness of the extremities caused by peripheral neuropathy or poor blood circulation, as well as Reynold's syndrome pertain to indications of EA.

Currently, most EA instruments utilize the dissymmetrical low-frequency pulsating waveforms, though a square waveform instrument has been recently invented. The stimulation intensity of the square wave is most stable and fits the need of high-quality scientific experiments. According to the frequency of stimulation, common waveforms of EA can be classified as continuous waves, interrupted waves, sparse-dense waves, and so on. The continuous wave is composed of a string of impulses that is outputted at a certain fixed and repeated frequency. When its frequency drops under 30 Hz, the wave becomes sparse. When its frequency is between 30~100 Hz, the wave becomes dense. The sparse-dense waves alternate between sparse and dense waves while the interrupted waves are sparse waves with certain break points for interruptions.

Clinical selections of EA with different waveform are based on their individual effects on the body. For example, EA with sparse waves can induce the contraction of muscles, generate intense twitching sensations, and raise the strength of muscles and ligaments. It is often used to treat flaccid paralysis and myasthenia, and is commonly used during induction period of acupuncture anesthesia. EA with dense waves has less muscle twitching responses but often has instant analgesia effects when applied on certain pain regions of the body surface. Clinically, it is commonly used for pain-relief, sedation, or to alleviate muscle spasms or vasospasms. It is also used for acupuncture anesthesia performed near the incision of surgery, which has certain analgesia effects on the skin-incision pain. Nevertheless, whether the type of continuous waves is sparse or dense, the body can easily adapt both of them. With

a lengthy period of stimulation, needling sensations will gradually attenuate. Therefore, needling sensations and therapeutic effectiveness of EA cannot sustain unless a steady increase of stimulation intensity is present. EA with sparse-dense waves can cause muscles to contract rhythmically, while EA with interrupted waves can cause strong muscle twitches. Both of them are difficult to be adapted by the body. EA with sparse-dense waves is often chosen for clinical treatment and acupuncture anesthesia, while EA with interrupted waves can induce stronger excitation effects on the neuromuscular system than the continuous or sparse-dense waves.

The intensity of the electric current for EA is generally adjusted at a level that can be tolerated by the patient without any pain or other uncomfortable feelings. However, the required intensity may vary at different reflex points or acupoints located at various body parts. For example, when nerve trunks or spots are punctured, only a weak stimulation intensity may be sufficient in attaining effects, whereas for muscular areas or subcutaneous tissues, a raised stimulation intensity may be required to attain effects. This phenomenon has been demonstrated in the process of EA anesthesia applied for poultry.

Moreover, patients with different diseases have a large individual difference of body sensitivity toward EA. For example, for patients of multiple sclerosis or tremors, the minimal required stimulation intensity to induce muscle twitches is much less than that of healthy people. Conversely, in patients of peripheral nerve injuries such as Bell's palsy, a stronger stimulation intensity of EA is generally required to achieve muscle twitches. Therefore, when treating diseases, an appropriate amount of electrical stimulation intensity should be determined based on individual conditions of the

disease. An overly intense twitching of muscle will make patient uncomfortable and more difficult to accept the therapy while an overly weak stimulation cannot sufficiently achieve the desired therapeutic effectiveness.

The total stimulation amount of EA is also closely correlated with the pulsating frequency in addition to the stimulation intensity. Even if the intensity is low, as long as the frequency is increased, needling sensations felt by the patient will remain strong. Thus, both intensity and frequency should be synthetically considered when selecting EA parameters. Generally, the human body can tolerate a raised frequency easier rather than a raised intensity of EA. The increased frequency usually indicates better analgesia effects. In a clinical report of EA anesthesia, the frequency was raised over 10 000 Hz. Generally, the low-frequency of EA is defined by any pulsating frequencies under 1 000 Hz, and the moderate or medium frequency is between 1 000~100 000 Hz. The high-frequency is over 100 000 Hz.

Because the absolute refractory period of nerve fibers is about 1 ms, namely, the motoneuron will not be activated by each stimulation unless the stimulation frequency is less than 1 000 Hz (which is categorized as low-frequency). Accordingly, the high-frequency stimulation cannot excite nerves; instead, it only has certain heat-production effects. The stimulation with a moderate frequency is more complex, of which some might excite nerves, while others might only affect excitation levels of nerves as well as generate heat-production effects.

Endorphins released into the cerebrospinal fluid after EA is one of the analgesia mechanisms. Recently, studies have shown that 2 Hz and 100 Hz EA could selectively induce different types of endorphins, such as enkaorphine and dynorphine releases ^[116]. Note that in some publications, 80 (or

100) Hz or 2 Hz EA were expressed as “lower” and “higher” frequency of EA, instead of the terms of “sparse” or “dense” (refer to Section 13.4). Although these terms are not consistent with the above definitions about the high- or low-frequency of EA, what they actually represent is the difference between two types of frequencies applied. Thus, it is advised to be cautious when referring to such resources.

Through applications of electrical stimulation or EA, there has been an ongoing debate regarding the necessity of integrating manual acupuncture into electrical stimulation to achieve better therapeutic effectiveness. In the West, TENS devices that use surface electrodes for stimulation have been widely applied for many indications, and have shown certain effects mainly on somatic pain and muscle spasms. Currently, there are many household electrical stimulation devices similar to TENS prevailing in China, which applied surface electrodes on acupoints. Ulett *et al.* once concluded that not only the analgesia effect of EA was better than manual acupuncture, but also there were similar good results between an electrical stimulation that applied surface electrodes of the skin, and EA ^[116].

However, integration of electrical stimulation and acupuncture, namely EA, generally has a broader range of indications and better analgesia effects. This is because the electrical stimulation with surface electrode is indeed superficial whether it is applied on the surface of acupoint or non-acupoints. Its stimulation depth is far less than that reached by the needling. In Chapter 2, we already analyzed that a deep acupoint has at least six layers, every single one of those layers may be the location of sensitive reflex point for some somatic diseases (refer to Section 2.3). Therefore, only that electrical stimulation connected to the needle can be precisely delivered to the deeper portion of the diseased

region or any related sensitive centers of reflex points.

In addition, it was reported that analgesia mechanism of EA is different from TENS. Presently, EA with sparse waves of 2~4 Hz is mostly used in the clinic. Some researchers compared the differences of inhibition effects between EA and TENS on blink reflex due to pain stimulation in normal volunteers. The EA was applied with a sparse wave (2 Hz) at a stronger intensity (10~12 mA) while the TENS was with a dense wave (100 Hz) at a weaker intensity (2 mA). It was observed that EA generated a progressive and moderate inhibitory effect that could be reversed partially by Naloxone (a morphine receptor β -blocker) while the TENS generated a sudden appearing and primary inhibitory effect that could not be reversed by Naloxone^[164]. The results hint that analgesia mechanism of EA and TENS, including the generation of endogenous morphine-like substances such as endorphin, are not identical. Certainly, this might not be caused by the differences of stimulation frequency or stimulation intensity; instead, it might be related to the local muscle twitching caused by neural activation at the deep muscle of acupoints during EA. It has been documented in other related studies that either needling or a continuous movement of muscles could induce the release of endogenous morphine-like substances^[165,166].

11.5 Techniques of Heat-Penetrating Moxibustion

The above discussion mainly concerns with how to increase the amount of needling stimulation. Now,

as for moxibustion therapy, one way to increase its stimulation amount is to change indirect moxibustion to direct moxibustion.

Heat-penetrating moxibustion (HPM), also known as **scar moxibustion**, is a popular direct moxibustion method frequently used in Japan. It has excellent therapeutic effectiveness for many visceral and somatic diseases. Although it might cause minor moxa trails, it is only a temporary phenomenon. Generally, the skin region applied with HPM becomes crusty and has granulation tissues formed under the crust, and then granular crust turns darken, plump and thick. The time it takes from the crust peeling off to the complete repair of the skin is about two weeks. The skin color will become slightly lighter than normal. The normal skin color completely recovers in three months after application of HPM without leaving any scar.

During HPM, because the skin reaction is distinct and requires a longer time to recover, usually subsequent moxibustion is not required. In special cases, it is necessary to take a longer interval (at least two or more weeks) between two successive moxibustion sessions. Moreover, the subsequent moxibustion should be applied on new acupoints or reflex points other than those stimulated in the preceding session. The detailed HPM steps are outlined below.

Choose high-quality argyi moxa and roll them into granular cones, put these cones onto intended points, then light them with fire. After they have all burnt, a heat sensation will gradually spread to the deep portion of points or travel along the meridians. In point-selection, reflex points with tenderness or hard nodules are preferred, which may be located by the practitioner's finger pressing. Use a certain level of finger pressure on the patient's body surface to compare the differences of tenderness or other responses such as regional resistance or hard nodules. Determine and select the sensitive centers

of reflex points as the spots for moxibustion.

As for the number of moxa cones required, it is generally determined by the burning speed of argyi moxa and heat sensations felt by the patient. When moxa cones burn quickly with a bright color and the local heat sensations are not obvious, additional moxa cones are required. When moxa cones burn slowly with a color of red and black, local hotness or burning sensations might be felt without requiring additional moxa cones. If the burning speed of moxa cones is between the above two situations, then a proper amount of moxa cones have been burnt and the patient may experience tolerable local heat sensations along with propagating heat sensations toward deeper portions of the body.

Similar to general indirect or heat moxibustion, patients may feel distinct individual differences of heat during HPM. Even with the same number of moxa cones or similar burning speed, some patients may feel only warmth, others may feel hotness, and the rest may feel intolerable burning sensations. The cause of various levels of heat experienced may be related to different diseases or stages of a disease. For example, during the initial treatment, a patient with acute disease might feel slight or no warmth at all. During the follow-up visit, however, the patient might begin to feel some hotness. When the disease is near full recovery, the hotness might be gradually raised and even become intolerable burning sensations that might accompany some itching. In the case of a chronic disease, the heat sensations may be intense during the initial treatment, and with each follow-up visit, a gradual decrease of heat sensations might be observed accompanying with comfort feelings. However, when the chronic disease is near full recovery, an intense hotness might reoccur.

In addition, the body might gradually adapt the thermal stimulation under continuous moxibustion.

For patients receiving daily moxibustion, they gradually become accustomed to the thermal stimulation, and tolerable to a hot or even burning moxibustion. However, for those without a regular schedule of moxibustion, they might feel hot in subsequent moxibustion. As for those who have moxibustion with multiple cones, they might first experience some hotness when the initial cone is applied, with additional cones are added, the sensations gradually turn to slight warmth and eventually to hotness once again. Nevertheless, over 90% of the patients that accepted HPM felt very comfortable under hotness despite the situations mentioned above.

HPM generally has no side effects, and it can be applied on most skin regions for symptoms of the body. It is suitable for various systemic diseases. Some selected acupoints with greater effects on the whole body include Tianzhu (BL10), Jianzhongshu (SI15), Jianjing (GB21), Quchi (LI11), Hegu (LI4), Zusanli (ST36), Sanyinjiao (SP6), and Kunlun (BL60). Symptomatic application of these points may achieve curative effects for certain diseases^[189].

Note that it is inappropriate to call HPM as scar moxibustion, which may scare away the patients. Actually, it merely forms a scab without any scars, so it should be called **scab moxibustion** instead. In the past, there were actual scar moxibustion techniques that could form a permanent scar locally if a larger region was applied with excessive direct moxibustion. Because there was a local suppuration prior to the scar, it was also referred as **suppuration moxibustion**, which were commonly used to treat certain chronic and intractable symptoms such as rheumatoid arthritis and asthma. Moreover, there was a more general term called **trail moxibustion**, which could include both HPM and scab/suppuration moxibustion.

11.6 Prolonging Stimulation

In acupuncture therapy, the stimulation amount is the product of stimulation intensity and stimulation duration (refer to Section 8.3). To increase the stimulation amount, in addition to various methods of enhancing stimulation intensity, one can also prolong the stimulation duration. This is our proposed principle of **prolonging stimulation**.

Needle-retaining is a commonly used method in prolonging the needling duration. However, it has been demonstrated in the practice of acupuncture anesthesia that a plateau of analgesia effects is usually reached in about a half hour of continuous manual needling or EA. After that, lengthy stimulation duration cannot further raise the analgesia effects. This may be related to the maximum neural factors that have been activated during the period. Of course, the activation of humoral factors may occur in a prolonged period of stimulation, which could be longer than a half hour. Therefore, when treating most neuralgia, including surgical pains with body acupuncture or EA, the needle-retaining period of a half hour may be sufficient, but for other dysfunctions or when applying other stimulation means, such as wrist-ankle acupuncture, it might need to be further prolonged.

When applying needling therapy, intentional induction of residual needling sensations is an alternative method to prolong the stimulation duration. This can be realized through an excessively intense needle-manipulation, such as lifting, thrusting or twisting needles with a great amplitude or angle. The residual needling sensations often last for several hours, sometimes even up to one or two days. The cause is mainly due to minor pull of tissues generated within points that rarely occurs when applying mild needle-manipulation techniques.

It has been observed through in-vivo animal

experiments that the group treated with an needle-manipulation of intensive **tonification and purgation methods** had a permutation mess of muscle fibers within the acupoint center, as well as a coaxial distribution of surrounding muscle fibers and the exterior layer of epimysium in the subcutaneous tissues. On the contrary, it was seen in the group treated by **equal tonification and purgation methods** that there were cross-sections of most muscle fibers and slight twists in the exterior layer of epimysium of subcutaneous tissues. In the group treated by needle-insertion without needle-manipulation techniques, there was a slight fragmentation of muscle fibers seen occasionally ^[153]. Although this kind of tissue metamorphosis or injuries could be quickly self-healed, it persisted longer after intensive needle-manipulation techniques when compared with general needling, so it might significantly increase the stimulation amount inputted into the body and raise therapeutic effectiveness.

To prolong the stimulation duration on acupoints, there is a series of other methods in lieu of filiform needles, such as pressing auricular points with embedded herbal seeds, stainless steel pellets (**auricular pellet-pressuring method, APPM**), **auricular needle-embedding method (ANEM)**, **picking therapy**, **catgut-embedding method**, and **acupotomy** at acupoints. Common features of APPM, ANEM or picking therapy are convenient and easy to operate, but these methods usually only could stimulate superficial portions of points, so they often are inapplicable for deep acupoints or reflex points located at muscular regions of the body. For the latter, the catgut-embedding method, acupotomy and water acupuncture are more applicable ^[156]. The catgut embedded in points can be gradually decomposed and absorbed after a certain period. Before it is decomposed entirely, it can still provide a certain degree of stimulation to points. Acupotomy is a

medical instrument used for closed TCM surgery and integrated functions of filiform needles and scalpels. Actually, it is just a needle with a razor sharp yet narrow blade, which not only can be inserted into the deep part of a point like that of filiform needles, but also can be used to complete general tasks of a surgery such as cutting, separating and decompressing that cannot be performed by needle-manipulation techniques ^[157]. The applications of acupotomy have already shown the effects of persistent stimulation on acupoints and relieving hard nodules, which are prospective in clinical acupuncture.

Water acupuncture, otherwise known as hydro-acupuncture, **acupuncture with injection of fluids**, or **point-injection**, is a therapy that integrates needling and injection of fluids into points, in which the injected fluids are either medications or Chinese herbal extracts ^[158]. The common ones used by us are 10% hyperosmotic glucose solutions, which take advantage of its hyperosmotic pressure to stimulate related tissues at deep parts of points. Ample clinical trials have demonstrated that it is a safe and effective mean of stimulation, particularly for eliminating local tender spots, even relieving hard nodules. It is preferred to use thin and long dental needles (at least 2 *cun* in length) in the point-probing prior to injections. During the probing process, explore the sensitive centers of the point until certain remarkable needling sensations can be attained. This is a key item in enhancing therapeutic effectiveness of water acupuncture. The dosage of glucose solution in each injection should be determined based on the individual muscularity of intended points. In general, inject 5~10 mL of solutions per point. If Chinese herbal or medication agents other than glucose or saline are injected, then careful attention must be paid to prevent possible allergic reactions and other side effects resulting from them.

Derived from general moxibustion, the trail moxibustion (HPM or suppuration moxibustion), especially the suppuration moxibustion fits with the principle of prolonging the stimulation period. In the suppuration moxibustion, ignited moxa cones or some medicinal creams with causticity are directly applied onto the skin of selected points to suppurate the skin. It seemed ruthless, where the skin was suppurated for a certain period, but actually, it could sustain effective persistent heat stimulation. In other words, it may leave a longer duration of stimulation source at the intended reflex points or acupoints, which is worthy to be used for certain chronic and intractable disorders. The limitations of this method are some pain and possible scars from the moxibustion, so it has been less applied in the modern age. However, its substitute method (HPM) only produce scabs instead of permanent scars, is still prevalent in Japan ^[189].

Of course, scabs or trails due to moxibustion can be induced by other means such as external application of some fresh Chinese herbs. In treating tennis elbow, raw garlic pastes are often applied on the tender spot of the elbow, at the beginning, only a local burning sensation was induced, but if it was placed for over a half hour, some local vesicles of the skin might be formed, and eventually might lead to superficial scabs. Most of these scabs or trails would subside over time. This kind of external application of fresh herbs may have therapeutic mechanisms identical to that of trail moxibustion.

In addition, various forms of **warm needling** and **red-hot needling** that integrates needling with thermal stimulation ^[156] have culminating effects of both mechanical and thermal stimulation. These needling methods, especially fire needling, may cause a certain degree of scald, so they also pertain to the methods of prolonging stimulation.

In short, for many intractable patients, when the

general acupuncture strategy fails to attain desired therapeutic effectiveness, the above methods of prolonging the stimulation duration may be applied.

11.7 Point-Associations through Multiple Passages

The association of points has the same significance as the selection of points in clinical acupuncture. It is not only aimed at treating various symptoms that simultaneously existed in a patient, namely so-called **point-association according to symptoms**, but also often aimed at treating a symptom by combining several points to ensure optimal results. There have been several formulas of point-association developed for the latter purpose. They include several pairs of point-associations: the anterior and posterior sides, the superficial and deep portions, the upper and lower portions, the left and right sides, as well as the distal and proximal portions of the body ^[83].

From the perspective of systems theory, the essence of point-association is to choose several points with different information passages that can be activated concurrently. This may enable a sufficient amount of acupuncture information to be inputted into the body. Meanwhile, even though not every point or information passage was effective, it would still be possible to have at least one of them available for a smooth transmission of information. Thus, miscellaneous methods of point-association used in clinical acupuncture may be concluded as one principle, namely the **stimulation through multiple passages (STMP)**. The following is the analysis of commonly used point-association methods and their characteristics about related information passages.

11.7.1 Associations of micro and whole body reflex zones

In the modern era, there are already various micro needling therapies derived from classical acupuncture. They can be applied at micro reflex zones on the head, face, hands, and feet. For example, there are scalp acupuncture, auricular acupuncture, eye acupuncture, nose acupuncture, face acupuncture, lip acupuncture, tongue acupuncture, hand/foot acupuncture, wrist-ankle acupuncture, and so on. A combination of body acupuncture and micro acupuncture has been widely applied in the clinic, where associations of micro and whole body reflex zones are required. The whole body reflex zones, which are categorized into somatic, visceral, and central reflex zones, encompass all acupoints and extraordinary points that are usually referred as body points.

Although each type of micro acupuncture therapy has been applied in numerous case studies, auricular acupuncture, scalp acupuncture, hand/foot acupuncture are the most commonly used due to the convenience and the safety of stimulation on the ear, head, hands and feet. Micro reflex zones or points lodged on the head possess a series of characteristics different from that of other body parts. First, their passages of reflex information are often distinguishable. When reflex zones of the ear, nose, or scalp are stimulated, the needling information is mainly inputted into the nervous centers through the trigeminal lemniscus, instead of the spinal cord (refer to Section 2.4). Second, they are closer in proximity to CNS, so there is less attenuation of information during the transmission of inputting therapeutic information. Third, they have a higher tolerance to electrical stimulation so that a greater stimulation amount can be applied.

Therapeutic roles of auricular reflex points are closely related to innervating features of the ear ^[19],

where extensive distribution of vagus fibers may enable needling to alter functional states of ANS to a certain extent. Thus, during acupuncture anesthesia, applying auricular reflex zones usually induced a distinct inhibition on visceral stretching reactions. When autonomic nervous dysfunctions or visceral disorders seemed intractable with just body acupuncture, integrating with auricular acupuncture could often attain a 'magical' effect.

The scalp acupuncture is a secondary method to auricular acupuncture in applications of micro reflex zones. It has been used to treat more than 80 kinds of common disorders. Because those main lines or zones for stimulation on the scalp are near or correspond to functional locations of cerebral cortex (Color Figure 7 at the end of the book), they are typical central reflex zones of the head. It has been demonstrated that the main indications of scalp acupuncture are disorders of CNS, psychosis, pains, paraesthesia, and other neurogenic visceral dysfunctions. When applying scalp acupuncture, it will not take effects unless there is a sufficient amount of stimulation inputted. It can be realized through a fast-paced twisting of needles (e.g., up to 200 times/min) at a greater angle or combined with needle lifting-thrusting method at a limited amplitude, which may raise the unit intensity of stimulation. It also can be realized through a longer needle-retaining period (e.g., 1~3 hours). After manual needling, a pulsating electrical stimulation with sparse-dense waves or continuous waves at a moderate intensity can be applied for 20 min ^[90].

However, both auricular and scalp acupuncture have certain limitations because their stimulation information are not inputted through the spinal cord. For instance, they have fewer effects in directly controlling pain and inhibiting reflective muscle tension at the spinal level. Especially when points on the head or face present a hyposensitivity, their

needling effects will be less than that of body acupuncture, particularly of puncturing body points with same segmental innervations as the affected region.

Different from reflex zones at the ear, nose, and scalp, when points on the trunk and limbs are punctured, the needling information is first inputted through the spinal cord. This is obviously beneficial to its competition and integration with surgical pain information at the level of spinal cord. However, muscular body points have a lower tolerance to electrical stimulation. Only when needles are inserted into their superficial layers, such as subcutaneous tissues or when electrodes are placed on the skin surface, a higher intensity of electrical stimulation can be tolerated.

Owing to the different features of above-stated auricular, scalp and body points, it is suitable to apply associations between auricular or scalp acupuncture and body acupuncture as they can complement each other. Familiar examples are associations of auricular and body acupuncture for visceral dysfunctions or various pains, and associations of scalp and body acupuncture for central diseases, such as apoplexy/hemiplegia or epilepsy.

However, many body points on the head may or may not overlap with various micro reflex zones on the head. The association between micro reflex zones of the head and body points lodged at other parts, the association between body points on the head and trunk or limbs, the association of body points and micro reflex zones of the hand or foot, all pertain to the same principle mentioned above. Besides, associations of micro reflex zones at different body parts, such as associations of hand/foot acupuncture and scalp acupuncture, associations of wrist-ankle acupuncture and auricular acupuncture, all are able to input effective therapeutic information through

different information passages.

11.7.2 Associations of local and distant reflex zones

Another popular method of STMP is the association of local and distal acupoints or reflex zones distributed on the entire body.

For example, visceral reflex zones can lodge either on corresponding region of the trunk (chest, abdomen, and back) or on the extremities. When treating a visceral disease, both local and distal reflex zones of the viscera can be selected as locations of stimulation. Their associations, such as Zhongwan (CV12) and Neiguan (PC6) for stomachache, Shenshu (BL23) and Sanyinjiao (SP6) for urogenital diseases, often have good results. Likewise, the following associations all pertain to this type of principle with good results. For somatic pains, apply associations of local *Ashi* and distant points within same somatic zones or along the same meridians. For central disorders, apply associations of points on the head or the back and those of the extremities, or associations of middle and border zones in central reflex zones.

Local points or reflex zones may be located at every portion of the body but they lodge only within the affected region, while **distant points** or reflex zones represent those that lodge within a distant region away from the affected portion. Sometimes, distant points located on the extremities also are called **distal points**. Those near the affected region are called **adjacent points** or **adjacent reflex zones**. For associations of local and distant points, combining those on the head and the extremities, on the trunk and the extremities, as well as on the trunk and the head are the most frequent. The good results that stem from them are mostly due to the combination of their different effects and mechanisms.

When associating points on the head with those on the trunk or the extremities, stimulation information inputted on the head is mostly delivered through the trigeminal lemniscus instead of the spinal cord, which is the passage for stimulation information inputted from the trunk or the extremities. When applying point-associations on the trunk and the extremities, though their information are inputted through the spinal cord, their afferent nerves may be from different neural segments, thus their afferent passages may vary, i.e., they may pertain to an association of points located at different neural segments.

The followings are some characteristics of local points or reflex zones on the trunk and distal points on the limbs, especially below the elbow and knee.

For local points or reflex zones on the trunk, they often have direct or short reflex arcs due to their close proximity with the affected region. These points or zones are innervated by the same or adjacent segments for the affected region, and they often appear at an earlier stage of the disease. Moreover, they can be easily detected and often provide relatively reliable reflex information. When they are stimulated, the afferent passage of therapeutic information is also relatively short so that the effects are attained sooner. Even if there were insufficient stimulation intensity, there would still be some distinct effects. When applying an intense stimulation, it may not require precise localizations of reflex points. In other words, these points or zones might have a relatively low specificity in actions of points. In addition, their stimulation might no longer require a distant propagation of needling sensations. Instead, a local propagation of needling sensations from superficial to the deep portions of the region may already be sufficient. Disadvantages of selecting local points are that their effects generally only last for a short time, and after a stronger stimulation,

some residual needling sensations might occur, which might be confused with the pain itself.

For distant points or reflex zones on the extremities, they are far away from the affected region, so their connections are indirect or they may have long and complicated reflex arcs. If the distant points and the affected region are innervated by spinal nerves, their connections mostly caused by the reflexes among distant segments, thus, when there are visceral or somatic disorders, distant reflex points usually appear at a later stage, are difficult to be detected. When they are stimulated, the afferent passage of therapeutic information is also longer so that effects are taken slowly. For example, it needs a certain time for inducing analgesia when applying distant points for acupuncture anesthesia. However, once its actions begin, they will last for a longer period. For the reason, in addition to the involvement of the spinal cord, higher nervous centers such as the thalamus as well as certain humoral factors may be involved.

11.7.3 Associations of bilateral reflex zones

When distant points are selected, there is a special method called *puncturing the right to treat the left* or *puncturing the left to treat the right*, which focused on stimulation of contralateral points of the affected region, namely, the **opposite needling method (ONM)** in TCM.

There are two types of point-selection for ONM. First, whether the pain or disease is located at acupoints or non-acupoints of one side, certain symmetrical points on the contralateral side can be selected. For example, puncture the lateral epicondyle of humerus of the healthy side to alleviate symmetrical tender spot in tennis elbow, puncture Qiuxu (GB40) to alleviate contralateral tender spots in sprained ankle, and puncture Taiyang (EX4) for contralateral migraine headache that occurs near the temporal

area. Second, reflex points on the contralateral side can be selected whether they are located at the same meridian or beyond the meridians, or on symmetrical locations. These reflex points may or may not lodge on the corresponded contralateral limb. For example, puncture a reflex point around Tiaokou (ST38) for contralateral shoulder pain, and puncture Yaotongdian (EX134) at dorsum of the hand for contralateral lumbago. Actually, when these reflex points appear on symmetrical locations of the diseased region, the second type is the same as the first.

When applied on the limbs, ONM can also be called **selecting points on a different limb**. However, the “different limb” may be either upper or lower limb on the ipsilateral side instead of the contralateral side, thus these two terms have a slight difference. For various somatic reflexes among the limbs, refer to Color Figure 6 by the end of this book and Section 3.7. Through these reflexes, puncturing either side of the body or a limb will act on the entire body including the bilateral sides or other limbs^[171,172]. This is the underlying mechanism of ONM. We once observed that puncturing Hegu (LI4) in normal subjects could increase the pain threshold of the entire body.

The ONM is mostly used for somatic pains. There are ample clinical trials in this field, which showed good results. Cui reported that it was used to treat 500 cases of soft tissue injuries that occurred at various parts of the body with a disease course of 2 hours to 20 years. Among them, 300 cases were cured, and the total effective rate was 97.6%^[167]. Lou of China applied piercing Tiaokou (ST38) into Chengshan (BL57) on the contralateral side of the affected shoulder for 30 cases of frozen shoulder. Results showed 12 cases were remarkably effective, 16 cases effective, and two cases ineffective^[168]. We once applied ONM in 79 cases of lumbago and leg

pain with satisfied results. The changes of pain symptoms and bilateral tenderness were taken as indicators to guide subsequent treatments. Through five sessions of treatment, 80% of these cases showed remarkable effects [169].

For somatic pains, generally, first stimulate the affected side. If no effects are attained, then stimulate the healthy side. However, the so-called “healthy side” could be relative. For example, when there are bilateral pains on the legs, both sides are affected, and there is no so-called “healthy side”. However, the bilateral pains or tenderness degree often are not equal, thus the side with mild pain still could be treated as the “healthy side”, while the side with worse pain being the affected side.

There are at least two benefits when applying ONM for analgesia. First, it allows the patient to move the affected region during needling. In patients with soft tissue injuries, pain often restricts the motion of the affected region, which may aggravates the pain due to local accumulations of nociceptive substances. While puncturing the healthy side to achieve certain pain relief, the affected region may be exercised simultaneously. If so, it may help to alleviate the pain and speed up the healing process of the affected region. Of course, this purpose also can be approached through puncturing other distant points such as auricular points. Fang *et al.* of Hangzhou, China treated 65 cases of painful diseases with EA, and compared the analgesic effect of contralateral and ipsilateral stimulation. It was verified that ipsilateral or contralateral stimulation had similar effects on pain relief, while contralateral stimulation was better in improving motor impairment. They further demonstrated in rats that ipsilateral or contralateral stimulation might share the similar higher-level afferent pathways in acupuncture analgesia inside CNS [170].

Effects of ONM in rehabilitation of apoplexy/

hemiplegia patients are also evident. Zhang reported that there was a total effective rate of 94% in 100 cases of hemiplegia with puncturing of the healthy side [173].

On the other hand, for pains of hemiplegia patients, applying ONM on the healthy limbs alone can achieve remarkable analgesia effects. Due to the sensory defects of the affected limbs, puncturing points at the affected side might not be able to acquire needling sensations so that it is difficult to raise the pain threshold of the body. Therefore, when treating hemiplegia, it is advised to associate points of bilateral sides of body. Puncturing the healthy side may enhance the effects of puncturing the affected side, which can help to setup a functional compensatory area at the contralateral healthy cerebrum.

11.7.4 Associations of corresponding points or reflex zones

As mentioned above, ONM can be applied at corresponding or non-corresponding points on the contralateral side of the body. In addition to bilateral sides of the body, **corresponding points** may exist between upper and lower part of the body including upper limbs and lower limbs between the anterior and posterior trunks. Like ONM, association of **corresponding reflex zones** is mostly used for somatic pains.

There are two ways of selecting corresponding points or reflex zones between upper and lower parts of the body. First, choose upper and lower limbs, such as stimulate the ankle for wrist pain and vice versa, stimulate the elbow for knee pain and vice versa, stimulate the hip for shoulder pain and vice versa. Second, choose upper and lower parts of the trunk. The sole or the perineum area may correspond to the vertex. Puncturing Baihui (GV20) under a standing posture for heel pain pertains to the first way, while puncturing Baihui (GV20) under a sitting posture for proctoptosis or pain in coccyx pertains

to the second way. Generally, in selecting the corresponding points on upper and lower parts of the body, corresponding anatomical locations are the most important and can be easily identified.

For correspondence of upper and lower limbs, a common way is to select **corresponding cross-acupoints** at the contralateral side. So-called corresponding cross-acupoints are those acupoints lie on corresponded meridians and at the cross-sections of upper and lower limbs. If diseases exist on the upper limb, the corresponding cross-points are located on the contralateral lower limb and vice versa if diseases exist on the lower limb. For example, suppose pain or tenderness is found at Jianyu (LI15) in a case of frozen shoulder, one may select and puncture Biguan (ST31), the corresponding cross-point at the contralateral side. If there is pain or tenderness at left Jiexi (ST41) for a case of sprained ankle, one may select and puncture right Yangxi (LI5), a corresponding cross-point. If there is pain or tenderness at right Yangchi (TE4) in a case of sprained wrist, one may select and puncture left Qiuxu (GB40), a corresponding cross-point. However, when applying this method, it is not always required to select points at the contralateral side because no reports have yet indicated any differences of effects between corresponding cross-points at ipsilateral or contralateral sides. Clinically, when treating toothache, puncturing Hegu (LI4) at either side of the body could achieve some effects. We prefer selecting corresponding points on the upper limb to treat sciatica, but not on the contralateral side (refer to Section 13.14).

Selecting corresponding points between ventral and dorsal sides of the trunk is another method. It refers to two ancient ways, namely *puncturing the ventral to treat the dorsal* or *puncturing the dorsal to treat the ventral*. This method is mainly suitable for pains on the trunk and neck. For example, if there

is pain or tenderness at Taodao (GV13) due to the strain of interspinal ligament between T1~T2, one may select and puncture Xuanji (CV21), a corresponding acupoint. If there is pain or tenderness at Zhiyang (GV9), one may select and puncture Tanzhong (CV17). If there is a stiff neck and head cannot be raised, one may select and puncture Chengjiang (CV24), which is located at the front neck. These are examples for the method of *puncturing the ventral to treat the dorsal*. As for selections of dorsal *shu* (**stream**) points for disorders of the chest or abdomen, they pertain to the method of *puncturing the dorsal to treat the ventral*.

However, do not overlook the importance of stimulating the affected side when emphasizing applications of contralateral or corresponding points. Generally, there are direct reflex circuits when stimulating the affected region in comparison with the stimulation on contralateral or corresponding points. The latter stimulation is based on reciprocal reflexes between various corresponding parts of the body, thus may have fewer applications when the stimulation intensity is insufficient or the patient is hyposensitive to the stimulation.

Lin *et al.* assessed the effects of puncturing Neiguan (PC6), Zusanli (ST36), Sanyinjiao (SP6), and Quchi (LI11) on cutaneous circulation and pain threshold in eight normal adults. Stimulation of right Sanyinjiao (SP6) or left Zusanli (ST36) only induced the vasoconstriction of skin in both legs without changing the skin temperature in both arms. Stimulation of right Neiguan (PC6) or left Quchi (LI11) only induced vasoconstriction in both arms without changing the skin temperature in both legs. On the other hand, stimulation of right Sanyinjiao (SP6) only induced analgesia in the right sole, while stimulation of left Quchi (LI11) only induced analgesia in the left palm^[176]. Jin and Zhu of Beijing, China compared the differences of pain-relief induced by ipsilateral

or contralateral acupoints in healthy volunteers. The nociceptive flexion reflex (RIII reflex) elicited by sural nerve stimulation was applied randomly. EA in 0.8 times threshold of RIII reflex on ipsilateral Zusanli (ST36) could elicit inhibitory effects of RIII reflex. In contrast, these stimuli on the contralateral Zusanli (ST36) were completely ineffective. EA in one time RIII reflex threshold on bilateral Zusanli (ST36) could all inhibit RIII reflex^[70]. This suggests that a direct stimulation on the affected side may generate effects more easily than that on the healthy side even though the combination with stimulation on the healthy side can raise analgesia results by that in the affected side. Therefore, the stimulation on the healthy side generally is not required unless the stimulation on the affected side is ineffective or corresponding needling sensations are not ideal.

In short, one may consider associations between bilateral or corresponding points or reflex zones when ineffective results are observed from general point selections. Through this type to point-association, therapeutic information of acupuncture may enter the body through two different passages located on bilateral, upper, or lower parts of the body. It can ensure at least one of these passages to function properly.

11.8 Alter Preexisting Functional States of the Patient

In Section 4.2, we have already analyzed that regulatory effects of acupuncture for visceral functions is related to their original states. In the practice of acupuncture anesthesia, it also has been demonstrated that the successful outcome of analgesia is closely related to the preexisting

functional states of the patient, which include the personality traits, ANS functions, and the body sensitivity to acupuncture. These factors can have significant impacts on the transmission of acupuncture information and the process of integration between acupuncture and the surgical nociceptive information. Similarly, these factors may influence therapeutic effectiveness of acupuncture for many diseases, at least in the following four aspects.

11.8.1 Personality traits and mental states

According to studies of modern physiology and psychology, personality traits of patients may be categorized as strong and weak types. Those with **weak traits** mostly manifest as being easily scared, having passive defense responses and a generally lower pain tolerance. Those with **strong traits** can be further divided into the **disproportion type** (or **exciting type**) and the **proportion type**. The latter can be further divided into the **clever type** and the **inertia type**. Those with strong and disproportion traits may be easily excited and hardly depressed, those with strong and proportion traits usually are more active, and those with strong and inertia traits are often quiet and self-controlled. Generally, those with strong traits have a higher pain tolerance. Obviously, it is impossible to change personality traits of the patients in a short time, but personality traits may be utilized as an indicator when evaluating the appropriateness of undergoing acupuncture treatment or anesthesia for each patient in advance. For example, those with weak traits are not suitable for acupuncture anesthesia, while those with strong and proportion traits are most suitable.

On the other hand, the mental states of patient can also affect the outcome of acupuncture to some extent in spite of which personality trait the patient may possess. Thus, altering the current mental state of patient prior to acupuncture or surgery, such as

reducing nervousness or anxiety may raise the therapeutic effectiveness (refer to Sections 10.4 and 11.8).

It has been demonstrated that the quiescent state of patient's mind may facilitate the incidences of PNSAM^[51], which is closely correlated to the therapeutic effectiveness of acupuncture. It is advised to let the patient to fall into a quiescent state of the mind prior to acupuncture in order to alter the current mental states of the patient. Actually, the quiescent state mimics the sleeping state but is not 'real' asleep. Meanwhile, the mind of the patient is highly tranquil with certain consciousness and alertness. The patient may also have temporary reductions of somatic perceptions and responses to the external stimulation, but is still aware of one's own posture and the surroundings.

From the perspective of neurophysiology, the

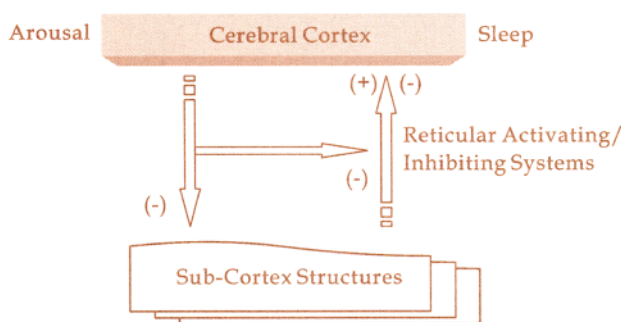


Figure 11.3 Reciprocal Communication between Cerebral Cortex and Subcortex Structures

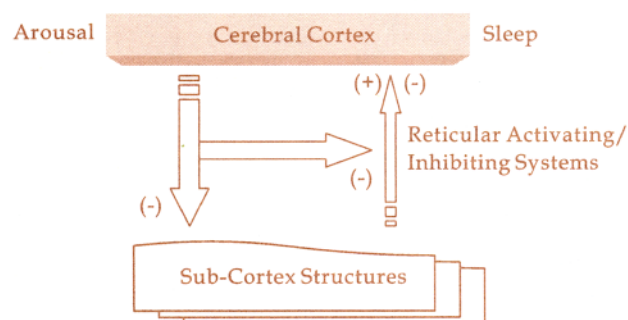


Figure 11.4 Quiescent State of the Mind

quiescent state of the mind is a neural state when the reciprocal connections between the cerebral cortex and subcortex structures (Figure 11.3) are weakened (Figure 11.4).

Many acupuncture practitioners may have experienced such quiescent state by themselves, such as that period just prior to falling asleep. In addition, the quiescent state may be realized through meditations under an alerted posture of the body (e.g., lotus seating), as required by many forms of *qigong* exercises.

11.8.2 Functional states of ANS

Functional states of ANS can be divided into three types, **sympathetic dominance**, **parasympathetic dominance**, and **relative proportion of these dominances**. As for innervating characteristics of these dominances as well as differences and correlations of their functions, refer to textbooks of physiology^[6] and Section 2.7 of this book. Table 11.1 lists several evident signs to identify the two dominances. When these signs are not obvious, the state of ANS pertains to the relative proportion type.

Generally, in patients of parasympathetic dominancy, the needling itself seldom induces pain. Instead, it is easily to generate needling sensations or skin redness around the needle during the needle-retaining period. Thus, these patients usually have better results. Clinically, pain is a common symptom and one of main indications of acupuncture. Patients of severe pain often have accompanied rising of the sympathetic tone, which reciprocally interacts with the pain, namely it may further reduce the pain threshold, while the pain can increase the sympathetic tone, like a vicious cycle. Raised parasympathetic activities due to acupuncture can resist higher sympathetic activities, eventually breaking the vicious cycle and significantly relieve the pain. This may explain why acupuncture analgesia or

Table 11.1 Dominant Characteristics of Autonomic Nervous System

Sympathetic Dominance	Parasympathetic Dominance
Fast heart beats, high blood pressure	Slow heart beats, low blood pressure
Decrease of gastrointestinal activity, mostly with constipation	Increase of gastrointestinal activity, mostly with loosing bowel movements
Thick salivary secretion	Thin salivary secretion or salivation
Cold skin, especially at the extremities due to vasoconstriction	Normal skin temperature
Constrictive nail fold capillary	Dilative nail fold capillary
Increase of perspiration, moist skin at the extremities	Decrease of perspiration, dry skin at the extremities
Decrease of the skin electrical resistance	Increase of the skin electrical resistance

acupuncture anesthesia was more successful in patients with parasympathetic dominance, or whose parasympathetic tone could be raised quickly by acupuncture.

Actually, both hyper and hypo autonomic nervous functions may be a cause or symptom of many disorders including pain, and they could be normalized by acupuncture. This regulatory effect of acupuncture has been demonstrated regardless of the previous ANS state, and is one of the most important functions of acupuncture. However, if the ANS state prior to acupuncture patients can be regulated by other ways in advance, acupuncture will attain better effects.

For example, it has been known that acupuncture has better effects in patients with parasympathetic dominance. For a patient in pain, if the parasympathetic tone can be strengthened through varied ways in advance, acupuncture will attain better analgesia effects. Regulate the breath before or during acupuncture is one way. Through numerous practices of *qigong*, it has been demonstrated that a slower and deeper breath is capable of lowering sympathetic tone and raising parasympathetic tone. Consequently, many practitioners had warm hands that may be due to dilated capillary vessels.

Regulation of the breath is one of three key factors of *qigong*. Its importance lies in that regulation of the breath is a natural access to the control of autonomic nervous activities. According to the knowledge of physiology, among all viscera, only the respiratory system is under dual neural controls: voluntary and involuntary. The involuntary neural control of breath is more significant during sleep when the breath remains without conscious efforts, while the voluntary neural control of breath can be experienced during wakeup periods. Meanwhile, the breath is controlled by the cerebral cortex, which can be faster or slower, even can be held for a period at will. Because the above characteristics of breath control, intentionally reducing the breathing frequency may raise the parasympathetic tone and reduce the sympathetic tone. In other words, through repeated practice of breath regulation, practitioners may finally alter their autonomic tones to a certain extent that will play a regulatory role on various visceral activities.

The above recognition about the dual controls of respiratory system and potential effects of regulation of the breath on the autonomic tones are crucial. This reveals the scientific essence of ancient *qigong* in which regulation of the breath was emphasized as

the first step in mastering any form of *qigong*. This may also elucidate mechanisms of the *qigong* practice in treating hypertension, coronary heart diseases, and peptic ulcers that may relate to autonomic nervous dysfunctions. We have received enormous responses since it was proposed at the International Congress of Traditional Medicine held in Beijing, China, 2000 ^[180].

Regulation of the breath is also beneficial to raise effects of acupuncture. It has been demonstrated in *qigong* practitioners who are proficient at the breath regulation, not only are the effects of acupuncture enhanced, but also a distant propagation of needling sensations is easier to generate, and heat or cool needling sensations are easier to be induced by the heat- or cool-producing needling techniques. Besides, a slower and deeper breathing exercise may help the practitioner enter the quiescent state of mind and attain a full relaxation of the entire body more easily. Such mental states are also beneficial to the outcome of acupuncture.

However, it must be noted that in order to increase the parasympathetic tone through breath regulation, repeated practice is very important. It is difficult to achieve a long-term effect with only a few practices, even though some instant effects may still be attained. Thus, in order to be incorporated regulation of breathing through *qigong* into acupuncture treatments, most patients need a certain period of persistent practice.

11.8.3 The body sensitivity

The sensitivity of the body surface toward acupuncture has a large individual difference, and may vary according to different stimulation regions and other influencing factors (refer to Section 10.1). It can be evaluated by the extent of needling sensations and responses of the body, to which is closely related. Generally, in patients of normal body sensitivity,

needling sensations of soreness, distension, heaviness, and numbness can be easily generated, and propagated to surrounding areas with a persistent needle-manipulation. Consequently, a satisfactory therapeutic effect follows. However, in patients of hyposensitivity, even a persistent manipulation often cannot generate ideal needling sensations and effects. Instead, certain regional pain may be induced if the needle-manipulation is overly intense. Therefore, increasing the body sensitivity prior to acupuncture may be relevant for these patients to raise therapeutic effectiveness.

Methods to raise the body sensitivity may be categorized as passive stimulation on the body surface and active physical exercises. The former includes preparative massage or thermal stimulation at the intended region and its surroundings in advance (refer to Section 12.9), as well as certain manual stimulation techniques on related nerve trunks or arteries (refer to Sections 12.4 and 12.6). The latter mainly is the *daoyin* training, such as that in the **eight-section brocade**, an ancient Chinese stretching exercise that can be practiced by patients themselves.

11.8.4 Tensions of soft tissues

Soft tissue injuries are common indications of acupuncture. Most acupoints or tender spots used for various somatic, visceral, and central disorders lodge in soft tissues such as muscles, tendons, and ligaments. Thus, the tensions of soft tissues in the entire body, especially at the affected region is also one kind of preexisting function of the body that may have impacts on needle-manipulation and even its therapeutic effectiveness. Moreover, altered tensions in the regional soft tissues, such as subcutaneous hard nodules themselves are one kind of reflective phenomenon on the body surface. There is a special needling technique called **resistance-needling**

method (RNM) that requires raised tensions of soft tissues at the affected region in advance for the convenience of finding and eliminating latent tender spots (refer to Section 12.7). Alternation of tensions in soft tissues can be realized through selecting specific postures or other modalities, such as massage or thermal applications.

In summary, the above four types of preexisting functional states in patients are closely related to the effects of acupuncture. Except for personality traits, all other types can be altered at a certain degree by specific approaches such as physical exercises, breath trainings or other modalities.

11.9 Miscellaneous Needle-Manipulation Techniques

Due to the simplicity of needling therapy, in addition to the selection of most effective points, applying various needling styles to fit different diseases conditions or patients, has been long pursued. Accordingly, miscellaneous needle-manipulation techniques have been created; some of them are single styles, while others are complex styles. These techniques have accumulated rich experiences in several stages of *deqi* including *houqi* (waiting *qi*), *cuiqi* (encouraging *qi*), *shouqi* (preserving *qi*), and *xingqi* (circulating *qi*).

Lifting-thrusting and twisting needles are two most basic needle-manipulation techniques. For their stimulation characteristics, refer to Section 8.4. If they are categorized according to the location of the needle tip or needle body with a point, the needle lifting-thrusting method is repeatedly up and down movements with or without deviation of needling

directions, while the needle-twisting method generally does not deviate from the original position after inserted to the intended depth.

Looking at hundreds of needling methods^[90] throughout the ages, they vary from style to style. If not considering some primitive and vague TCM concepts, such as *tonification* or *purgation* or complex changes in stimulation parameters, and only focused on whether the needle body moved within a point during the needling, then they can be simplified to the following two types.

11.9.1 Move the needle body subtly without deviation of the needle tip during needling

This can be further divided into two situations. The first is using the continuous or abrupt movement of fingers or wrist to vibrate the needle body slightly, such as nail-shooting, scraping, vibrating, sparrow-pecking methods. The second is a combination of horizontal twisting, swinging or pressing on the needle body so that both the needle body and the needle tip generate the stimulation force. These include the frequently used needle-twisting method as well as other needle-manipulation techniques, such as *rubbing*, *flying*, *dragon-tiger contending*, *shaking*, *rolling*, *green dragon waves its tail*, *white tiger shakes its head*, *circulating* (similar to *cutting*), and the newly developed *penknife* method, *bending* (reverse method).

Under the condition of the first situation, the stimulation of the needle tip or body within the point is subtle and steady, with a more fixated direction and needling sensations smoothly sustained. However, under the condition of the second situation, the stimulation of the needle tip or body within the point is strong and unsteady, with a much greater degree of alteration for the stimulation direction, thus needling sensations are more obvious. This is helpful to control the propagation direction of needling sensations.

11.9.2 Move the needle tip or body within different depths or portions of a point, with certain patterns

This type of needle-manipulation techniques includes *knocking*, *zi-wu-dao-ju*, *triple puncture technique at superficial, medium and deep layers*, *dragon-tiger ascending alternately*, *heat-producing*, *cool-producing*, and so on. They are mostly lifting-thrusting, of which stimulation layers are either superficial or deep. Moreover, during continuous lifting-thrusting, even if the needle tip may return to the preceding depth, it may not be the original point of stimulation. Thus, these types of manipulations may form a three-dimensional stimulation area across the entire point with a great stimulation amount. Whereas the needling sensations generated are intense and often beneficial in generating a local heat sensation that is otherwise difficult to acquire.

When practicing the aforementioned methods, various combinations of the amplitude and times or frequencies of moving needles, such as the speed of needle-manipulation may often be required. Actually, this is a key factor for acupuncture

stimulation (refer to Section 8.3). In general, a larger degree of the needle body movement within the point, a higher moving frequency, a more intense force applied, and a stronger needling sensations generated, may ultimately lead to a greater amount of needling stimulation. Interestingly, certain needle-manipulation techniques were even renamed after their stimulation frequencies were altered. For example, when using the *flying method* and *slow-tonification and swift-purgation method* in combination, it was called either *red phoenix meeting the source point* or *phoenix spreads its wings*. In addition, one needs to be wary of some ancient needling methods that emphasized on combinations of odd/even numbers (e.g., nine and six) of stimulation. Although the number of repeated stimulation can affect the stimulation amount, there should be little or no difference between nine or six times. Thus, usually there is no need to be tied down by such primitive conventions. As for the details of aforementioned needle-manipulation techniques, refer to the related acupuncture literature as well the needling techniques book by Prof. Lu, Soukang^[90].

Advanced Needling Techniques

Acupuncture has been practiced for thousands of years, and the ancestral Chinese have created many styles of classical and advanced needling techniques, such as the heat/cool- producing techniques and a series of methods to control the propagation of needling sensations. In the modern time, many novel needling techniques have been developed and they have achieved great success for many intractable diseases, of which the **nerve stimulation method**, the **blood vessel stimulation method**, and the **resistance-needling method** are the most representative. The **method of moving the needle with electricity** and the **Jin's painless needle-shooting technique** are our contributions to this field. Advanced needling techniques are helpful in attaining optimal effects of acupuncture though most of them have a high learning curve. In this chapter, we attempt to simplify those complex procedures or techniques by discarding some falsified or nonsense information.

12.1 Point-Probing and Repeatedly Needle-Thrusting Methods

Clinically, practitioners may often encounter

hyposensitive patients, whose body sensitivity toward acupuncture stimulation is generally low, and difficult to achieve satisfactory needling sensations or results. For this, a useful strategy is to apply either the **point-probing method (PPM)** or **repeatedly needle-thrusting method (RNTM)**.

Generally, there are more than two reactive layers within an acupoint or reflex point. After the needle is inserted, it first explores the most sensitive layer or center via its tip within a limited range, then twist, thrust/lift the needle to attain intense needling sensations. This is the commonly used PPM, which slightly moves the needle tip to acquire the maximum needling sensations.

According to our experience, proper procedures of PPM may be as follows. After the needle is inserted into a point at a certain depth, if no intense needling sensations or responses are generated, the practitioner may change the needling direction at the same insertion depth toward all sides to seek the sensitive center. Meanwhile, continue to inquire on or observe any response of the patient. Once a slight needling sensation appears, immediately cease the shifting of the needle tip, and then twist the needle to generate the maximum needling sensations. The needle-twisting can be one directional until the needle cannot be twisted anymore. The direction could be either clockwise or counterclockwise,

depending on where the most intense needling sensations may lie. If desired needling sensations are not generated after such manipulations, depress the needle into a deeper layer of the point and repeat the above procedures. Through several repeated attempts, the most sensitive center should have been stricken along with the attainment of desired needling sensations.

In general, when puncturing fleshy points, the practitioner may only feel “emptiness” around the needle unless the sensitive center has been stimulated. When stimulated, the practitioner may instantly experience **TDSAN** (tenseness and dragging sensation around the needle) while the patient may experience local needling sensations that could be propagated toward the surroundings. These regional reactions are two basic components of *deqi*. At that time, many patients may report certain relief of symptoms.

To attain greater needling sensations, one could try the method of RNTM, or called *zi-wu-dao-jiu* method in TCM. This is a representative method of intense stimulation, originated in the ancient literature of *Golden Needle Poetry*, and later has passed down to TCM practitioners across China since Ming dynasty. In this method, *zi-wu* means to twist the needle left or right, *dao-jiu* means to thrust the needle up or down. The *zi-wu-dao-jiu* method is a complex needling style that is primarily needle-twisting and lifting-thrusting manipulation by adjusting their speeds. Twisting the needle left is **tonification**, while twisting the needle right is **purgation**. This method considers the point has three layers during needle-thrusting and only two layers during needle-lifting. According to classical description, this method requires *thrusting three times and lifting twice* in each point, 371 times of lifting-thrusting and twisting in each layer, totaling 1 113 times.

In the modern times, RNTM has been simplified.

Its primary features may lie with the frequent stimulation by needle-twisting and lifting-thrusting. Obviously, this method attempts to strike as many sensory receptors as possible that may lodge within all layers of the point, thus, it can mostly acquire intense needling sensations along with satisfactory results. However, it does have some weaknesses. If the sensitive center is not at the initial needle-insertion direction, in spite of the number of needle-manipulating trials, the sensitive center will be difficult to be stricken. Therefore, when using the *zi-wu-dao-jiu* method, it is best to adjust the needling directions continuously. During the adjustment, slightly withdraw part of the needle body but leave the needle tip beneath the skin, then change the direction pointed by the needle tip and thrust the needle toward a new direction. Accordingly, RNTM indeed may provide a complete stimulation at all directions or layers of the point.

Comparing the above two methods, PPM first sequentially explores the sensitive center within the point at each depth and angle of needling, with continuous adjustment. After locating the sensitive center, then intensify the stimulation. The entire needle-manipulation process is usually mild with fewer local lesions of tissues. Actually, it is a feedback revision process to attain optimal needling sensations. However, it is somewhat timeconsuming, and requires the patient to timely report subjective feelings.

As for RNTM, it integrates the needle stimulation and the exploration of needling sensations together that covers every part of the point. Thus, it has intense manipulations and more local lesions of tissues. However, it is less time-consuming, and does not require a timely response by the patient. Therefore, if the body sensitivity of the patient is normal or cooperative, then PPM has more advantages with a higher success rate. If the body sensitivity of the patient is low, or PPM has failed

due to a slow reaction or with an uncooperative patient, then RNTM can be applied with better results.

12.2 Needle-Manipulations with both Hands

Most acupuncture practitioners are proficient with only one hand, such as the right hand to manipulate needles. However, if the practitioner is capable of needle-manipulation techniques with both hands, there will be much more therapeutic benefits. When a sustained needle-manipulation over 5 min is required, an alternating application of both hands can complete this task easily while avoiding attenuated finger strengths in operations using only one hand. Moreover, it is particularly suitable to allow two different points stimulated concurrently, which might lead to a greater amount of stimulation input through different information pathways and greatly enhance the therapeutic effectiveness (refer to Section 11.7).

For most practitioners, there is a distinct difference of finger strength between both hands. In general, right-handed practitioners have stronger right fingers than left. Take example of scraping the needle, the right fingers may apply a more intense manipulation for a longer time, which may vibrate the needle intensely. This holds true in left-handed practitioners as well. Besides finger strength, the difference of motor coordination capabilities of both hands are also significant, which may be manifested as non-uniformly controlled needling parameters such as the speed of needle-twisting and the amplitude of needle-lifting/thrusting. Therefore, in order

to use both hands proficiently, one should proactively exercise the non-dominant hand, as well as improve the coordination of both hands, which is crucial when two non-uniformed manipulations need to be completed, such as twisting two needles at opposite directions simultaneously.

Despite the learning difficulty of using both hands, it is still achievable. Throughout the ages, many Chinese acupuncture pioneers such as Master Jiao, Mianzhai are superior in this field. Skillful with both hands, Dr. Jiao can scrap or twist needles for a lengthy period (sometimes over 20 min), and has invented a set of methods of **moving palms to circulate qi** that combines *qigong* to exercise the finger strength. For detailed descriptions of these methods, refer to Master Jiao's book *Needle-Manipulations* ^[177].

The ancient *dragon-tiger contending* method is one of the alternating needle-twisting methods. The "dragon" means twisting the needle to the left, and the "tiger" means twisting the needle to the right. Their alternations represent "contending". This method can be applied either with a single hand (combining needle-twisting to the left nine times and to the right six times), or with both hands alternately at a single point (both thumbs moving forward). In addition, it is suitable to use both hands on two symmetrical acupoints respectively, and twisting needles simultaneously. It may start with both thumbs moving forward to the end of the turn, and then go back and forth for as many times as needed. Keep the speed of bilateral needle-twisting consistent. As a result, it can induce two separate stimulation with opposite needling forces on both sides of the body. Indeed, this needling style depicts a scenario where a "dragon" and a "tiger" at the left and right side of body, are contending with each other.

12.3 Point-Probing with Electroacupuncture

For patients with hyposensitivity of the body surface, when stimulating fleshy points without *deqi* after using PPM, another way is applying an electrical charged filiform needle to explore the point; we call it **point-probing with EA (PPEA)** (Figure 12.1).

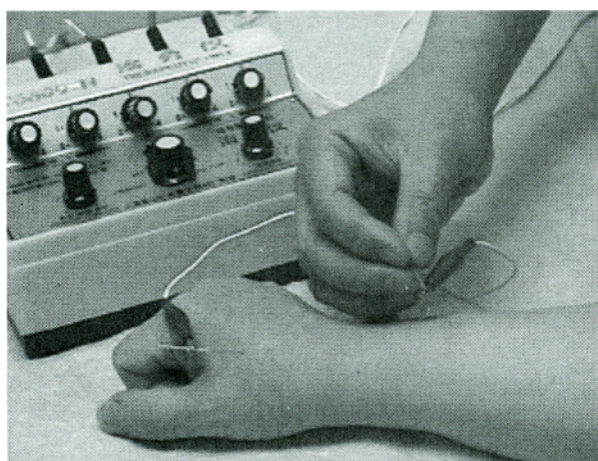


Figure 12.1 Point-Probing with EA

The following are the general steps of PPEA. When PPM has failed in attaining *deqi* in two separate points, do not withdraw the needles yet, instead, hook the needles to a pair of electrodes of an EA device, and observe the local tissue response after the electricity is turned on. Adjust the intensity of electrical current to a moderate level that is usually sufficient to induce muscle twitching around the needles. If this response is already apparent, then the needle tips have already stimulated the sensitive centers of the points. If this response is not triggered, then start to probe the sensitive centers with the “electric charged” needles. At all angles or different depths, slightly move the needles like that in PPM while paying careful attention to the patient’s responses around the needles. Once remarkable muscular twitching occurs,

immediately cease any movement of the needles and finish the probing. Afterwards, for those patients requiring EA, the needles can be retained until the completion of the EA treatment. Otherwise, the needles may be manually manipulated following the removal of electrodes.

This method was created while we treated stroke patients using EA. It is especially suitable for fleshy points as well as for patients with hyposensitivity or situations where they cannot timely report subjective feeling. In addition, it is advantageous to the treatment of paralysis. The local muscular twitching is often one of the optimal responses around the needle when treating paralysis. Whether the paralysis is due to central or peripheral nerves, this method can be applied at any paralyzed muscles in the patient.

Using the “electric charged” filiform needles to probe sensitive centers within the point is different from those devices such as the point or meridian explorer used in the clinic. Although both are electrical probes, the latter measures the changes of skin electric resistance or potential, whereas PPEA is used to locate the sensitive center nearest to the nerve trunks and branches by exploring responses of all tissues to the electrical stimulation. Ultimately, these two methods probe different layers of the point with distinguishable application scopes.

Note that the intensity of electric current used for PPEA should be moderate and adjusted according to the individual body sensitivity. Usually, this method is not recommended for patients of normal body sensitivity because sudden and overly intense needling sensations or muscle twitching might be generated upon electric charged probing. It is advised that PPM should be applied first to test the body sensitivity of the patient prior to PPEA.

12.4 Nerve-Stimulation Techniques

Nerve-stimulation technique is a novel therapy that integrates acupuncture with the knowledge of neuroanatomy, and has greatly enriched the contents of acupuncture therapy. This technique includes the stimulation on spinal radicle, nerve trunks, and nerve plexus, of which the stimulation on nerve trunks is the most frequently applied in the clinic.

General methods to stimulate nerve trunks are needling, plucking, embedded catgut suture, surface electrodes, and injections of Vitamins or normal saline. Here we only introduce the first two methods, nerve-stimulation by needling or plucking. As for other methods and detailed stimulation spots, refer to related literature ^[22] and sections in Part Three of this book.

It has known that the anatomical basis of acupuncture therapy is neural reflex arcs. During the classic acupuncture, therapeutic information is mainly inputted through the activation of sensory receptors and nerve endings within acupoints. Occasionally, certain nerve trunks or branches within acupoints could be stricken, such as the sciatic nerve being stimulated when Huantiao (GB30) is punctured deeply. Meanwhile, an electric-shock sensation can be generated. Because the electric-shock sensation or numbness is a specific indicator that only occurs upon stimulation of nerve trunks or branches, any needling sensations mixed with electric-shock sensation or numbness more or less suggest that certain nerve trunks passing through the point have been stricken.

The method of **NSN (nerve-stimulation by needling)** is intentionally to strike nerve trunks based on the knowledge of neuroanatomy, which differs from the occasional situations encountered when puncturing regular acupoints. Generally, this

stimulation targets the nerve trunks innervating the affected region of the body, and attempts to acquire the electric-shock sensation that may radiate to the affected area. Because peripheral nerve trunks are mostly consisting of a mixture of afferents and efferent nerve fibers, they are connective trunks from terminal sensory receptors to nervous centers or from nervous centers to motor effectors. When nerve trunks are stricken, the intervention information is not inputted from terminal sensory receptors of the reflex arc. Instead, it is inputted directly from afferent or efferent nerves, namely the intermediate components of the reflex arc (refer to Section 2.6). Accordingly, NSN may attain its therapeutic effectiveness through a shorter reflex arc and the input of greater stimulation amount.

For NSN, general filiform needles and their needle-insertion methods can be applied. The selection of insertion spots is based on the traveling routes of nerve trunks. In general, after the needle is inserted, slowly depress it into the deeper portion of the spot to seek an electric-shock sensation that may radiate to the affected region of the body. If it does not appear that indicates nerve trunks have not been stricken yet, adjust the depth or directions of needling. The probing procedure with feedback revisions is similar to that in PPM (refer to Section 12.1). Once the electric-shock sensation occurs, immediately either withdraw the needle or cease the probing process while retaining the needle. Alternatively, strengthen the stimulation mildly with a few cycles of twisting or flicking of the needle before withdrawing or retaining. While applying NSN for paralysis of the limbs, the needles may be hooked to an electric stimulator for additional stimulation to strengthen the stimulation amount during the needle-retaining period. However, avoid an overly stimulation of nerve trunks to prevent neural injuries.

Commonly, locating nerve points is not difficult.

Moreover, some of their locations are identical with acupoints. For example, the sciatic nerve trunks can be stimulated easily in the deep portions of Huantiao (GB30), Chengfu (BL36), and Yinmen (BL37). The deep peroneal nerve can be punctured on Zusanli (ST36) with an electric-shock sensation radiated down to the dorsum of the foot. The tibial nerve can be punctured on Weizhong (BL40) or Taixi (KI3) with an electric-shock sensation radiated down to the sole or toes. The deep radial nerve can be punctured on Quchi (LI11) with an electric-shock sensation radiated down to the hand. The median nerve can be punctured on Neiguan (PC6) with an electric-shock sensation radiated down to the middle finger.

Flicking the needle during NSN is a simple and useful stimulation style. For this, it is advised to use stainless steel filiform needles with a diameter of 0.5~1.0 mm and a length of 3~10 cm. Aimed at the selected nerve point, the needle is inserted quickly, then slowly depressed along with a mild rocking of the needle body in a perpendicular direction with the nerve trunk. When the patient appears to have an electric-shock sensation or muscle twitching, it indicates the nerve trunk has been stimulated. Tap the needle handle 5~15 times according to the individual tolerance level. Withdraw the needle instantly after flicking. This style of NSN may be applied once daily or once every other day, 15~20 sessions as a single course of treatment; one week of interval between two courses of treatment. This style of NSN is mainly used for paralysis, various types of neuralgia and numbness, and has remarkable results for trigeminal neuralgia, peripheral facial paralysis and facial muscle spasms (refer to Sections 14.5, 14.6 and 14.7).

For some superficial nerve points, such as the general peroneal nerve spot, the median nerve spot, ulnar nerve spot^[22], needles are often not required, instead, plucking the nerve trunk with the fingers

are used. For example, the brachial plexus spot that is 1 *cun* above the middle clavicular, namely Jingbei (EX92) is plucked, an electric-shock sensation can radiate to the patient's ipsilateral fingers. These superficial nerve points are easily located by touching or pressing of fingers. Even if needling is required, the depth of insertion of 0.5~1 *cun* is usually sufficient in obtaining radiating electric-shock sensations.

Occasionally, NSN targets some spinal spots, which usually are selected between the second lumbar vertebrae (L2) and the lower cervical vertebrae. When needling these spinal spots, take a sitting posture, lower the head and bend the waist slightly, needle tip is slightly pointed upward as it is inserted obliquely 1.5~2.5 *cun*. Slowly insert the needle, wait for electric-shock sensations to appear, then immediately cease any manipulation and withdraw the needle without retaining. We once integrated this method to treat rheumatoid arthritis and other diseases with good results (refer to Section 13.7). However, because stimulating the spinal spots with needles is full of risks, this method must be used extreme cautiously. Instead, one may apply epidural puncturing with EA to attain similar therapeutic effectiveness, which is applicable for intractable pains caused by visceral tumors or other diseases. Alternately, one can also apply filiform needles to stimulate Huatuoji (EX102) points corresponded to those spinal spots^[27] or place surface electrodes on them for EA.

Numerous studies have demonstrated that NSN not only can dramatically reduce number of points selected each time, but also can strengthen needling sensations and raise therapeutic effectiveness. It was observed that in 1 232 cases with 11 types of symptoms of hemiplegia, sciatica, hysteria, facial neuritis treated with NSN, 97.3% had good results and 61.3% achieved curative rate^[22].

12.5 Pulsating Responses and Pulsating Points

During needling therapy, local muscle twitching or pulsating responses of the extremities often can be seen with the naked eye. Those acupoints or stimulation locations that show such responses are called **pulsating points**, such as Hegu (LI4), Shousanli (LI10), Quchi (LI11), Ximen (PC4), Naoshang (EX119), and Jianqian (EX118) on the upper limb as well as Huantiao (GB30), Yinmen (BL37), Chengjin (BL56), Chengshan (BL57), Zusanli (ST36), Houling (EX157), Fenglong (ST40), Qianzheng (EX63), and Tianzong (SI11) on the lower limb. In fact, by NSN stimulation on many nerve points mentioned in the preceding section, pulsating responses are frequently accompanied with the electric-shock sensation. Not only are they resulted from the stimulation of nerve trunks, but also from a reflexive contraction of extrafusal muscles due to stimulation of muscle spindles. This section describes various pulsating responses and introduces applications of pulsating points.

According to their manifestations, pulsating responses can be divided into two classes. The first is the visible muscle twitching around the needle while the practitioner feel sudden TDSAN (tenseness and dragging sensation around the needle) *as if the fish is swallowing the bait*. Simultaneously, the patient may feel intense needling sensations of soreness and distension, but without evident jerks of the limb. The second is the occurrence of jerks on the limb or joint stimulated. Meanwhile, the patient may have an electric-shock sensation, soreness and distension, or even pain. Of course, some patients might not experience any needling sensations.

Obviously, the first class of pulsating responses can be regarded as an “amplified” or visible phenomenon of *deqi*. It usually occurs when

puncturing an acupoint or reflex point located at the muscular area of the body, and is the result of stretch reflexes by needling muscle spindles distributed within the point. Once muscle spindles are stimulated, the afferent impulses from the sensory apparatus within the muscle spindle are raised that can induce myoelectric activities and contractions of extrafusal and intrafusal muscle fibers. The reflective contraction of extrafusal muscles usually is the cause for visible muscle twitching around the needle, whereas, the contraction of intrafusal muscle and reflective tension of local extrafusal muscles might be related to the occurrence of TDSAN and the facilitation of local sensory excitations to induce soreness and distension (refer to Section 2.5).

The second class of pulsating responses has mechanisms that are more complex and may be further categorized into three types.

First, the jerks of the limb or joint stimulated are due to direct stimulation of motoneuron trunks. During the stimulation of nerve trunks, either sensory afferent fibers or motoneuron efferent fibers can be stimulated (refer to Section 2.3). When motoneuron fibers are stimulated, multiple motor units may be synergistically contracted, which may lead to evident stretching movements of the joint. This is especially significant when thicker mixed nerve trunks are stimulated. For example, there are jerks of the lower limb upon stimulation of the sciatic nerve trunk during the deep puncture of Huantiao (GB30), Chengfu (BL36), Yinmen (BL37), or Weizhong (BL40), as well as the flexion of the middle finger upon stimulation of the median nerve in Neiguan (PC6). Therefore, this type is actually a NSN method for motoneurons.

Second, the jerks of the limb or joint stimulated are due to flexor reflexes that are induced by nociceptive stimulation on the body surface. For example, when stimulating Yongquan (KI1) at the

sole or Qiuxu (GB40) at the ankle with an augmenting intensity, the ipsilateral foot, sometimes even the entire lower limb will have a flexion response. When puncturing either Shixuan (EX128) or Laogong (PC8), a flexion jerk of the upper limb may be induced. Actually, these flexor reflexes are attempting to evade the nociceptive stimulation. When puncturing the paralyzed limbs of hemiplegia patients, these phenomena are frequently seen. The main mechanism of this phenomenon includes two aspects. Because of the hypersensitivity of the paralyzed extremities, a light needling stimulation is sufficient to induce the pain. In addition, due to reduced inhibitory effects from the higher centers, the spinal flexor reflex becomes expanded. Acupoints that can trigger this kind of reflex are mostly located at the extremities or more sensitive areas surrounding the small joints. These flexor reflexes can be utilized as a type of passive exercise in the rehabilitation treatment of hemiplegia (refer to Section 14.9).

Third, the jerks of the limb or joint stimulated are due to the stretch reflex caused by stimulation of muscle spindles. It is similar to the first type of pulsating response, but can only take place at the region of smaller joints, such as the fingers. The finger movement may be dependant on the contraction of a single muscle. Take puncturing Hegu (LI4) as an example, an evident twitching of the index finger or thumb along with intense needling sensations of soreness or distension could be observed. It has been proven that this jerking is induced by the activation of corresponding muscle spindles. There are two different groups of muscle spindles within Hegu (LI4), which are responsible for the movements of the thumb or index finger respectively. When the needle tip is near the first interosseous dorsalis muscle at the ulnar side, there is an abducting movement of the index finger,

whereas the needle tip is close to the adductor pollicis at the radial side, there is an adducting movement of the thumb. In this book, it is called **tendon reflexes induced by acupuncture** (refer to Section 2.5).

In short, the second class of pulsating responses, specifying the jerks of the limb or joint stimulated may have any of the three mechanisms mentioned above, namely the stretch reflex induced by the stimulation of muscle spindles, the flexor reflex induced by the pain stimulation, and the muscle contraction resulted from direct stimulation of motor nerves. Nevertheless, the **pulsating points** termed here only refer to those that may have induced visible muscle twitching (the first class of pulsating response) or the jerks of the limb or joint via stimulation on muscle spindles (the first type in the second class of pulsating responses). The stimulated locations with pulsating responses caused by other two types of mechanisms generally are not considered in the scope of pulsation points.

Because muscle spindles are extensively distributed, when puncturing most fleshy acupoints, the muscle spindles are easily stimulated to attain *deqi*. Then, why are the visible muscle twitching or pulsating responses not generated each time when the spindles are stimulated? The occurrence of pulsating responses may be influenced by the following three factors in addition to the activation of muscle spindles.

(1) The appropriate body postures and relaxed muscles. Unless the body is fully relaxed, particularly the local muscles, the reflexive contraction of extrafusal muscles cannot be aroused by stimulation of muscle spindles. This is like the requirement for the knee jerk reflex test when the lower limb must be bent and relaxed prior to the tapping of the femur quadriceps tendon. Although the basic center of the stretch reflex is in the spinal

cord, it is still facilitated or inhibited by higher centers. Under certain pathological conditions, such as the recovery stage of apoplexy/hemiplegia, the pulsating responses by needling are particularly easy to be observed due to the reduction of spinal inhibitory effects from higher centers. Therefore, when puncturing Shousanli (LI10) or Quchi (LI11), the forearm should be bent slightly and relaxed fully to facilitate the generation of muscle twitching of the extensor carpi radialis longus. When puncturing Jianyu (LI15) or Naoshang (EX119), the upper arm should be jacked up slightly with the deltoid muscle completely relaxed in order to induce the muscle twitching. As for proper body postures, refer to Section 10.2.

(2) Only superficial muscle twitching is visible. It requires a superficial needling instead of deep needle-insertion. The contraction of the deep muscles might only be felt but not visible, similar to TDSAN. When deep needle-insertion Huantiao (GB30), besides TDSAN, the most frequent sensations are electric-shock sensation radiated to the foot, or some jerks of the lower limb, which is resulted from the stimulation of sciatic nerve located at its deep portion. If the intended is only superficial muscle twitching in the buttock, then the superficial sensitive center should be targeted, namely probing muscle spindles within superficial gluteus maximus muscles. This is also true when puncturing Shousanli (LI10) or Quchi (LI11), where superficial needling (about 0.5 *cun* deep) is required. Otherwise, when piercing Quchi (LI11) into Shaohai (HT3), though a deep needle-insertion might generate needling sensations of soreness and distension in the entire forearm due to the activation of deep sensory receptors, there would be no simultaneous twitching at superficial muscles (the extensor carpi radialis longus).

(3) Only small joints (such as fingers) moved by

simple muscle contractions may twitch upon needling. Those large joints of the limbs controlled by synergistic effects of multiple muscles will not jerk unless the muscles are subjected to a concurrent stimulation. When only parts of them are stimulated, at most the stimulated muscle shows some twitching. For example, when puncturing Jianqian (EX118) of the anterior shoulder, only anterior portions of the deltoid muscle around the needle may twitch instead of jerks in the entire upper arm.

Therefore, in order to acquire visible muscle twitching, take the above three influencing factors into the consideration. Moreover, to locate pulsating points correctly, one may apply acupressure tests on the prepared locations prior to needling. A similar muscle twitching can often occur just by pressing with gliding fingers.

Prof. Wang, Dai, of Beijing, China, is an expert in this field. He once applied the method of puncturing pulsating points to treat 32 cases of hemiplegia patients caused by cerebral infarct. The selected points were located at the *Yang* meridian of the affected side, such as Jianyu (LI15), Quchi (LI11), Hegu (LI4), Huantiao (GB30), Yanglingquan (GB34), and Guangming (GB37). The results showed 20 cases fully recovered, four cases with remarkable effectiveness, and six with some effectiveness, the total effectiveness rate is 93.75% [90]. We had similar findings about the efficacies of pulsating points for hemiplegia patients, and later applied this method for other motor dysfunctions or diseases, such as neural paralysis, frozen shoulder, and tendonitis with remarkable effects (refer to Section 14.9). In addition, for various pains, as long as there are pulsating responses around the needle, a speedy pain-relief mostly can be achieved.

Note that modern observations on pulsating responses have widened recognitions about the *deqi* phenomenon. In TCM, according to the speed of *deqi*,

it can be classified to either *xie (evil) qi* or *guo (grain) qi*. As stated in the book *Yellow Emperor's Internal Classic*: "The evil *qi* comes fast and furious, the grain *qi* comes slowly and peacefully." Indeed, these are classical descriptions of differentiating the two type of *deqi* around the needle. For the grain *qi* that is generally considered to have positive effects, it comes slowly and peacefully. The patient feels comfortable while the practitioner experiences TDSAN but without distinct resistance of needle-manipulation. For the evil *qi* that is generally considered to have negative effects, it comes fast and furious. The practitioner may feel a sudden TDSAN around the needle, and a greater resistance of needle-manipulation, or needle-stuck feeling may follow.

As mentioned above, the pulsating responses of muscle twitching is one "amplified" or visible phenomenon of *deqi*. From the definitions of the above types of *deqi*, the pulsating responses come fast and furious, which seem to pertain to the category of evil *qi*. However, under most situations, the muscle twitching ceased instantly and subsequent needle-manipulation techniques usually have no obvious resistance encountered. Moreover, there might be subsequent muscle twitching generated if the needle is repeatedly manipulated. Thus, we believe this kind of visible muscle twitching should still pertain to the category of grain *qi*. In other words, grain *qi* may not always come slowly and peacefully. According to the notion of *effect upon arrival of qi*, the muscle twitching can be regarded as the most remarkable phenomenon of arrival of *qi* or *deqi*. Generally, when *deqi* occurs, the TDSAN felt by the practitioner also may come abruptly as long as the needle tip is striking a certain spot within the point. Thus, *deqi* also pertains to the grain *qi*, but its occurrence is different from the visible muscle twitching. Furthermore, TDSAN is mainly caused by a sudden increase of local muscle

tension instead of the muscle twitching. Of course, any possible muscle twitching, which might occur at deep parts of the point and invisible from the surface, is not excluded from the generation of TDSAN.

However, the type of pulsating response that manifests as the flexor reflex seems to pertain to the evil *qi*, because certain jerks of the limb might result in the bent and stuck needle. For example, this situation often occurs when puncturing Zusanli (ST36) for paralyzed foot of the hemiplegic patient, which can trigger a sudden flexion of the foot. To avoid this situation, proper selection of pulsating points according to the individual needs is crucial. For paralyzed foot, one may choose Qiuxu (GB40) at the ankle or Yongquan (KI1) at the sole instead of Zusanli (ST36). These points can induce the same flexion reflex of the foot but will not bend the needle. This fact suggests that at certain circumstances, even the evil *qi* can be useful.

Actually, classical *deqi* is only defined as TDSAN without various pulsating responses by needling, which might be attributed to the thick needles used in the ancient times. Thick needles are difficult to be punctured deeply, and may cause more needle-insertion pain. They may also have different actions compared with thin needles commonly used today. The recently developed NSN techniques usually require deep puncturing for stimulation of nerve trunks. Meanwhile, thin needles (No. 30~32) are often used to avoid possible lesions of the nerves. Similarly, in order to acquire muscle twitching, it is better to use thin needles. Generally, thin needles can induce muscle twitching more easily than thick needles because thicker needles may stimulate a larger area which might lead to worse needle-insertion pain and may activate additional sensory receptors prior to or during the activation of muscle spindles. These factors may have inhibitory actions

on the stretch reflex induced by muscle spindles.

12.6 Blood Vessel Stimulation Techniques

The method that applies needles to prick superficial blood vessels of specific locations on the body surface, and to let out slight amount of blood to treat diseases is called **pricking blood vessels, blood-letting puncture**, or known as **collateralmeridian puncture** in TCM. Because it is slight painful than regular needling techniques without bloodletting, its stimulation amount inputted to the body is comparatively greater, thus it may raise therapeutic effectiveness.

However, stimulation aimed at blood vessels may be realized through other ways without bloodletting or on locations that are non-acupoints. Here we have categorized all styles of blood vessel stimulation, whether they are on acupoints or not, as **blood vessel stimulation techniques**.

Blood vessel stimulation techniques can be classified into two types: The first is the **pricking blood vessels** that directly use the needle to prick small blood vessels to let out a slight amount of blood. The second is the external stimulation of certain large arteries by a pressing hand or through other means without any bloodletting. The blood vessels pricked can be either superficial or deep, which pertains to either intentional or coincidental stimulation, respectively. Namely, superficial blood vessels are visible and its pricking can be planned intentionally. Deep blood vessels are hidden, but still can be occasionally pricked by a deep needle-insertion. Both of them are types of intense stimulation on the body.

When the intentional bloodletting technique is applied, superficial congested veins are usually targeted with a three-edged needle, such as in the case of pricking blood vessels at Weizhong (BL40) for lumbago. The blood that comes out of veins is dark blue and the amount let out each time may vary from several drops to 10 mL ^[81]. For acupoints on the extremities or the areas with abundant blood vessels, slightly thicker filiform needles also can be used instead of the three-edged needle. The blood that slowly comes out from capillary blood vessels is dark red. The examples of this case are pricking blood vessels at Shixuan (EX128) for shock, or pricking blood vessels at Shaoshang (LU11) for tonsillitis (refer to Section 20.1), pricking blood vessels at Taiyang (EX4) and Yintang (EX2) for headaches. In addition, applying the seven-star needles to let out blood from the capillary blood vessels of the skin is also common and can achieve therapeutic effectiveness for some cutaneous neuritis.

In clinical acupuncture, when the bloodletting puncture is not needed, one should avoid pricking visible blood vessels at the superficial skin during the needle-insertion. Of course, it is inevitable to strike some hidden blood vessels in the deep portion of the point. According to an observation of 308 acupoints by Dalian Medical Univ., China, there were 106~141 acupoints (36.7%~45.9%) where the subcutaneous veins or deep blood vessels were pricked ^[154]. When blood vessels are punctured, the pain felt by the patient is the most direct indicator. At this time, if the needle has already pricked the blood vessels but is not withdrawn, the pain sensation may gradually subside. As the needle may still plug the wound in the blood vessel wall, no instant bleeding will occur unless the needle has been withdrawn.

The amount and speed of bleeding is related with

the size and property of the punctured blood vessels. If the pricked blood vessels are venule or capillary, they have only slight amount of dark exudative blood. If the pricked blood vessels are small arteries, the bleeding of red color would be fast, and may quickly swell up. Therefore, whenever the patient feels pain during puncturing, check to see if there is any bleeding at the punctured spot immediately after the needle is withdrawn. To prevent bleeding, use a dry cotton ball to press the punctured spot for a short while. Once bleeding occurs, press the spot longer for several minutes. However, for patients whose disease condition is indicative for bloodletting method, a slight amount of bleeding by puncturing might actually be beneficial, such as for vascular headaches (refer to Section 14.8). In such cases, there is no need to attempt to stop exudative blood immediately. Until a certain amount of blood is let out, then press the needling area tightly. Of course, it should be carefully considered like any other bloodletting puncture methods, never underestimate the risks of a hemorrhage.

The mechanisms behind bloodletting puncture methods may be related to neural reflexes induced by the activation of pain-pressure sensory receptors distributed densely at the vein and artery walls. In addition, the smooth muscles on the arteriole walls and their sympathetic innervations are directly stimulated, which may be involved in the effects of regulating regional vasotonia during the bloodletting puncture. To attain the maximum effects of stimulation on the blood vessels and regulation of sympathetic activities, it requires an intense regional pain and a certain amount of bloodletting. The former indicates that more free nerve endings have been activated. The latter indicates that regional blood vessels may have been moderately pricked and the sympathetic vaso-constriction has been inhibited. Obviously, the three-edged needles can

fulfill these requirements more easily than filiform needles.

However, note that the bloodletting puncture is not suitable for every patient. It must be cautiously used for those prone to bleeding, females during menstruation, or those taking Aspirin or other blood thinning medications. For them, even general acupuncture can induce slight bleeding from the needled spots easily. Thus, it is advised to avoid using bloodletting puncture whenever possible.

Besides the bloodletting puncture, another method of blood vessel stimulation is puncturing the thick walls of certain large arteries using filiform needles. This can achieve similar effects to the bloodletting puncture but without any bleeding. When the arterial wall is punctured but not pierced or the inserted needle tip is near the artery, a pulsating motion of the needle handle in accordance with the arterial pulses can be observed during the needle-retaining period. This phenomenon often occurs at certain locations where the arteries are superficial and the arterial pulses are easy to be detected by fingers. Examples of such are: The radial artery at Taiyuan (LU9), the posterior tibial artery at Taixi (KI3), the anterior tibial artery at Chongyang (ST42), the femoral artery at Jimai (LR12), the superficial temporal artery at Ermen (TE21) or Erheliao (TE22), the deep temporal artery at Taiyang (EX4), and the external carotid at Renying (ST9). Once the arterial wall has been punctured, cease any needle-manipulation techniques to avoid bleeding after the needle is withdrawn.

Applying the above method at Renying (ST9) where the external carotid artery sinus is located is the method of **sinus puncture**. However, it must be handled with care. For safety reasons, it is suggested to use finger acupressure or massage instead of needles to stimulate this acupoint. First, have the patient lie supine with the head lowered. After

locating the most distinct pulsating location of the carotid, massage or lightly press the location of one side no more than 6~7 sec each time. If needed, take several minutes of break and then repeat the procedure. In Western medicine, this way is often used to treat supraventricular tachycardia, where the onset could immediately subside in 50%~80% of the cases. The mechanisms are mainly resulted from the reflective excitation of the vagus ^[184]. This method can also be used for hypertension, bronchial asthma, cholelithiasis, gastrospasm, and so on. Renying (ST9) can also be stimulated using the seven-star needles, which has certain hemostasis effects for hemoptysis.

Alternately, temporary external oppression at large arteries, which supply blood to the affected region of the body, is a safer and more effective method. This is often applied in *tuina*. To recover the blood perfusion, the pressure should be released immediately once the distal blood circulation has been temporarily cut off. The commonly used are the femoral artery at Qichong (ST30) or Jimai (LR12), and the axillary artery at Jiquan (HT1). They are especially suitable for diseases with symptoms of numbness, chilliness, or pain of the extremities.

It was reported when the artery at Qichong (ST30) or Jimai (LR12) was oppressed for 2~3 min with the thumb, the patient could feel numbness and distension on the lower limb. Following the sudden release of the oppression, the patient could instantly feel a descending warmth like that of hot flush to the foot. Repeat this stimulation for 1~2 times to dredge the extremities with poor blood circulation. This method has certain therapeutic effectiveness for the obliterating thromboangiitis ^[155], and it can be combined with acupuncture to raise therapeutic effectiveness further. However, if the patient experiences intense pain due to this method, cease it immediately.

Clinically, to raise the patient's overall body

sensitivity to acupuncture, apply massage prior to acupuncture could improve regional blood circulation. The above external stimulation of large arteries can also be selected to attain the same goal. For example, when the sensitivity of the upper limb needs to be raised, one can apply the external stimulation on the axillary artery on the armpit. While the blood supply of the upper limb is being temporarily blocked, and following the sudden release of the oppression, the patient can instantly feel a descending warmth down to the hand. Afterwards, subsequent needling on the upper limb may have significant needling sensations or other responses around the needle. For this style of external stimulation on the large arteries on the extremities, the brachial cuff that is applied in blood pressure monitors can be instead of finger pressures.

12.7 Resistance-Needling Method

Resistance-needling method (RNM) is useful and effective in treating injuries of soft tissues, including muscles, tendons, and ligaments, and so on. As one kind of dynamic needling techniques, it aims to stimulate points with tenderness or spontaneous pain and requires a premise of increased regional muscle tension through certain special body postures.

For most acute or chronic pains of soft tissue injuries, regular acupuncture has satisfactory therapeutic effectiveness. However, for those with hyposensitivity of the body surface or those who have no obvious tender spots under a still posture but with pain or tenderness triggered by special postures, apply RNM can achieve marked and quick results.

During the regular needling therapy, patients are required to take a proper body position and relax the muscles or soft tissues in the affected or punctured region. On the contrary, in RNM, both detection and needle-manipulation of reflex points are applied under certain tensions of regional soft tissues. The detailed steps of RNM are as follows.

First, instruct the patient to actively move the affected part of the body towards all directions or ask an assistant to stretch the affected part until the patient feels regional pain or when the spontaneous pain becomes worse. At this time, there is obvious tenderness at the location where the pain is generated, and such tender spots are the intended spots of puncture. During needling, let the patient keep the same body posture without any movements of the affected region. Insert a needle into the center of tender spot, twist, lift, and thrust the needle for one minute or so. Generally, do not retain the needle. After the needle has been withdrawn, let the patient move the affected part towards all directions to compare any changes in pain level and location with that prior to puncturing. If the spontaneous pain or tenderness remains at the same location under the same posture, puncture the point once more but adjust the needling direction and depth. If the previous tender spot disappears but a new spot emerges, then puncture the new spot. The location of the new tender spot may be different from the previous location either under the same or different postures. Repeat this type of chasing stimulation until most tender spots are eliminated and the pain temporarily alleviated.

The difference between RNM and the regular needling method is the raised tension of regional soft tissues prior to and during treatment. The raised tension is attained when regional soft tissues including muscles are stretched to approach a certain degree of resistance. This is the origin of RNM.

During the detection of reflex points, due to the specific body posture and the consequently raised tension in the affected region, original symptomatic signals such as spontaneous pain or tenderness can be amplified. Thus, those originally weak or tiny tender spots may be fully explored (refer to Section 2.5). During the needling process, keeping the same body posture can ensure an accurate stimulation at the sensitive center of tender spot. A great deal of clinical practice has demonstrated that severe sports injuries (e.g., several ligaments or tendons torn concurrently) may cause lesions of the soft tissues that are located at more than one location. Meanwhile, there may be several tender spots coexisting, of which the most significant one may overwhelms others that have less degree of tenderness. Because these tender spots can be eliminated by directly puncturing, once the most painful tender spot has subsided, the secondary tender spots will dominant and may become the target of subsequent puncturing.

RNM usually has dramatic effects in treating sports injuries of soft tissues, and is applicable for either acute or chronic stages of them (refer to Section 13.3). It is also suitable for shoulder dyskinesia in the pain stage of frozen shoulder (refer to Section 13.1).

While applying RNM, the patient's position must be kept still. Otherwise, a sudden movement of the body during treatment may result in an acupuncture accident, such as making the needle stuck, bent, or even broken inside the point. Because the patient might not be naturally relaxed at the time of RNM, apply one or several cushions to fixate the stimulated region as a way of avoiding involuntary body movements. In case a needle becomes bent and stuck inside the point, the original posture should be recovered slowly so that the bent and stuck needle can be withdrawn smoothly. Of course, due to the higher quality of material used in making modern stainless steel filiform needles, under proper body

postures, it is rarely to see them break during clinical acupuncture.

12.8 Heat/Cool-Producing Techniques

Another strategy to improve acupuncture results is to attain needling sensations with particular properties through specific needle-manipulation techniques, especially warmness or coolness for patients of certain indications. When warmness or coolness is produced, it usually indicates that autonomic nervous functions governing vasotonic activities at the affected region or the entire body have been activated, which is beneficial for the treatment of the disease.

As for needling techniques to attain either the warmness or coolness, they are documented in many classical literature of TCM as *saoshanghuo* (heat-producing) or *toutianliang* (cool-producing), and have been practiced by many acupuncture pioneers over time^[90]. Master Jiao has summarized the essence of the above techniques into eight simple keywords: **lifting, thrusting, back, forth, quick, slow, deep, and superficial**^[177]. Simply put, lifting the needle generates coolness while thrusting the needle generates warmness. According to Master Jiao's experience, the warmness could be generated during the *saoshanghuo* technique, and sustained after the technique is applied. Sometimes, the patient might heavy perspire shortly after or during the night of the session. The coolness induced by the *toutianliang* technique could only be generated shortly after the technique is applied.

The heat- and cool-producing techniques have been recognized to treat the deficiency-cold

syndrome and the asthenia-hot syndrome in TCM, respectively. In addition to their satisfactory effects, there is a higher incidence of generating warmness by the heat-producing technique in those with deficiency-cold syndrome, or of generating coolness by the cool-producing technique in those with asthenia-hot syndrome. However, to attain optimal results, it is crucial to analyze and differentiate symptoms according to the eight guiding principles of TCM, which categorizes entire functions of the human body into four pairs of syndromes. Cold syndrome and hot syndrome are one of those pairs that are most remarkable. Typical cold syndrome presents when the patient feels chills at a certain region of the body, or has ice-cold skin on the extremities or affected region. Most patients with chronic somatic pains, such as chronic rheumatic or rheumatoid arthritis, might have the manifestation of cold syndrome, which is often called **cold-blockage** and is an indication of the heat-producing technique. On the other hand, when the patient presents feverish symptoms throughout the entire body or has regional inflammation, such as acute paroxysm of rheumatism or neuralgia (trigeminal neuralgia or sciatica), an increasing skin temperature or warmness, as well as skin redness and swelling could be observed at the affected region. All these pertain to the manifestation of hot syndrome and are required application of the cool-producing technique.

According to the experience of many acupuncture pioneers, warmness is often easier to attain than coolness. The former is usually generated based on the sensations of soreness and distension, while the latter is based on the sensations of numbness and heaviness^[90]. Their mechanisms are considered to be related to increasing or decreasing skin temperature at the stimulated region or entire body. Because the skin temperature is controlled by the

blood flow amount within skin blood vessels innervated by sympathetic nerves, the generation of warmth or coolness is closely related to the alterations of sympathetic vasoconstrictive activities. However, the direction of skin temperature change is difficult to be controlled by needling at will. In general, during acupuncture, especially EA, skin temperature will first show a temporary decrease, then a gradually increase for a period ^[204–206].

We consider that the heat- or cool-producing technique belongs to a type of sustained intense or weak stimulation, respectively. Stimulation in the both techniques is sequenced and stereoscopic. The key is to emphasize the lifting or thrusting of the needle, namely the direction and strength of the stimulation force. For convenience of clinical application, we have simplified these two techniques as follows (Figure 12.2).

When applying the heat-producing technique, select an acupoint or reflex point with obvious deep tenderness or distension upon pressing, and painlessly insert a slightly thicker filiform needle (No. 28–30) into the superficial layer of the point. If the needles were of the guide tube type, use the **Jin's painless needle-shooting method (JPNSM)** (refer to Section 10.6). Then move the needle within a depth of 0.1–0.5 *cun* using the swift thrusting and slow

lifting technique to probe the sensitive center of the superficial tissue layer, which is similar to sparrow-pecking needling. The spot stricken by the needle tip each time may slightly deviate. Acquiring sensations of soreness and distension, or TDSAN will indicate that the sensitive center is reached. In order to strengthen needling sensations, twist the needle towards one direction (clockwise or counterclockwise) until it cannot be twisted further. Simultaneously, continue to repeat the lifting and thrusting technique with the same way as before, but avoid an overly intense stimulation that may cause pain. Because swift thrusting at this time is conducted after the generation of needling sensations and is conducted simultaneously with the twisting technique, it can drag the needle-surrounding tissues downward and propagate needling sensations to the deeper portions of the point.

Then, further depress the needle downward to the deep layer of the point, and repeat the above manipulations at the superficial layer within a depth of 0.1–0.5 *cun*. During the entire manipulation, a pressing hand besides the needle can be applied to enhance the stimulation. In the mean time, if patients have already generated warmth through such a round of needle-manipulation, then needles could be retained or carry on other manipulations to promote propagation of warmth toward distant regions (refer to Section 12.9). If no significant distension or warmth is generated through this round of needle-manipulation, then slowly lift the needle upward to the superficial layer and start a new round of needle-manipulation as before. Because this kind of stereoscopic stimulation is very strong, usually no more than three rounds are required, otherwise, one should abandon this point and try another point.

When applying the cool-producing technique, select an acupoint or reflex point with instant

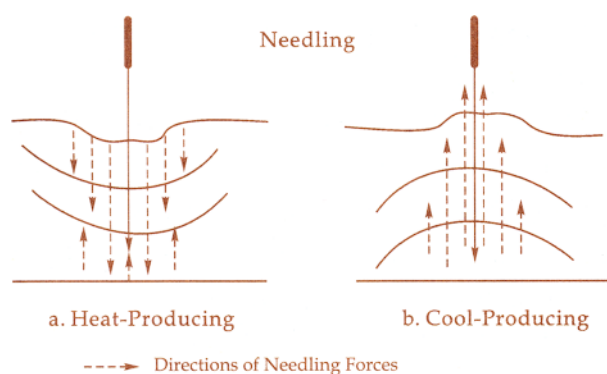


Figure 12.2 Directions of Needling Forces during Heat/Cool-Producing Methods

heaviness and numbness upon superficial pressing. First, pierce the skin of the point with a slightly thinner filiform needle (No. 32~34) in a swift and painless method (JPNSM). Then, insert the needle slowly and gingerly to the deep layer. Once there are mild soreness, heaviness, numbness or electric-shock sensations generated, cease the movement of the needle immediately and avoid stimulation of the sensitive center of the point (such as the muscle spindle). Start to twist the needle at a minor amplitude, accompanying a swift lifting of the needle tip within a depth of 0.1~0.5 *cun*, which also can lift the tissues surrounding the needle together and propagate needling sensations generated from the deep layer upward to the superficial layer. This manipulation (slow thrusting and swift lifting of the needle) can be repeated 3~6 times as long as it can be tolerated by the patient. The spot stricken by the needle tip each time may slightly deviate.

Then, withdraw the needle to the superficial layer of the point, and repeat the above manipulations at the deep layer within a depth of 0.1~0.5 *cun*, to generate diffuse heaviness and numbness sensations at the superficial region. During the entire manipulation, do not apply pressing hand besides the needle, which not only can avoid the excessive needling sensations, but also not interfere with the lifting of tissues surrounding the needle body. If no significant coolness is generated by the end of the first round of needle-manipulation, then slowly thrust the needle into the deep layer and start a new round of needle-manipulation as before. In general, it takes several minutes of such weak stimulation or several rounds of these needle-manipulation techniques to induce the desired coolness. If still no any coolness generated, though there is already a significant amount of heaviness at the region, one should abandon this point and try another point.

If the reduction of skin temperature is the

premise of generating coolness, there might be an alternative and simple way, i.e., applying EA to attain coolness^[207,208]. However, EA cannot ensure the reduction of skin temperature per stimulation. It was reported that initial EA could decrease the skin temperature, but repeated stimulation may increase the temperature. Moreover, preexisting basic skin temperature might influence the production of coolness or warmth. This principle is applied for either manual or electrical heat- or cool-producing techniques^[209,210].

12.9 Control the Propagation of Needling Sensations

In order to obtain optimal effects of acupuncture, it is relevant to ensure reflex pathways of acupuncture information are unobstructed when the information is inputted from various portions, different layers of reflex zones or acupoints of the body. One of its primary objective indicators is the arrival of *qi* at the diseased region (AQDR) described in TCM.

Generally, the premise for AQDR is the propagation of needling sensations along the meridians (PNSAM). Until now, the relationship between PNSAM or AQDR and therapeutic effectiveness has been studied in more than 10 kinds of diseases in China: bronchial asthma, coronary heart disease, hypertension, gastroparesis, chronic hepatitis, malposition of fetus, enuresis, facial spasm, myopia, and deaf-mutism. Ample acupuncture practices have demonstrated that the significance of PNSAM appearance presents a direct correlation with the needling effects. It seems the closer to the focus or the affected part the PNSAM is, the better the curative effects.

Many acupuncture pioneers have a rich experience and extensive publications on how to control the transmission direction of needling sensations or AQDR. Here, we present a comprehensive summary including our own clinical expertise of over 40 years.

12.9.1 Choosing the correct reflex points

Selecting the correct reflex points is one of the most crucial steps in effectively raising therapeutic effectiveness of acupuncture, and is the primary factor in controlling the propagation of needling sensations and promoting needling sensations to arrive at the diseased region sooner.

In the modern clinical acupuncture practice, many alternative names of acupoints are proposed to describe the properties of acupoints or stimulation locations. These include reflex points, reaction points, sensitive points, tender spots, electro-permeable points, as well as trigger points. They often appear in miscellaneous articles, reports, or textbooks, but their definitions are generally vague and may confuse the readers.

Strictly speaking, those locations on the body surface with a detectable response due to reflective mechanisms are simply called **reflex points**, which can also be referred as **reaction points**. However, the name of reaction points is overemphasized in the regional responses or reactions and it does not indicate the mechanisms of reflex. **Tender spots** are used to represent reflex points that mainly have regional tenderness. Regional reactions of reflex points can be manifested in other forms, such as low electrical resistance of the skin. Accordingly, reflex points may also be called **electro-permeable points**. Those with miscellaneous reactions or hypersensitivity are also called **sensitive points**. **Trigger points** is widely known in the West. According to the definition, trigger points are located on the

hypersensitive regions in soft tissues, especially muscles, where there is tenderness or referred tingling, numbness, burning, or itching sensations upon pressing (refer to Section 7.3).

We believe, in these descriptions, reflex points are the most appropriate in expressing reflective connections between certain locations on the body surface with corresponding viscera or other tissues. The reflex zone is composed of reflex points that possess similar reflective connections and are closely distributed, even merged into clusters.

How does one differentiate between the reflex point and classical acupoint? It is known that most classical acupoints are sensitive points due to denser sensory receptors or nerve endings distributed within them. Most classical acupoints have obvious tenderness, so most of them are also tender spots. In addition, they could be electro-permeable points with lower electric resistance, or thermal sensitive points. On the other hand, reflex points mostly possess characteristics of tenderness or lower electric resistance, and may show certain regional hard nodules or alternations of the skin temperature. Locations where most reflex points appear are consistent with that of classic acupoints or extraordinary points. Clinically, reflex points are often found within the scopes of acupoints. However, this does not indicate that acupoints are reflex points because many reflex points reside out of the courses of meridians. Therefore, emphasizing the selection of reflex points is to encourage practitioners to be not confined by the courses of meridians or locations of acupoints.

Actually, the courses of meridians are more important than the locations of acupoints. **Better missing acupoints than the meridian** is a TCM experiential statement. In other words, acupoints at the same meridian mostly have similar effects, or they may have certain variations of the locations

throughout the course of a meridian. However, based on the importance of selecting reflex points, which may appear out of the courses of meridians, we propose another statement with more extensive connotation: **Better missing the meridian than reflex points.** It means that reflex points should always be chosen regardless of where they appear, on or out of the meridian courses.

Large quantities of clinic practice have demonstrated that in order to propagate needling sensations to arrive at the diseased region easily, one must select corresponding reflex points as stimulation locations. There are shortcuts between reflex points and corresponding organs or tissues located at other portions of the body. As long as weak stimulation is applied, intense needling sensations, even warmth will be generated, and they may be propagated towards distal reflective organs or tissues.

12.9.2 Continuous structure of tissues

Indeed, there are certain impacts from depth of insertion on the propagation of needling sensations. The essence mainly lies in the different tissues stimulated, in which there are obvious differences of structural continuity in addition to the differences of sensory receptors or nerve branches distributed. For the whole body, the skin and subcutaneous tissues possess the optimal continuity, while most of the muscles do not possess such continuity, only ending at the joints. Corresponding with this fact, clinical and laboratory studies observed a farther propagation of needling sensations induced by stimulation on superficial skin or subcutaneous nerves of acupoints. In addition, this propagation can most easily cross over the joints as well as induce other meridian phenomena, such as papuloid zones, red or white lines of the skin along the meridians. On the contrary, the propagation of needling sensations induced by stimulation on deep muscles of

acupoints usually can only travel a short distance, hardly crossing over the joints. Even those that are able to cross over the joints will need a temporary pause at the joints before moving on.

Accordingly, when applying distal acupoints to treat diseases at the superficial portions of the body, such as dermatosis, one can adopt methods of superficial needling or skin electrodes to induce the farther propagation of needling sensations. If one intends to acquire deep needle-insertion sensations with a distant propagation, one should insert the needle into the muscles and apply particular needle-manipulation techniques to propagate needling sensations and cross over the junctions between adjacent muscles.

12.9.3 Appropriate needling sensations

In order to propagate needling sensations toward surroundings or a location far from the point stimulated, appropriate needling sensations including their properties and intensities are required. Although each type of basic needling sensations (soreness, distension, heaviness, and numbness) is able to travel far, the propagation of numbness is by far the easiest to be propagated, while soreness is the most difficult. Thus, to attain propagating needling sensations, it is best to acquire the numbness first, and then apply some particular needling methods, such as scraping the needle to propagate it to its surroundings or a certain location. If the sensation acquired at the beginning is an obvious soreness, then one should adjust the manipulation or depth of needling so that the properties of needling sensations can be altered. In addition, the warmth or coolness based on the combinations of soreness-distention or heaviness-numbness can likewise be propagated farther.

To attain a distant propagation of needling sensations, needling sensations must not only be

intense and painless, but also retained at the region for a certain period. Once propagating needling sensations has been generated, if the practitioner stops the operation of the needle, or needling sensations are not sustained at the stimulation location due to other causes, then the initial propagation will fade gradually. According to Master Jiao, when needling Guangming (GB37) of the leg for optic atrophy, it needs at least 15 min of continuous needle-manipulation to propagate needling sensations from the leg to the eye.

12.9.4 Directions of stimulation

The direction of propagating needling sensations is mostly in accordance with the **direction of stimulation**, which at least is three-fold: **needling direction** or angle, **shifting direction of striking spots** within a point during consecutive stimuli, and the **direction of needling force**. Among them, the needling direction can be easily controlled. It is just the direction pointed by the needle tip after the needle enters the point, and the direction can be proximal, distal or towards the diseased region. When adjusting the needling direction, partially withdraw the needle body but keep the needle tip beneath the skin, then depress it again along a new direction (refer to Section 10.11).

During acupuncture anesthesia, the direction of needle tip aimed at the surgical area not only can facilitate the arrival of propagating needling sensations at the area, but also has a better analgesia effect even if no obvious propagation of needling sensations is observed. Clinically, AQDR is pursued to raise the effectiveness of acupuncture. After local needling sensations are generated, adjusting the direction of needle tip aimed at the diseased region can facilitate AQDR. This is particularly relevant when the needling sensations to proximal portions of the body are desired as needling sensations are

propagated more easily to distal portions of the body (refer to Section 5.1). For example, when puncturing Zusanli (ST36), needling sensations usually propagate easily toward the foot. If one intends to force needling sensations propagate toward the abdomen, the needle tip should be pointed at the thigh after the generation of needling sensations. At the same time, it is best to pressing a hand at a location below Zusanli (ST36), such as Shangjuxu (ST37) to obstruct descending needling sensations.

As for the shifting direction of striking spots within a point, it refers to the sequence of striking several consecutive spots, and it is another aspect about the direction of stimulation. For example, suppose the second sensitive spot stricken is on the left side of the first sensitive spot stricken within the same point, the shifting direction is then to the left. Generally, the propagation of needling sensations follows this shifting direction.

The direction of needling force is the third aspect about the direction of stimulation. As mentioned in the preceding section, to produce warmth, a swift thrusting and slow lifting is required. For this method, a synergic force is induced towards the deep portion of the point, and vice versa when the slow thrusting and swift lifting is applied to produce the desired coolness.

12.9.5 Reduce the resistance and shunt of qi

The propagation of needling sensations is like flowing water. Stronger needling sensations originated like that of the elevated water level can propagate farther. Besides, it is required to dredge the front blockage to reduce the resistance of propagation, and block the rear to reduce the shunt of propagation as much as possible, which is called the **dredging method** and the **blocking method**, respectively (Figure 12.3).

The dredging method usually refers to various

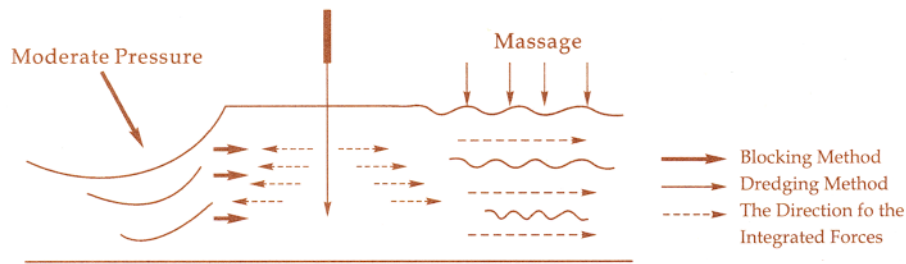


Figure 12.3 Dredging and Blocking Methods to Promote Propagating Needling Sensations

massage or acupressure manipulations, such as patting, pinching, pressing, and kneading at portions of the body or along the meridians prior to needle-insertion or during needle-manipulation techniques. Stimulation by dredging methods actually can increase the sensitivity of local tissues along the propagation course of needling sensations, which may be realized through purgation the threshold of information passages (refer to Sections 11.8 and 5.4).

When puncturing an acupoint or reflex point, needling sensations can propagate toward any direction around the point or at the proximal or distal direction along the meridian. Applying a finger pressing besides a point can block or reduce the shunt of needling sensations toward the pressed area. Consequently, this may aggregate stronger needling sensations that can propagate toward the areas without finger pressing. For example, if the proximal side of a point is pressed, needling sensations generated will be easily propagated to the distal of the point, and vice versa. This is the **blocking method**, in which the location pressed may either be a non-acupoint near the punctured point or an adjacent acupoint at the same meridian. For example, pressing Yangchi (TE4) when needling Waiguan (TE5), or pressing Shangjuxu (ST37) when needling Zusanli (ST36) in order to propagate needling sensations to the proximal portion of the body.

12.9.6 Needling-relay to circulate qi

The most frequent propagation of needling sensations does not pass through the larger joints such as the knee, elbow or the shoulder located at the traveling courses of the meridians, especially when needling sensations propagate from the distal to the proximal portion of the body. In addition to the above-mentioned measures, the needling-relay method, otherwise known as **needling-relay to circulate qi (NRCQ)**, is also applicable. For example, in order to propagate needling sensations to proximal portions of the limb, one can puncture certain points successively from the distal to the proximal, which are either located or not located along the meridian. Suppose the first point punctured is Waiguan (TE5), and the desired destination of propagating needling sensations is the shoulder. When needling sensations have reached the elbow but they are obstructed there, one can insert another needle at Quchi (LI11) of the elbow and apply the same needle-manipulation as that at Waiguan (TE5), which enable sensations to move toward the shoulder continuously. This kind of needling-relay method can be applied consecutively until the desired destination has been reached. Number of needling-relay points is dependant on the propagation distance of needling sensations generated by each stimulation of the relay. The shorter the propagation distance is, the more needling-relays are needed, and vice versa.

PART Three

Clinical Trials and Case Studies

This part focuses on detailed treatments of common indications of acupuncture, especially for those intractable cases applying theories or principles introduced in previous parts. It contains many case studies and clinical trials from our personal experiences of over 40 years, as well as discussions about related treatment strategies, mechanisms, and assessment of effectiveness for each indication.

As for common indications of acupuncture, in 1979, the World Health Organization (WHO) recommended 43 kinds of disorders that may be treated by acupuncture therapy (see the table).

In 1997, the consensus statement released by the National Institutes of Health (NIH) of USA conservatively acknowledged that acupuncture is effective for postoperative and chemotherapy nausea and vomiting, nausea of pregnancy, and postoperative dental pain. In their consensus statement, there are numbers of other pain-related conditions for which acupuncture may be effective as an adjunct therapy, an acceptable alternative, or as a part of a comprehensive treatment program. These conditions include but are not limited to addiction, stroke rehabilitation, headache, menstrual cramps, tennis elbow, fibromyalgia, lower back pain, carpal tunnel syndrome, and asthma ^[211].

Actually, there are many other indications of acupuncture that go far beyond the table and those listed by NIH. Through numerous cases over thousands years of practice, In China, there have been abundant experience in treating more than 300 types of disorders using acupuncture, and the scope of acupuncture indications continues to broaden. In the West, acupuncture is also being increasingly used as an alternative therapy for drug or alcohol abuse, cancer and AIDS, which adds to the list of indications besides analgesia and rehabilitation.

In general, acupuncture has at least three main effects: analgesia, regulation, and rehabilitation. Most functional disorders and some organic diseases are indications of acupuncture. For therapeutic methods, our emphasis is on the key aspects of treatment for each indication, such as point location and selection,

Disorders of the Musculoskeletal System

13.1 Frozen Shoulder/ Shoulder Pain

Frozen shoulder, or called periarthritis of shoulder, is one of spontaneous, progressive inflammations in the articular capsule of shoulder, where certain ligaments and tendons may be affected. To date, the etiology of this disorder remains unclear although it is considered as a degenerative disorder. Frozen shoulder is mostly seen in the middle-aged, and the elderly, thus it is also known as “**fifty’s shoulder**”. Many patients of frozen shoulder have a history of soft tissue injury or arthritis in the affected region. In the acute stage (or **pain stage**) that are mainly caused by subacromial bursitis and rotator cuff tendonitis, a severe pain in the shoulder may be accompanied with regional swelling, increased skin temperature at the acromion or the upper arm, as well as restricted movements of the upper arm. In the chronic stage (or **frozen stage**), with the shoulder pain lasting over several months, the adhesion of regional soft tissues may occur so that there is a marked dyskinesia, even muscular atrophy in the shoulder. Effective acupuncture treatments at the pain stage may prevent occurrence of the subsequent “frozen” symptoms. If the “frozen” symptoms have already occurred, acupuncture treatments still can facilitate the rehabilitation of dyskinesia and muscle

atrophy in the shoulder, as well as shorten the recovery process, which often refers to the final **melting stage**. In short, acupuncture, especially EA has excellent therapeutic effectiveness for this disorder.

【 Therapy 】

For frozen shoulder, needling therapy can be associated with moxibustion, infrared radiation, electricity, acupressure, as well as active and passive exercises of the affected shoulder.

Pain stage: Eliminate inflammation, attain analgesia, and prevent freezing of the joint by combining superficial needling method with a thermal therapy at localized tender spots. Tender spots can often be observed around Jianyu (LI15), Jianqian (EX118, i.e. Jianneiling), Jianzhen (SI9), Binao (LI14), Naoshu (SI10), Naoshang (EX119), Jugu (LI16), Jianjing (GB21), Jianliao (TE14), Bingfeng (SI12), and Tianzong (SI11). Some points at the ipsilateral side, such as Quchi (LI11), Shousanli (LI10), Waiguan (TE5) and Hegu (LI4) may also be associated. Because regional reflexes are mostly located in soft tissues surrounding the shoulder, generally, deep needle-insertion is not required unless the centers of reflex points cannot be stimulated or intense needling sensations cannot be generated. One may apply MNSP (multiple needles

at a single point), as well as tying a moxa to the needle handle for moxibustion or infrared radiation simultaneously. Retain needles for 30 min. Once a certain degree of pain relief is reached, instruct the patient to perform exercises of the affected shoulder. Acupuncture in this stage should be applied once daily or once every other day.

Frozen stage: Eliminate adhesion and increase mobility of the affected shoulder by combining deep puncturing of regional acupoints in addition to the aforementioned, such as Jianyu (LI15), Jianqian (EX118), and Jianzhen (SI9). It is best to add electricity to needling so that more intense twitching sensations can be induced at the affected shoulder. Retain needles for 30 min. One may also apply ONM (opposite needling method) at the healthy side or corresponding points, such as Shousanli (LI10) at the contralateral upper limb or Yanglingquan (GB34) at the ipsilateral lower limb. While needling these points, instruct the patient to perform exercises of the affected shoulder. Acupuncture in this stage should be applied once every 3~4 days. Request the patient to perform self-acupressure at the affected shoulder with an electric massager at least twice daily.

Melting stage: Combine exercises of the affected shoulder with self-acupressure. Acupuncture in this stage can be applied occasionally.

As for the treatment of simple subacromial bursitis, rotator cuff tendonitis of other causes, refer to the above methods for the frozen shoulder.

【 Case Studies 】

Case 1: Patient was a 52-year-old male. He had suffered with pain in both shoulders for many months, and pain was worse in the right shoulder. Diagnosed with frozen shoulder, most of his pain was located in the lateral side of upper arm around the deltoid muscle, and was especially noticeable

during movements such as lifting or extending of the arm. For acupuncture, bilateral Jianyu (LI15), Jianqian (EX118), Jianjing (GB21), Shousanli (LI10), and Waiguan (TE5) were selected. Needles were retained for 30 min after the generation of needling sensations. Local infrared radiation was applied accordingly. Acupuncture was applied twice weekly. After the fourth session, the patient indicated he was feeling much better. After 12 sessions of acupuncture, all of his shoulder pains were relieved.

Case 2: Patient was a 48-year-old female. She had suffered from pain in left shoulder for three years. Although the degree of pain was not severe, she had obvious limited mobility in her shoulder that affected her sleep, exercises, and other daily activities. She was unable to touch the ear or shoulder scapula on the right side. Diagnosed with subacromial bursitis or rotator cuff tendonitis, she took anti-inflammatory medications and physical therapy, without much success. In three months, the patient had 22 sessions of acupuncture. At the beginning, three needles were used on reflex points detected in the deltoid muscle, which were Binao (LI14), Quchi (LI11), and Waiguan (TE5). Needles were retained for 30 min after the generation of needling sensations. Acupuncture was applied twice weekly. The first six sessions used a combination of needling and infrared radiation. Later on, due to indistinct effectiveness, EA was used instead. Meanwhile, patient was instructed to exercise the affected shoulder. By the end of the treatment, there was significant improvement in her shoulder mobility and pain. A follow-up four years later found that the patient was completely healed after discharging from acupuncture.

【 Discussion 】

Effectiveness of acupuncture in treating frozen

shoulder has been demonstrated in some clinical randomized controlled studies. Kleinhenz *et al.* of Germany treated 52 sportsmen with rotator cuff tendonitis in a randomized, single-blinded, clinical trial using a new placebo-needle as control. Patients were treated for four weeks. Real acupuncture was shown to be more effective than in a similar therapeutic setting of sham acupuncture in the treatment of pain ^[212].

Considering the fact that exercise itself could improve symptoms of the frozen shoulder, Sun *et al.* of Hong Kong in 2001 evaluated the effectiveness of acupuncture besides exercise. Thirty-five patients diagnosed with frozen shoulder were randomly allocated to an exercise group and an exercise plus acupuncture group and treated for six weeks. A blinded assessor using the Constant Shoulder Assessment assessed the functional mobility, power, and pain at the baseline, 6 weeks and 20 weeks. When compared with the exercise group, the exercise plus acupuncture group experienced significantly greater improvement of symptoms. Improvements in scores by 39.8% and 76.4% were seen for the exercise and the exercise plus acupuncture groups, respectively at six weeks ($P=0.048$), and were sustained at the 20-week re-assessment (40.3% and 77.2% respectively, $P=0.025$) ^[213]. This trial demonstrated that a combination of acupuncture with shoulder exercises may raise rehabilitation effectiveness for the frozen shoulder.

Currently, main conservative medical therapies for frozen shoulder include regional nerve block (RNB), physical therapy, and anti-inflammatory medications. Actually, an integrative approach of both acupuncture and conservative medical therapies may enhance the effectiveness for frozen shoulder. Lin *et al.* of Taipei conducted a comparison study between the pain relief effects of EA, RNB and EA in addition to RNB in the frozen shoulder. One

hundred and fifty patients with frozen shoulder were randomly divided into three groups. Group I ($n=50$) had RNB with stellate ganglion block and suprascapular nerve block by 1% Xylocaine 10 mL. Group II ($n=50$) had EA at Jianyu (LI15), Jianjing (GB21), and Jianneiling (EX118), as well as *Ash3i* point treatment. Group III ($n=50$) had EA in addition to RNB, in which acupuncture was performed first, and then followed by RNB. The results showed that a combined EA and RNB method had significant higher quality of pain control, a longer duration, and better range of movement of the shoulder than that of EA or RNB performed alone ^[214].

The optimal body position for shoulder pain patients receiving acupuncture is the sitting posture, preferably sitting by a table with the affected arm naturally hanging down or placed on the table so that it is slightly raised (see Figure 10.4a). This posture can help relax the deltoid muscle and fully expose the acromion, which allows the practitioner to have easier access in detecting regional swelling and reflex points. For example, when suffering from bursitis of acromion, some reflex points with swelling and tenderness may be detected at Jianyu (LI15) and its surroundings, as well as around Jugu (LI16) and Jianjing (GB21). When the arm is slightly raised on the table, Jianyu (LI15) becomes slightly depressed, which is helpful for the practitioner to deeply insert the needle perpendicularly into the point or the articular cavity. Moreover, needling those points around the shoulder with relaxed muscles can help induce regional muscle twitching more easily, which is an indicator of striking the sensitive center of the affected tendon or muscle. Alternately, the patient can also take a lateral recumbent posture with the affected shoulder and arm straightly placed on top on the body (see Figure 10.3a, b). With this posture, the shoulder is also fully exposed like that of the sitting posture.

Point selection should be properly adjusted according to individual locations of the pain or dyskinesia. For examples, select local points or reflex points such as Jianzhen (SI9), Binao (LI14), Naoshu (SI10), and Naoshang (EX119) for pain at the anterior shoulder and the deltoid muscle. Select Jugu (LI16), Jianjing (GB21), Jianliao (TE14), Bingfeng (SI12), and Tianzong (SI11) for pain at the posterior shoulder or the suprascapular area. When pain is diffuse and located throughout the entire shoulder, RNM (resistance-needling method) can also be applied to eliminate the pain (refer to Section 12.7). According to Master Jiao, select Jianyu (LI15), Quchi (LI11), Shousanli (LI10), Waiguan (TE5), and Hegu (LI4) as master points for rheumatic pain of the upper limb. For those with difficulty in raising arms, associate Jianliao (TE14) and Qingling (HT2). For those with difficulty in moving arms backward, associate Jianzhen (SI9), Tianzong (SI11), and Bingfeng (SI12).

In the rehabilitation process of frozen shoulder, timely analgesia and effective exercises of the affected shoulder are crucial to the success of the treatment because pain and dyskinesia could form a vicious cycle. Regional pain restricts mobility and may accelerate the adhesion of regional soft tissues, which may result in a decreasing mobility of the shoulder. Consequently, more nociceptive metabolites may be accumulated at the affected region to aggravate the pain. Thus, it is advised to apply acupuncture analgesia at the early stage of this disorder. During the short post-session pain relief period, instruct the patient to perform a full-range exercise of the shoulder immediately. Once the shoulder becomes completely frozen, though the pain maybe less at that stage, it is difficult for the patient to perform active exercises on the shoulder. In this case, it is advised to combine passive exercises of the shoulder by the assistance of another person to immobilize the scapula and to exercise the upper

arm. Whether it is active or passive, exercises of the shoulder should be performed full-range or at all directions via twisting, lifting, and stretching the upper arm forward and backward.

Because most frozen shoulder patients have symptoms of pain and dyskinesia, both are suitable for the method of ONM. In addition to stimulating regional reflex points on the affected side, one can also stimulate symmetrical portions on the healthy shoulder, corresponding portions of the lower limb, other points with intense needling sensations such as Shousanli (LI10), Yanglingquan (GB34)^[215], or scalp reflex points^[216]. Along with ONM, patients should be instructed to perform exercises of the affected shoulder.

13.2 Cervical Spondylopathy/ Chronic Neck Pain

Neck pain is mostly caused by cervical spondylopathy, intervertebral disc hernia, vertebra injury, and dislocation, as well as whiplash or soft tissue injuries. In this section, we emphasize the treatment of chronic neck pain caused by cervical spondylopathy and intervertebral disc hernia. As for the treatment of cervical soft tissue injuries, refer to next section. In general, acupuncture has remarkable effects for pains of the neck, shoulder, and arm, as well as finger numbness and tingling.

[Therapy]

Mainly apply needling therapy, and select reflex points or acupoints within the lateral and posterior somatic reflex zones, which reside on the posterior neck, suprascapular region, and the posterolateral side of the upper limb. First, determine locations of

pathological focuses according to the pain and its radiation routes. For example, a pain radiating to the thumb most likely indicates C6 radiculalgia, while a pain radiating to the middle and index fingers most likely indicate C7 radiculalgia. Select 1~2 ipsilateral reflex points with obvious tenderness or slight prominence as master points and puncture them 0.5~1 *cun* besides the affected cervical vertebrae. Associate points selected may vary according to individual symptoms. Tianzhu (BL10), Fengchi (GB20), Dazhui (GV14), Jianwaishu (SI14), Jianzhongshu (SI15), Jianjing (GB21), Quyuan (SI13), and Tianding (LI17) may be associated for pain of the neck and suprascapular region. Jianyu (LI15), Binao (LI14), and Quchi (LI11) may be associated for pain of the shoulder and upper arm. Shousanli (LI10), Waiguan (TE5), Hegu (LI4), Zhongzhu (TE3), and Shenmen (HT7) may be associated for numbness and tingling of fingers. Retain needles for 20~30 min after the generation of needling sensations. It is possible to combine with electrical stimulation or thermal therapy such as moxibustion or infrared radiation. Continuous acupuncture treatments should be applied once every 3~4 days until most symptoms are alleviated.

【 Case Studies 】

Case 3: Patient was a 53-year-old female. She had suffered with cervical pain that radiated down the right scapula, forearm, and wrist for a year. Diagnosed with cervical spondylosis, she often took anti-inflammatory medications with only temporary relief. Examinations found tender spots at Dazhui (GV14), Shenzhu (GV12), the right Jianzhongshu (SI15), Jianwaishu (SI14), Jianjing (GB21), Quyuan (SI13) and Waiguan (TE5). For acupuncture, these tender spots were stimulated twice weekly with the patient in a sitting posture. Needles were retained for 30 min after the generation of needling sensations

while infrared radiation was applied to the suprascapular and cervical regions. Since the initial session, much of her pain was relieved. By the ninth session, most pain of the arm and shoulder eased except slight soreness on the neck. Through 12 sessions of acupuncture, the entire cervical pain and soreness were alleviated completely.

Case 4: Patient was a 39-year-old female. She had suffered with chronic neck pain for many years but gradually became worse about half year ago. The pain radiated to the right forearm accompanied tingling of the fingers. Diagnosed with moderate disc hernia of C5~C6 vertebrae, she took various therapies, such as anti-inflammatory medications, cortisone shots, physical therapy, and massage therapy, all without much results. For acupuncture, with a sitting posture, the above needling method was employed on the local reflex zones, of which Quyuan (SI13), Jianzhongshu (SI15), Jianwaishu (SI14), Fuyin (EX73), Fengchi (GB20), and Tianzhu (BL10) were selected. Other reflex points in the right upper limbs such as Quchi (LI11), Shousanli (LI10), Shidou (SP17), and Waiguan (TE5) were associated as well. Acupuncture was applied twice weekly. Since the initial session, her numbness and tingling of the fingers were alleviated. After 8 sessions of acupuncture, all symptoms were completely relieved.

【 Discussion 】

Acupuncture has exceptional results in treating neck pain, as evidenced by ample clinical reports from China over the years. However, until now, this efficacy still has not been fully acknowledged in the West. In 1999, White and Ernst of UK reviewed the efficacy of acupuncture or laser on acupoints in the treatment of neck pain. Overall, the outcome of 14 randomized controlled trials were equally balanced between positive and negative. Acupuncture was

superior to those without acupuncture in one study, and acupuncture was either equal or superior to physiotherapy in three studies. Acupuncture was not superior to indistinguishable sham control group in four out of five studies. The results of the study showed that out of eight high-quality trials, five were negative. In conclusion, the hypothesis that suggests acupuncture is efficacious in the treatment of neck pain is not based on the available evidence from sound clinical trials [217]. It appears that the differences of results are probably due to different needling techniques and skills of practitioners. From our observation, most recent clinical trials conducted in the West seem to lack considerations for the impact of point selection or needle-manipulation techniques on the study outcome.

David *et al.* of UK compared the effectiveness of acupuncture and physiotherapy in the management of chronic neck pain. Seventy adult patients with non-inflammatory neck pain over six weeks and without abnormal neurology were randomly assigned to receive either of the treatments. Results showed that both acupuncture and physiotherapy were effective forms of treatment [218]. Peng *et al.* reported that 37 patients with chronic neck and shoulder pain were treated with a series of EA treatments. Twenty-four of their patients (64.9%) obtained significant long-term improvement. An increase in regional microcirculation by peripheral sympathetic blockade from EA was thought to be responsible for the tissue healing and subsequent pain relief [219]. Coan *et al.* treated 30 patients of cervical spine pain syndromes with acupuncture. After 12 weeks, 12 of 15 (80%) of the treated group were improved, some dramatically, with a mean 40% reduction of pain score, 54% reduction of pain pills, 68% reduction of pain hours daily and 32% less limitation of activity. Two of 15 (13%) of the control group reported slight improvement after 12.8 weeks.

The control group had a mean 2% worsening of the pain score, 10% reduction in pain pills, no lessening of pain hours and 12% less limitation of activity [220]. Luo and Luo of Shenzhen treated 278 cases of cervical spondylopathy with EA and massage therapy. Through 3~5 sessions, the pain and numbness subsided in about 96% of the patients, and the cure rate was 82.7%, but in the control group it was only 61%, which indicated that EA might enhance the cure rate ($P < 0.05$) [221].

For cervical spondylopathy, local reflex points mostly appear on the posterior neck while adjacent reflex points may emerge on the suprascapular area. Distant reflex points mostly reside on the posterolateral upper limbs. Thus, lateral and posterior somatic reflex zones located on the *yang* side of the neck, shoulder and the upper limb (including the three *yang* meridians of the hand) are primary reflex zones for the treatment of cervical pain.

When selecting points on the cervical and suprascapular regions, the patient should be under a proper body position, of which the optimal is sitting with the forehead leaned on a higher cushion and both arms placed besides the head (see Figure 10.4b). By taking this posture, not only cervical and suprascapular regions are fully exposed for convenience of detecting reflex points and treatments, but also allow the patient to be more comfortable during the needle-retaining period.

With the sitting posture, the practitioner can easily detect regional reflex points with slight prominences or hard nodules by lightly finger pressing on the bilateral cervical vertebrae or suprascapular areas. Of course, the patient also can take the prone posture with a cushion placed beneath the forehead (see Figure 10.2a or b), but the neck should be kept straight at all time. This posture is commonly used to detect reflex points of the suprascapular area, but

not suitable for detecting cervical reflex points. When taking the prone posture, if a proper cushion is placed beneath the chest (see Figure 10.2a), the cervical area will be better exposed, which is especially suitable for those with thoracic cyrtosis.

Note that for chronic neck pain or numbness of the fingers due to cervical degeneration (osteoarthritis) or disc hernia, acupuncture usually can only alleviate the symptoms rather than alter abnormal manifestations of the cervical vertebrae under X-ray or MRI. This suggests that clinical symptoms of this disease are not always in accordance with its pathological manifestations. Actually, the clinical symptoms are mainly caused by a radicular oppression due to inflammatory swelling of surrounding soft tissues, while pathological changes of the cervical vertebrae facilitate occurrence of symptoms such as pain or numbness. Effects of acupuncture in relieving these symptoms are realized through its anti-inflammatory actions as well as the mechanism of promoting regional microcirculation.

13.3 Stiff Neck/Whiplash

The neck is susceptible to injuries due to its broad scope of motion. Injuries of cervical soft tissues such as stiff neck or whiplash due to auto accident is a common cause of acute neck pain, where the pain is mostly distributed on the cervical and suprascapular regions, sometimes may radiate to the hind head, the upper back between the bilateral scapulas, and the ipsilateral arm. The pain could be worsened by turning the head or moving the ipsilateral arm, and it may become chronic unless effective and timely treatments are applied. In general, acupuncture or

tuina can achieve excellent effectiveness for such cervical pains.

[Therapy]

Needling therapy is often used for patients of stiff neck or whiplash. For acute cases, both distal and local points can be selected. For chronic cases, local points are preferred. When puncturing the distal points, Waiguan (TE5) and Xuanzhong (GB39) can serve as master points and a strong stimulation without needle-retaining can be applied. During the needle-manipulation, instruct the patient to exercise the neck concurrently. Commonly used local points are those with tenderness, swelling or hard nodules, such as Tianzhu (BL10) and Fengchi (GB20) for stiff neck, Quyuan (SI13), Jianwaishu (SI14), Dazhui (GV14), Shenzhu (GV12), Feishu (BL13), Jianjing (GB21), and Tianzong (SI11) for pain on the scapula and the upper back. Choose 5~7 local points each time, and retain needles for 20~30 min after the generation of needling sensations. For reflex points with a larger scope, the method of MNSP (multiple needles at a single point) can be applied. When the affected region is markedly swollen, it is suitable to combine needling with infrared radiation or moxibustion during the needle-retaining period.

In addition, *tuina* or acupressure can be applied alone or in conjunction with acupuncture. First, apply routine manipulations to relax the muscles of the neck and shoulder, gently turn the patient's head left and right. When cervical muscles are fully relaxed, push the patient's chin lightly towards one side with a moderate amount of force, which might generate a crisp "clicking" sound. Then, knead and press local *Ashi* points or tender spots such as Tianzong (SI11) or Jianjing (GB21). Finger pressures should be heavy enough so that the patient feels some intense yet tolerable sensations of soreness on the affected region, even local warmth, or

perspirations throughout the entire body. Meanwhile, instruct the patient to exercise the affected region. Finally, rub the local skin using the ulnar side of the palm until the skin turns slightly red and becomes warm. By using this method, most stiffness of the neck can be alleviated instantly.

The above treatments can be applied once daily for acute patients and once every other day or every 3~4 days for chronic patients.

[Case Studies]

Case 5: Patient was a 39-year-old male. He had suffered from severe cervical pain and stiffness in the right side for 18 days. The pain often woken him up several times at night, and seriously affected his daily life. The cause of the pain was unknown, but most likely was due to a poor sleeping posture. He had several chiropractic treatments without much relief. On examination, the patient sat with his head lowered and a walnut-sized hard nodule was found on the right neck, near C5~C6 vertebrae. With the technique of MNSP, five needles were inserted into this hard nodule from different angles, and some needling sensations of soreness and distension were generated. In addition, Dazhui (GV14), right Fengchi (GB20) and Jianjing (GB21) were selected as associate points and punctured in conjunction with an electrical stimulation during the 20 min of needle-retaining period. After only two sessions of acupuncture, the patient's cervical pain and the stiffness were completely relieved.

Case 6: Patient was a 46-year-old female. She had suffered with a chronic pain on the left suprascapular region for several years with numbness in her left fifth finger. Diagnosed as muscular pain, she went through chiropractics, massage, physical therapy, pain medications, and herbal plasters, all without much help. On examination, there appeared to be a hard nodule (knot) with tenderness near Quyan

(SI13) on the left suprascapular region. This nodule was selected as master point and ENM (encircling needling method) was applied. Five needles were inserted around the hard nodule while a needle was inserted into the center. Associated points were Tianzong (SI11), Feishu (BL13), Waiguan (TE5), and Zhongzhu (TE3). After the generation of needling sensations, such as soreness and distension, needles were retained for 30 min while infrared radiation was applied. Acupuncture as shown above was applied twice weekly. Since the initial session, she felt much less pain. Through eight sessions, most of her symptoms were completely alleviated.

Case 7: Patient was a 39-year-old female. She had suffered with pain in the right neck and shoulder for four years due to an auto accident. The pain often radiated to the head and forearm on the right side. Diagnosed with chronic myofascial cervical syndrome, she had a surgery and took pain medications, but the pain remained. On examination, local swelling and distinct tenderness between the right suprascapular region and the spine was detected. She could not tolerate even the slightest vibrating massage, and a light touch on the regional skin could induce severe pain. Acupuncture methods as above were applied as the patient took a sitting posture. First, 5~7 needles were inserted within a small reflex zone of the right suprascapular region. In addition, select associate points of Tianzhu (BL10), Fengchi (GB20), Waiguan (TE5) or Yanglao (SI6) in the right side. Acupuncture was applied twice weekly. After two sessions, the regional hypersensitivity to external stimulation at the right suprascapular region was much reduced and she was able to receive vibrating massages without pain. After 10 sessions, most regional swelling had subsided, though slight soreness and distension remained. In the next three months, she completed 25 additional sessions, though occasionally some soreness in the

right mid-back and scapula region flare up, they were instantly alleviated with each session.

[Discussion]

Stiff neck can be caused by improper head positions during sleep, heavy lifting, or whiplash, which mostly pertains to sprained muscles or tendons in the affected regions. Symptoms and treatments for these causes are similar. Stiffness and pain are mostly located on the lower neck and suprascapular regions often-accompanying weakness and soreness of the ipsilateral arm.

For those with acute stiff neck and limited scope of soreness, needling therapy mostly can alleviate the symptoms immediately. Out of distal points, Waiguan (TE5) of the forearm, Laozhen (EX133) of the dorsal hand or Xuanzhong (GB39) of the lateral leg has exceptional efficacies, which are like “miracle points” similar to Hegu (LI4) for the simple toothache. Although these points lodge within the upper or lower limb respectively, they are located within the lateral somatic zone together along with the above common symptoms. This may be the reason why puncturing such points can achieve good effectiveness. According to distributing patterns of somatic reflex zones, distal reflex zones of the neck are mainly located on the upper limb, but also can reside on the lower limb (refer to Section 3.7).

During acupuncture anesthesia of thyroidectomy, it was found that selecting points in the upper limb, such as Neiguan (PC6) had better analgesia outcome than those in the lower limb. However, there have not been comparative reports about the differences for the neck pain applying reflex points of the upper or lower limb. According to our experience, when soreness or pain symptoms are only limited at the cervical and suprascapular regions, points at the ipsilateral either upper or lower limb, such as

Waiguan (TE5) or Xuanzhong (GB39), are suitable. For patients with symptoms on the upper limb, Waiguan (TE5) or Laozhen (EX133) at the ipsilateral side is preferred. When the cervical pain radiates to the upper back including the region between the scapulas, which pertains to the posterior somatic zone, puncturing Waiguan (TE5) or Xuanzhong (GB39) might not be effective. For such cases, one may select Houxi (SI3) or Chengshan (BL57), which pertain to the posterior somatic zone. Certainly, for stiffness, soreness, or pain at all of the above locations, direct stimulation of local reflex points within the affected region may also achieve effectiveness.

However, for chronic, reoccurring cervical pain, soreness or stiffness with a large scope, only applying acupuncture might be difficult to yield desired results. An effective strategy is to combine acupuncture with *tuina* or acupressure. Many years ago, we reported that applying *tuina* could raise the therapeutic effects for stiff neck, and all 30 cases were cured through 1~2 sessions of treatment^[221], in which the manipulation is very similar with chiropractic techniques that are popular in the West. We experienced with *tuina* that acute and simple stiffness of the neck might be immediately relieved, but those intractable neck pains due to chronic inflammations might only achieve a slight relief. Thus, after *tuina*, it is advised to apply acupuncture or acupressure in conjunction to raise the therapeutic effects. Some patients are more susceptible to cervical sprain due to a lower tension of cervical muscles. When treating such patients, instruct them to exercise the cervical muscles routinely, which may strengthen the muscle tension for preventive purposes.

According to Master Jiao's experience, when treating mild cases of stiff neck, apply *tuina* with pushing and pressing methods, which starts from Fengchi (GB20) to the shoulder, then from Dazhui

(GV14) to Jianzhongshu (SI15) and Jianwaishu (SI14). Finally, knead and push down Fengmen (BL12) with a heavy pressure. For severe cases, select Fengchi (GB20), Tianzhu (BL10), Bailao (EX76), Dazhui (GV14), Jianzhongshu (SI15), Jianwaishu (SI14), Fengmen (BL12), Zhigou (TE6), or Waiguan (TE5).

As for the neck pain due to whiplash, its treatment method is the same as that for stiff neck, but for severe cases, a longer treatment course might be required. If not treated properly and timely, some acute cases may become chronic myofascial cervical syndrome. For chronic neck pain, in addition to the body acupuncture, auricular acupuncture may also be applied. Rabl *et al.* of Germany reported that 153 patients suffering with pain, edematous conditions, and impaired movement due to traumas sustained in accidents, were treated or after-treated with body acupuncture and auricular acupuncture. In all nine groups, improvement of the painful condition was significant to highly significant. In addition, they studied effects of acupuncture on the local skin temperature in a group of 54 patients suffering from accident traumas and 20 healthy probands during and after treatment. In all patients, there was a very significant rise in skin temperature at the area of the lesion, which persisted beyond the treatment period, and in some cases even increased. This effect was also observed to a lesser extent on the contralateral side, untreated extremity. However, no change in skin temperature was observed in the healthy probands who were treated in the same manner. It was concluded that needle stimuli in the area of lesions had not only a local, hyperemic effect, but also showed super regional actions that were dependent on the integrity of the organism ^[225]. Obviously, this study suggests that the mechanism of analgesia by applying *Ashi* points during classical treatment of soft tissue injuries is related to the improvement of regional blood circulation.

In the above two sections, we have discussed various treatments for acute and chronic cervical pain. It was interestingly observed that the analgesic effect of acupuncture for the neck is superior than that on other parts of the body, possibly only next to the head. A study compared the differences in the raised pain threshold of skin on various body parts except the head, and found the following order: Neck > Chest > Abdomen > Lower limbs > Upper limbs. This demonstrated that under the same stimulation, the increase of pain threshold in the cervical skin is the most remarkable ^[109]. It was observed that the success rate of acupuncture anesthesia for surgeries on various body parts had a similar order to the above: craniocerebral surgeries had the highest success rate, cervical and thoracic surgeries (e.g., thyroidectomy) was the second, abdominal surgeries came in the third, and the extremities finished last (refer to Section 2.10). This probably can explain why acupuncture has efficacy for neck pain.

13.4 Lumbago

Lumbago (lower back pain) is one of the most common indications of acupuncture. Whether it is acute or chronic, caused by lumbar disc/discs hernia, muscle sprains, degenerative vertebrae, or strains, acupuncture can achieve certain therapeutic effectiveness. Many patients of lumbago also have pain radiated to the buttock and the lower limb similar to sciatica symptoms, including numbness of the foot. This section focuses on the treatment of lumbago, as for sciatica or the leg pain, refer to Section 13.14.

【 Therapy 】

For acute lumbago, the body acupuncture can be applied with *tuina* and traction therapy. For chronic lumbago, other therapies such as water acupuncture (injection of solutions of glucose, saline or medicated herbs on the points) and auricular acupuncture may also be integrated.

For a localized lumbago, choose local reflex spots with tenderness at the lumbosacral region as master points and distal reflex points on the posterior lower limb as associate points, such as Yinmen (BL37), Weizhong (BL40), and Chengshan (BL57). For a diffused pain or only with less regional reflex points, select distal reflex points on the upper limb, such as Shousanli (LI10), Cuoshan (EX124), Houxi (SI3), Yanglao (SI6), and Yaotongdian (EX134) at the dorsal hand. Along with needle-manipulation or needle-retaining, instruct the patient to exercise the lower back at all directions including bending of the knees. When the pain is alleviated and localized, then regional reflex points can be associated. For lumbago between L2~L3 vertebrae, regional reflex points often emerge around Shenshu (BL23), Mingmen (GV4), Zhishi (BL52). For lumbago around L4~L5 vertebrae, regional reflex points often emerge at the lumbosacral region, shaped like an inversed triangle and encircled by Dachangshu (BL25), Guanyuanshu (BL26), Ciliao (BL32), Shiqizhuixia (EX111), and Yaoyangguan (GV3).

In general, apply an intense needle-manipulation. If no ideal needling sensations are generated, connect the needles to an electric stimulator (continuous wave, 2~4 Hz at moderate intensity). During the 30 min needle-retaining period, infrared radiation can also be applied at the affected region. In addition to the body acupuncture, wrist-ankle acupuncture can also be applied on the bilateral “Lower 6” points by inserting the needle toward the affected region horizontally at a depth of 1.5~2 *cun*. Meanwhile, the

generation of needling sensations is not required, but it is necessary to retain the needles for a longer period, such as around 30~60 min.

【 Case Studies 】

Case 8: Patient was a 28-year-old male. He had suffered with acute lumbago for two days. The pain occurred suddenly when he tried to bend the lower back to lift some heavy boxes. Most of the pain was concentrated lateral to L2 vertebrae, which severely restricted the mobility of the lower back. He also had a similar occurrence seven months ago. Examination showed local tenderness at bilateral Shenshu (BL23) and Qihai (BL24), Xiajishu (EX110) and Yaoyangguan (GV3) on the midlines, as well as some muscle distension on Yinmen (BL37). The patient took a prone posture during the needling of these points. After the generation of needling sensations, electrical stimulation was added (continuous waves, frequency at 2 Hz). The electrical intensity was slowly increased until muscles were gradually twitching. Needles were retained for 20 min. After needles were removed, the patient felt a slight pain relief instantly and performed 15 squats while pressing Shousanli (LI10) on one side of forearm simultaneously. Afterwards, the patient reported further relief from pain. The next day, when he came for the second session, he was able to move the lower back at all directions except at a certain posture where there is some residual pain. Four days later, through the third session, all of his back pain was gone.

Case 9: Patient was a 51-year-old male. He had suffered from an acute lumbar muscle sprain on the right side for two weeks due to lifting heavy objects. The pain endured was severe, and radiated down to the right hip. He stayed in bed and was unable to walk, and difficult to turn the body during sleep. X-rays of the lumbar vertebrae did not detect any abnormality. Examination showed normal lumbar

curve of the spine, certain tension of the right lumbar muscles, and obvious tenderness around the right Shenshu (BL23) and Yaoyan 1 (EX112). Comparison of these points at the bilateral sides showed a great difference of tenderness with a slight tenderness on the contralateral side. For the treatment, ONM was applied during the initial session. As the pain was being eased by needling, he was instructed to perform slight exercises of the lower back. At the beginning, he was afraid to move the body due to possible pain. However, upon further encouragement, he began to exercise the lower back with a greater degree of motions. Consequently, he did not feel any pain during the bending and swinging of the spine. The post-treatment examination showed the original difference between bilateral tenderness no longer presented and the patient was able to walk home on his own. The next day, he indicated the pain was almost eased completely and the lumbar muscles were relaxed with only slight tenderness. To stabilize the results, an additional acupuncture session was applied. A follow-up in three months showed the patient resumed regular activities without any pain or relapses of lumbago.

Case 10: Patient was a 34-year-old male. He had suffered from lumbago for two years that affected the bending of the back. Pain radiated down to lower limbs and became worse when coughing, turning the body over during sleep, or after a long walk. Examination showed no abnormality in the spine, but bilateral tightness and tenderness of muscles was detected at the level of L4~L5 vertebra. The tenderness was around Dachangshu (BL25), and presented bilateral imbalance, worse on the left side. Acupuncture was applied twice weekly. Since the initial session with ONM, he could bend the back with no pain and showed a decreased imbalance of bilateral tenderness. After four sessions, his tight lumbar muscles became relaxed, and the bilateral

tenderness was eliminated. Moreover, performing regular activities such as bending the back, walking, running for an hour did not induce any pain. A follow-up in three months found the patient living pain-free even after a long day of work.

[Discussion]

In a randomized controlled study, Wang and Tronnier of Germany demonstrated that classical acupuncture was more effective than placebo acupuncture for lower back pain. One hundred and thirty-two patients with acute or chronic lower back and leg pain were examined before and after surgery for lumbar disc/discs protrusion. Diagnosis was based on CT and MRI findings. Patients received acupuncture and remained drug-free throughout the study period. The Visual Analogue Scale (VAS) was used to assess pain intensity before and after (i.e., 30 min, 60 min, 2 hours, and 6 hours) acupuncture. Classical acupuncture culminated in a significant reduction of pain, but placebo acupuncture led to similar early pain relief that was not statistically significant and then declined thereafter^[227]. In 2001, Schmitt *et al.* of Germany examined the potential benefit of acupuncture in 60 patients with lower back pain and radicular symptoms. Three to 12 months after the end of acupuncture, 88% of patients were satisfied with treatment outcome. MRI or CT diagnosed those patients with lower back pain and lumbar disc/discs hernia. Pain intensity was assessed before and after treatment on a 100 VAS. Intensity of lower back pain dropped from 59 to 19, and intensity of radicular pain from 64 to 12. Though this study was non-controlled, the authors concluded that acupuncture, as a non-invasive treatment with few complications, was indeed a promising therapeutic option for lower back pain, especially when associated with radicular symptoms^[228].

Whether it is acute or chronic, lumbago may have

local reflex points at the affected region, or distal reflex points at other portions of the body, mainly at the posterior lower limbs. All of which can be effectively used for lumbago.

The appearance of local reflex points seems to be related to the location of lumbago. In general, points with tenderness and higher muscular tension can be detected and punctured along three longitudinal lines: the midline (GV), 1.5 *cun* or 3 *cun* besides the midline (BL) of the lower back. There are two main areas of lumbago: around the L2~L3 vertebrae and around the L4~S1 vertebrae, which are the portions with the greatest amplitude of motion in the lower back and are both injury prone. For lumbago of L2~L3, local reflex points may lodge around Shenshu (BL23), Mingmen (GV4), Zhishi (BL52). For lumbago of L4~L5, they may appear around Dachangshu (BL25), Guanyuanshu (BL26), Qihai (BL24). Through a slight touch from fingers transversely at the affected region, tighter or bulged muscles can be detected easily. For those with acute inflammation, skin temperature may be higher at the affected region than that of the surroundings. When the pain is concentrated at the midline of the lower back, local reflex points may be around Mingmen (GV4), Yaoyangguan (GV3), and Shiqizhuxia (EX111). In general, the more precise stimulation at local reflex points, namely the affected tissues (e.g., supraspinal or intervertebral ligament, sacrospinal muscle) hit by needling, the better results of analgesia it may attain.

Distal reflex points often appear at extending longitudinal lines of suffering areas, mostly within the posterior somatic zone, such as Yinmen (BL37), Weizhong (BL40), and Chengshan (BL57) of the lower limbs, as well as the point of "Lower 6" in the wrist-ankle acupuncture. They also can extend upward toward the neck, appearing at Tianzhu (BL10). According to Fang *et al.* of Shanghai, when

acute lumbago occurred at bilateral lumbar muscles along the course of BL, tenderness usually appeared at Tianzhu (BL10) of the affected side rather than in the healthy side. If the lumbago was severe, accompanying mild prominence of this point could often be seen. Puncturing this point had instant effects of analgesia ^[196]. According to distribution rules of somatic reflex zones, lumbosacral distal reflex zones are mainly located in the lower limbs, but they were not excluded from the upper limbs (refer to Section 3.7). Distal reflex points for lumbago in the upper limb include Shousanli (LI10) and Cuoshan (EX124) of the forearm, and Yaotongdian (EX134) of the dorsal hand. However, with regard to the curative effect of acupuncture for lumbago, there is a lack of study on the comparison of significant difference between reflex points of the upper or lower limbs.

Cuoshan (EX124) of the forearm is an experiential point discovered by Master Jiao. According to his experience on acute sprain of the lower back, quicker effects can be attained once Cuoshan (EX124) is first punctured to generate significant propagating needling sensations, with or without retaining the needles. For some cases, even applying a heavy acupressure at this point can relieve the pain. If the pain is at the middle of the lumbar vertebrae, corresponding intervertebral points or Huatuojiayi (EX102) may be associated. For patients of lumbar muscle strain, in addition to those local points, puncture Siliao (BL32~34), Baihuanshu (BL30), Weizhong (BL40), and Kunlun (BL60).

Stimulation of distal reflex points, especially those on the upper limb not only can be used to relieve the diffused pain, but also suitable for those who need to exercise the lumbar portion during acupuncture as it does not interfere with the movement of the affected region. To attain the latter objective, instead of acupuncture, acupressure may be applied,

which is particularly suitable for acute lumbago or those with limited mobility in the lower back and legs. Before or after puncturing local reflex points, apply acupressure at Cuoshan (EX124) of the forearm or Yaotongdian (EX134) of the dorsal hand, meanwhile, instruct the patient to perform repeated exercises of bending knees and stand up, back and forth for more than ten times. With these exercises, the patient may immediately experience pain relief in the lower back.

In treating acute lumbago, an early and proper exercise of the lower back and legs is relevant. Many cases of acute lumbago are thought to be due to synovial hernia that are caused by improper postures during the bending of the back. After certain time of the herniation, the synovial membrane could become inflamed so that irritations may occur in surrounded nerves and manifest in some clinical symptoms, such as regional pain or reflective muscular tension. Timely exercises of the lower back and legs are helpful in resetting the normal place of herniated synovial membrane as early as possible. Moreover, it can improve blood circulation at the affected region and remove the accumulated nociceptive metabolic products so that the reflective muscular tension can be alleviated. Of course, due to severe pain, some patients cannot move the affected region unless acupuncture analgesia is attained. In that case, apply acupuncture for analgesia first, or instruct the patient to move the affected parts of body during acupressure on distal points.

If the synovial hernia cannot be recovered through active exercises of the patient, another therapy is to apply *tuina* including traction, which is helpful to relax tensed muscles of the lumbosacral area. Sometimes, there is disturbance of small articulations of the lumbar vertebrae complicated by acute lumbar sprain or chronic lumbar muscle strain. Zhang and Wang of Beijing, China reported that 57 cases with

disturbance of small articulations in the lumbar vertebrae. They were treated by a combination of puncturing effective points and manual traction with satisfactory results. The cure rate was 39.3%, the markedly effective rate was 28.6%, with a total effective rate of 98.3% [229].

Lumbar and cervical vertebrae are most liable to be degenerated (osteoarthritis). Lumbar degeneration is a common cause of chronic lumbago, for which Huatuojiagi (EX102) points around L1~L5 vertebra are effective when punctured Wang *et al.* of Guangzhou reported that 32 cases of L3 transverse process syndrome were treated mainly by EA at Huatuojiagi (EX102) points between L1~L2. Another 30 cases of the syndrome were treated by conventional acupuncture as controls. Results showed that treatment by EA at Huatuojiagi (EX102) was superior in analgesic effect and clinical total effective rate to that by conventional acupuncture. It is considered that the mechanism of EA at Huatuojiagi (EX102) is related to the activation of posterior ramus in spinal nerve that innervates such points [230].

In the West, most patients of lumbar disc/discs hernia or hyperostosis may choose the surgery, which could indeed help many of them to eliminate the pain. However, there are scores of cases that had surgery but were ineffective or have recurrence of pain shortly after the surgery. Such patients with post-operative lumbago or leg pain often come to acupuncture as one's last resort or only hope. However, because the surgery often disrupts normal anatomical structures of the lumbar region, such as cutting off nerve branches, subsequent acupuncture will be difficult in generating necessary needling sensations. This may explain why the effectiveness of acupuncture is often less for those post-surgical patients than those who have never taken surgeries before. For these post-surgical patients, it is relevant to seek out their most sensitive reflex points at the affected region, and

puncture the most sensitive centers of points as accurately and deeply as possible in order to attain the maximum needling sensations. An indirect indicator of effective acupuncture is the elimination of tender spots. Li *et al.* of Guangzhou punctured tender spots of the lower back and buttocks involved in intractable, lower back pain cases after disc/discs hernia surgeries. Therapeutic results showed much promise. The total scores for each tender point after treatment were significantly lower than those taken before treatment ($P<0.001$) [231].

EA often can enhance effects of manual acupuncture for many diseases, including lumbago. According to Thomas and Lundberg of Sweden, 40 patients of chronic lower back pain were randomly entered into a study. Thirty had three trial treatments with manual stimulation of needles, electrical stimulation at a low frequency of 2 Hz (LF), and high-frequency stimulation at 80 Hz (HF), and then continued treatment with the mode they felt most benefited them. Ten patients were put on the waiting list for treatment, but served as the untreated control group. The results were evaluated after six weeks and at six months for: activity related to pain, mobility, and verbal descriptors of pain and the patient's subjective assessment of his condition. After six weeks, patients receiving treatment showed significant improvement ($P<0.05$) on three of the four measures, compared to the untreated controls. After 6 months, a similar measure of significant improvement was seen in patients continuing with LF acupuncture, but not in those groups continuing with manual stimulation of needles or HF acupuncture. The results suggested that 2 Hz electrical stimulation was the mode of choice when using acupuncture in treating chronic, nociceptive lower back pain cases [232]. In our clinical practice, 2~4 Hz EA was also often applied with satisfactory results.

In some intractable patients with chronic lumbago,

there may be no obvious tenderness but muscular tension or cord-shaped hard nodules at the affected region. For these patients, when stimulating local reflex points, try to eliminate the tension of muscle as a feedback indicator. In addition to EA, water acupuncture may also be applied as soon as possible, injecting 5~10 mL of 10% glucose solution or 1 mL of Vitamin B₁ solution at each point, once every other day or twice weekly. If these patients still have tender spots at corresponding meridians or somatic zones of the lower limb, needling of these reflex points with an intense stimulation can be combined to gradually eliminate tenderness. Through these treatments, some of them still have chances to achieve desired results to a certain extent.

The causes of lumbago are miscellaneous. Besides pathological changes of the lumbar vertebrae and the surrounding soft tissues, they may also be caused by visceral referred pain, such as renal colic and contracting/pulling pain of the uterus in pregnancy. In general, acupuncture works for any lower back pains due to visceral causes.

For lower back and pelvic pain in pregnancy, Wedenberg *et al.* of Sweden reported in 2000 that acupuncture could relieve pain and diminished disability in lower back pain during pregnancy better than physiotherapy [233]. Ader *et al.* of Sweden treated parturition pain with intracutaneous injections of sterile water. Forty-five pregnant women in the first stage of labor presenting with lower back pain were randomized into two groups. One group received intracutaneous injections of sterile water in the lumbosacral region, while the other group was given corresponding subcutaneous injections of isotonic saline, regarded as a placebo treatment. In the group that received intracutaneous sterile water injections, the mean VAS score was more significantly less compared to the placebo group at 10 min ($P<0.001$), 45 min ($P<0.02$), and at 90 min ($P<0.05$) after the

treatment. The midwives' blind estimation of the effectiveness of treatment was consistent with the VAS assessment. The analgesic method presented was found to be an effective treatment against lower back pain during the first stage of labor and it is speculated that the mode of action resembles acupuncture^[234]. The sterile water injection is a type of hypo-osmotic stimulation, and is categorized as a type of water acupuncture. According to our experience, for the lower back pain due to visceral causes, acupuncture can be applied on corresponding visceral reflex zones at the lower limbs besides pain regions. For instance, needling Sanyinjiao (SP6) and Yinlingquan (SP9) can attain distinct analgesic effects against renal colic due to calculi in the kidney, even promoting excretion of the calculi.

13.5 Hip Osteoarthritis/Groin Pain

Osteoarthritis, or hypertrophic arthritis, is a type of degenerative arthritis that is characterized by the occurrence of degenerative alterations in the articular cartilage pad, and hyperostosis in the articular edge. This disease is mostly seen at large joints, such as the hips and the knees, and occasionally seen at small joints like the spine. Hip pain caused by osteoarthritis is mostly localized around the major femoral trochanter, often accompanying pain in the groin. Here we only introduce the treatment for hip osteoarthritis, as for the treatment of osteoarthritis of the knees and spine, refer to Sections 13.2, 13.4, and 13.6, respectively. In general, acupuncture has satisfactory results for osteoarthritis.

[Therapy]

Select local reflex points as master points. For pain

on the posterior or lateral side of the hip, select Juliao (GB29), Huantiao (GB30), and tender spots around the major femoral trochanter. For pain on the anterior side of the hip or the groin, select Weidao (GB28), Chongmen (SP12), Yinlian (LR11), Biguan (ST31), and their nearby tender spots. For pain radiating to the thigh and leg, certain reflex points of the lower limb, such as Fengshi (GB31), Futu (ST32), Xuehai (SP10), Yanglingquan (GB34), and Xuanzhong (GB39) can be associated. Needling therapy is applied once every other day or every 3~4 days with an intense stimulation. Retain needles for 30~40 min after the generation of needling sensations. Electrical stimulation (continuous wave, 2~4 Hz, moderate intensity) may be combined with needling.

[Case Studies]

Case 11: Patient was a 79-year-old female. She had suffered from chronic pain in her right hip and lower limb for almost ten months. Each time when the pain reoccurred, she was difficult to walk, even with a cane. Acupuncture was applied as shown above. With her pain relieved instantly after each subsequent session, each recurrence could be controlled with several consecutive sessions.

Case 12: Patient was a 71-year-old female. She had suffered from osteoarthritis in both hips, which caused much pain and stiffness for over eighteen months. Her main complaint was unable to stand up from a sitting posture due to severe pain. Needling therapy was applied at local reflex points on both hips, four points per side. Due to her excess weight (~280 lbs), even when needles were inserted at depths of 3~4 inches, she could hardly felt any needling sensation. To strengthen the stimulation, EA was applied. Since the initial session, her pain was much relieved. After 3 sessions, she was able to stand up easily from a sitting posture without any pain.

Case 13: Patient was a 67-year-old female. She had

suffered from pain in the right groin and hip for one week, and had a hard time sitting down due to pain. Needling therapy was applied once every other day. Tender spots at Huantiao (GB30), Juliao (GB29), Chongmen (SP12), Yinlian (LR11), Biguan (ST31), Xuehai (SP10), Liangqiu (ST34), and Zusanli (ST36) of her right side were selected. After the generation of needling sensations, needles were retained for 30 min and applied infrared radiation at the affected region simultaneously. During the stimulation, it was observed that her right groin was especially sensitive to thermal stimulation and was especially warm. She reported much less pain after the third session and all pain was relieved after ten sessions of acupuncture. At the 5-month-follow-up, the patient still has kept the pain off.

[Discussion]

In 2000, Fink *et al.* of Germany reported the effectiveness of acupuncture treatment in 67 patients with hip osteoarthritis. This was a prospective, randomized, controlled, double-blinded, clinical trial. Sixty-seven patients were separated into two treatment groups: Group 1 (treatment) had traditional needle placement and manipulation. Group 2 (control) had needles placed away from classic positions and not manipulated. Endpoints were pain from VAS, functional impairment (hip score), activity of daily living (ADL) and overall satisfaction before treatment, 2 weeks and 2 months post-intervention. Results showed for all endpoints that there was a significant improvement in both groups, but no significant difference was found between them. It was concluded that the needle placement in the area of the affected hip helped to relieve symptoms of osteoarthritis, even if some non-classical acupuncture techniques or points were used^[235]. This report indicates that there is no greater specificity in actions of acupoints to treat hip pain. In addition, hip arthritis often has a good

response to needling even without any particular manipulations after the needle-insertion.

Due to the anatomical characteristics of the hip, hip pain may appear not only at the lateral buttock or around the major femoral trochanter, it may also radiate to the groin and thigh. Thus, its reflex points with remarkable tenderness can often be found in those territories. For the convenience of examination, the patient should take a lateral recumbent posture to expose the affected hip fully, particularly the major femoral trochanter. When the pain is on the groin, the patient should take a supine posture, which helps to locate reflex points around Weidao (GB28), Biguan (ST31), and Chongmen (SP12), as well as Futu (ST32) and Xuehai (SP10) easier. The key to raise the curative effect of this disease is to stimulate local reflex points with tenderness accurately, especially around the major femoral trochanter. However, there are no known acupoints around the major femoral trochanter, so any reflex points detected in that region are *Ashi* points or “non-acupoints”. When these non-acupoints become clustered, ENM (Encircling Needling Method) may be applied by inserting multiple needles in the small concentrated area. Because of the depth of hip inflammation, some patients with obesity may not have obvious tender spots in their buttocks or the major femoral trochanter. For those patients, ENM can still be applied in the major femoral trochanter, but deep puncturing is required to generate desired needling sensations.

From our experience, the decision on whether to strengthen the stimulation via particular manipulations or to combine with electrical stimulation during the needle-retaining period should be made based on individual, instant acupuncture response, or the body sensitivity of the patient. For hypersensitive patients, sometimes only a simple needle-insertion without any manipulations may be sufficient in

generating an obvious effect. This concurs with the findings of Fink *et al.* in easing the hip pain with acupuncture on the non-acupoints^[235], but it was unclear whether those reported non-acupoints were actually sensitive spots.

Since hip and knees are large joints of the lower limb that support the entire body weight, they are more susceptible to be worn out or becoming degenerated. This is especially common in elders with obesity. Therefore, during the treatment of such cases, weight loss of obese patients will be helpful in consolidating therapeutic effectiveness. Among various physical exercises aimed at losing weight, swimming or sports activities in the water are most suitable because of the water buoyancy, which can ease the load of the body weight on large joints and prevent their possible wearing and tearing of tissues during exercises. However, it is advised to not soak those joints in the water for a long periods, absolutely no more than half an hour each time, even in warm water, because symptoms of arthritis could be worsened under a damp environment.

13.6 Knee Arthritis/Knee Pain

Knee arthritis includes rheumatic osteoarthritis and rheumatoid arthritis that is a common cause of knee pain. Whether it is acute or chronic, acupuncture may result in excellent outcome. As for the other types of knee pain caused by soft tissue injuries or inflammation in the knee, such as sprained or injured collateral ligaments (the medial or lateral), crossed ligaments, or menisci, as well as synovitis or tendinitis, acupuncture and/or other secondary methods such as moxibustion and infrared radiation can also be applied.

【 Therapy 】

Mainly select local reflex points. The key is symptomatic point selections according to locations where pain, tenderness, change of skin temperature or swelling might occur.

For pain in the anterior part of the knee with stiffness, reflex points may mostly appear around the edge of kneecap, such as Xiyan (EX146) including the lateral Xiyan (EX146), namely Dubi (ST35), and medial Xiyan (EX146), as well as Heding (EX145) and Bindi (EX147). Among them, swelling at Xiyan (EX146) is particularly common, and can be selected as the master point and punctured with the method of MNSP (multiple needles at a single point), of which several needles are deeply inserted into the articular cavity from Xiyan (EX146), at different directions. Besides, reflex points on muscles of the anterior thigh that are attached to the knee joint, such as Liangqiu (ST34), Xuehai (SP10), Binshang (EX144), and Futu (ST32) can be stimulated concurrently. When knee pain is radiated to the leg or results in tiredness of the lower limb, Zusanli (ST36), Yanglingquan (GB34), and Yinlingquan (SP9) may be associated.

For swelling and pain in the popliteal fossa, reflex points may mostly appear around Weizhong (BL40), Weiyang (BL39), Yingu (KI10), Heyang (BL55), Fuxi (BL38), Chengjin (BL56), and Yinmen (BL37). If pain is on the bilateral sides of the knee (e.g., the sprain of medial or lateral collateral ligament), then reflex points may mostly emerge around Xiyangguan (GB33), Shangyangling (EX154), Shangyinling (EX155), and Ququan (LR8).

Needling therapy on the above points is applied once daily or once every other day for acute patients, while once every 3~4 days for chronic patients. Retain needles for 30 min after the generation of needling sensations. For intractable cases, EA, direct or heat-penetrating moxibustion, and infrared

radiation can be combined with needling.

【 Case Studies 】

Case 14: Patient was a 63-year-old female. She had suffered from rheumatic osteoarthritis in her left knee for eighteen months. Pain often suddenly recurred and progressively worsened. The latest onset lasted for two weeks. She tried ice packs and anti-inflammatory medications but still was unable to receive much relief. Examination showed swelling and limited mobility in her left knee. Local tenderness was obvious, accompanying redness and a higher temperature in the regional skin, which indicated she had the hot syndrome of TCM. Acupuncture was applied once every other day. Local tender spots in the knee joint were punctured, such as Xiyan (EX146), Liangqiu (ST34), Heding (EX145), Xuehai (SP10), Ququan (LR8), Zusanli (ST36), and Yanglingquan (GB34). When needles were inserted from Xiyan (EX146) into the articular cavity, about 2 *cun* in depth, intense regional distention was felt. The day after her initial session, she felt much better, with less pain and reduced local skin temperature. Through six sessions of acupuncture, the regional pain and redness of the skin were all eliminated, and she could walk normally.

Case 15: Patient was a 78-year-old male. He had suffered from pain beneath the right kneecap for several months. He was unable to bend and extend the knee smoothly, which greatly affected his daily life. Examination found the skin temperature of his right knee was cold but without much swelling, which indicated he was of the cold syndrome in TCM. Needling therapy was applied at Xiyan (EX146) (two needles per point), Bindi (EX147), Liangqiu (ST34), Xuehai (SP10), Yinlingquan (SP9), and Zusanli (ST36). Infrared radiation was also applied at the affected areas during the needle-retaining period. Since the initial session, he felt

much better. After the second session that was applied one week later, the knee pain was completely relieved, and he was able to walk or run as normal. To stabilize results, he came for acupuncture once weekly for a total of seven weeks. At the 6-month-follow-up, the patient had not seen any recurrence of the knee pain.

Case 16: Patient was a 30-year-old male. He had suffered from constant pain in the lateral area of his left knee for a year. He was diagnosed with collateral ligament inflammation in the left knee, the same one that was injured 8 years ago and had a subsequent surgery that removed some fragments of the cartilage. Because he did not notice any significant results from anti-inflammatory medications, he came for acupuncture. Examination showed the pain was mostly centralized between Yanglingquan (GB34) and Xiyangguan (GB33), but no local swelling or changes of skin temperature were observed. Needling was applied once weekly at these tender spots as well as Xiyangguan (GB33), Yanglingquan (GB34), and Dubi (ST35). By the sixth session, the pain was completely alleviated. However, whenever the weather changed or after an excessive exercise, he still experienced some recurrence of the pain. Fortunately, with each reoccurrence, one or more sessions of acupuncture as shown above could instantly relieve the pain.

【 Discussion 】

Over the years, acupuncture has gradually become recognized as a beneficial therapy for patients of knee arthritis in the West. In a randomized trial, Berman *et al.* of USA investigated the efficacy of acupuncture as an adjunctive therapy to standard care for the relief of pain and dysfunction in elderly patients of knee osteoarthritis. Seventy-three patients with symptomatic osteoarthritis of the knee were randomly assigned to treatment (acupuncture) or

standard care (control). Results showed that patients randomized to acupuncture improved on both WOMAC (Western Ontario and McMaster Universities Osteoarthritis Indices) and Lequesne indices compared to those who received standard treatment alone. Significant differences on total WOMAC scale were seen at four and eight weeks, respectively. No adverse effects of acupuncture were reported. These data suggested that acupuncture is an effective and safe, adjunctive therapy to conventional care for patients with osteoarthritis of the knee [236]. In a retrospective study, Creamer *et al.* of the same group further examined the relationship among demographic and psychosocial variables and response to acupuncture as defined by reduction in knee pain and disability at the end of an eight-week course of treatment. They concluded that other than a weak relationship with anxiety (at eight weeks only), there was no evidence to indicate a link between psychosocial variables and response to acupuncture [237].

Christensen *et al.* of Denmark also observed remarkable effectiveness of acupuncture in treating knee osteoarthritis. Twenty-nine patients with 42 osteoarthritic knees were randomized into two groups. Group A was treated with acupuncture while Group B served as a no-treatment control. When comparing two groups, there was a significant reduction in pain, analgesic consumption and in most objective measures. In both groups, there was an 80% subjective improvement, and a significantly increased mobility in the knee (an increase mainly in worst knees). Results were significantly better in those who had not been ill for a long time. Seven patients responded so well that they did not want a surgery at that time. It was concluded that acupuncture can ease the discomfort and pain of osteoarthritis while waiting for surgery and perhaps even serve as an alternative to surgery [238,239]. Jensen *et al.* of Norway

reported the effect of acupuncture treatment in patellofemoral pain syndrome. Seventy-five patients with this disease were randomly assigned either to acupuncture treatment (twice weekly for four weeks) or no treatment. Evaluation of the result was blinded. Patients were followed for one year with the Cincinnati Knee Rating System (CKRS) scale as the main outcome measure. Results showed that at 12 months there was a significant difference in the CKRS score between the groups (acupuncture 75.2 versus no treatment 61.7, $P = 0.005$). They concluded that acupuncture could be an effective alternative treatment for patellofemoral pain syndrome.

A recent, randomized controlled clinical study funded by NIH demonstrated that acupuncture not only provides appreciable pain relief for knee osteoarthritis, but also significantly improves function. All of the 570 participants were aged 50 or older with osteoarthritis of the knee and had experienced knee pain during the month prior to joining the trial. They also never had received acupuncture treatments, had not had surgery in the previous six months, and had not used steroid or similar injections. Each participant continued with his or her standard medical care. In addition, they received one of three treatment options: a 12-week self-help course for management of their condition, acupuncture, or sham acupuncture. Progress was measured again at four, eight, fourteen, and twenty-six weeks. By week eight, participants receiving acupuncture were showing marked improvement in function. By week fourteen, the acupuncture group experienced a significant decrease in pain, compared with the other two groups. Overall, acupuncture decreased pain by 40% and improved function a similar percentage [240].

However, there were also some studies concluding that real acupuncture (at acupoints) was no

more effective than sham acupuncture (at non-acupoints) in the treatment of osteoarthritic pain of the knee. For example, Takeda and Wessel observed that both real and sham acupuncture significantly reduced pain, stiffness, and physical disability in knee osteoarthritis, and there were no significant differences between the groups ^[242]. In the preceding text, we have mentioned this kind of comparison most likely will be unable to deny the therapeutic effectiveness of acupuncture, at most it may only suggest a lower specificity of action in those selected acupoints. When certain acupoints have a lower specificity of action, it is reasonable to expect no significant difference of needling effects between them and non-acupoints located within the same reflex zones (refer to Sections 4.1 and 9.1).

To raise the therapeutic effects of acupuncture for knee pain or osteoarthritis, it is crucial to determine corresponding reflex points. Because of the large area of the knee, the regional swelling and pain may appear anywhere, such as the bilateral sides above the kneecap, the medial and lateral collateral ligaments, or the popliteal fossa, thus, precise point selection with syndrome differentiation is required. Note that Dubi (ST35) and the medial Xiyang (EX146) are like 'two windows' in the knee because they can often reflect its internal changes, as most knee swellings first emerge on those points. Thus, Dubi (ST35) and Xiyang (EX146) are often selected for knee arthritis or pain due to soft tissue injuries. Of course, some patients with knee pain may not have any swelling at Xiyang (EX146), instead, there might be some tenderness at the boundaries between the lower end of femur and the upper end of tibia that are equivalent to the middle points of the medial or lateral collateral ligaments. In those circumstances, direct stimulation of these tender spots is necessary. However, these spots are mostly located on the surface of the periosteum, where needles are difficult

to be inserted perpendicularly and deeply, thus, oblique or horizontal needling is often applied.

There are four newly discovered points around the knee that have remarkable effects in relieving knee pain: Bindi (EX147), Shangyangling (EX154), Shangyinling (EX155), and Binshang (EX144). First three points are experiential points of Master Jiao. Apply perpendicular needling on Bindi (EX147) and depress the needle deeply into the articular cavity, while puncturing obliquely on Shangyangling (EX154) and Shangyinling (EX155). Binshang (EX144), an experiential point discovered by Shirota Bunshi of Japan that should be punctured at a depth of 1.5 *cun* to propagate needling sensations to the knee.

When treating knee arthritis, it is relevant to note the differentiations between the cold and hot syndromes. A simple test is to put a palm on the patient's kneecap and feel the difference of skin temperature between the affected region and its symmetrical portion on the contralateral side. In the acute phase of the disease, the regional skin temperature is mostly raised in addition to local swelling, which pertains to the hot syndrome. In the chronic phase or in elder patients, local swelling might not be significant, instead, a cold skin or muscular rigidity could be felt, which pertains to the typical cold syndrome of arthromyodynia. To enhance therapeutic results for the cold syndrome, it is best to apply the heat-producing needling method to attain local warmth, or combine with moxibustion or other thermal therapies during the needle-retaining period.

Presently, the procedure of knee replacement surgery is widely used to treat knee arthritis, relieve knee pain, and help recover normal knee functions completely. However, a portion of these patients might still experience post-surgical residual pain and often seek acupuncture as their last resort. For these

patients, it is usually more difficult for acupuncture to achieve the same level of effects as that of other arthritis patients without surgery or of other joints without surgery in the same patient. The reason behind this is mostly due to the disturbed anatomophysiological relationship at the surgical region.

Besides the above methods, the opposite needling method (ONM) can also be applied for knee arthritis. It was reported by Arichi *et al.* that some curative rate was obtained when patients of knee osteoarthritis were treated by acupuncture on the healthy side at the symmetrical part of the lesion. Meanwhile, flexion-extension exercise with massages on the affected part was also associated ^[243].

13.7 Rheumatoid Arthritis/ Arthritis of Small Joints

Rheumatoid arthritis is a kind of autoimmune disorder with unclear causes. In terms of TCM, rheumatoid arthritis as well as osteoarthritis and fibromyalgia pertain to the category of arthromyodynia. Acupuncture has accumulated an abundant experience in treating this disorder. For different joints affected, point selection and needle-manipulation techniques may vary. When treating large joints such as shoulders or knees, acupuncture methods are similar to that of the frozen shoulder or knee osteoarthritis (refer to Sections 13.1 and 13.6). Here we emphasize on treating small joints.

【 Therapy 】

Select reflex points with tenderness, swelling, or a higher skin temperature at affected joints or their adjacent regions. Mainly apply needling therapy, but

can be combined with moxibustion or infrared radiation. The following are the commonly used points for corresponding joints.

Elbow: Zhouliao (LI12), Quchi (LI11), Qinglengyuan (TE11), Tianjing (TE10), Cuoshan (EX124), Shousanli (LI10), and Sidu (TE9).

Wrist: Yangchi (TE4), Yangxi (LI5), Yanggu (SI5), Shenmen (HT7), Daling (PC7), and Taiyuan (LU9).

Metacarpophalangeal joints: Baxie (EX132), Hegu (LI4), Sanjian (LI3), Zhongzhu (TE3), and Yemen (TE2).

Ankle: Qiuxu (GB40), Jiexi (ST41), Shangqiu (SP5), Kunlun (BL60), Taixi (KI3), and Shenmai (BL62).

Metatarsophalangeal joints: Bafeng (EX163).

Interphalangeal joints: On the ventral or lateral side of affected joints.

When puncturing points on mass muscles or in articular cavities, select thick filiform needles (No. 26 or No. 28) and repeatedly apply various needle-manipulation techniques, such as needle thrusting, lifting, and twisting, or apply the heat-producing technique to attain regional warmth.

When puncturing points on the bone surface, insert the needles obliquely or horizontally and slightly move needles back and forth within these points, as if “rubbing against the periosteum”, and then retain the needles for 30 min.

For patients with severe articular pain or pain involving multiple joints, select other associate points or advanced needling techniques to help raise the pain threshold or the immunity, such as NTN (nerve trunk needling method). When NTN is applied, the patient may feel an electric-shock sensation that radiates toward distant portions of the body without retaining the needles.

【 Case Studies 】

Case 17: Patient was a 42-year-old female. She had suffered from rheumatoid arthritis for 15 years.

Inflammation was mostly in her wrists and ankles, as well as in the left shoulder and right knee. Persistent pain varied while there were no visible malformations of the joints. The patient was on daily non-steroid anti-inflammatory medications for many years. When she first came to acupuncture, she had swollen wrists and the left shoulder and skin temperature of those affected regions was higher than the rest of the body. Acupuncture was applied as shown above. After only one session, the swelling and pain of the left wrist and shoulder subsided, and the skin temperature on affected regions returned to normal. The pain in her right wrist was also much better except a slightly higher skin temperature and some swelling remained at the bottom of her thumb. The next day, another session was applied mainly focusing on the reflex points of the right wrist. Three days later, the pain, skin redness, and a higher temperature on the right wrist were all alleviated.

Case 18: Patient was a 53-year-old female. She had suffered from pain in her left big toe for six months, and could only wear open-ended sandals as the pain greatly affected her walking. She took Endomathicin but did not receive much relief. Laboratory tests excluded gout and examination found a widened interdigital region between the first and second toes of left foot. There were also obvious tenderness and swelling at the first metatarsophalangeal joint, and some raised skin temperature at the surface of big toe. However, the skin redness or swelling was not distinct. Five needles were superficially inserted at the dorsal midline of big toe, and two needles were insert at one of Bafeng (EX163) between big and second toes, and one needle each at Xingjian (LR2), Taichong (LR3), Dadu (SP2), and Taibai (SP3), respectively. Needles were retained for 25 min along with infrared radiation at the local affected regions. After needles were removed, the patient was able to walk without any pain. Two days later, she came

for the second session, and stated it was the first time in 6 months that she could wear regular shoes. However, at the third session, she reported pain had recurred and shifted to the dorsum of left foot. Meanwhile, an increased skin temperature and tenderness in her left foot were detected. Subsequent puncture was focused on tender spots at left Taibai (SP3), Taichong (LR3), Xianggu (ST43), and Zulinqi (GB41), as well as Jiexi (ST41) and Qiuxu (GB40). Infrared radiation was applied at the affected region were combined with needling. Three days later, the pain on the dorsum of the left foot subsided, and through ten sessions of treatment, all of her foot pain and swelling were alleviated.

【 Discussion 】

Acupuncture has tremendous benefits for rheumatoid arthritis. First, at the early stage of this disease, timely acupuncture can control its inflammation and reduce the recurrence frequency, which is crucial in preventing damage to the bones and cartilage of the affected joints. Second, this disease is mostly chronic and often recurs, a long-term application of anti-inflammatory medications or steroids during treatment will bring serious adverse effects. However, acupuncture can be applied repeatedly for a lengthy period without any adverse effects. Third, even for patients with bony ankylosis and rigidity of muscles, acupuncture has considerable rehabilitation effects. Of course, applying acupuncture alone might not be sufficient in recovering joints that have had osteomalacia.

Rheumatoid arthritis does not discriminate when it comes to sizes of joints, large or small, any joints can be affected. Similar to treating arthritis of large joints, such as shoulder, hip, and the knee, which all have been discussed previously, a key in effectively treating arthritis in small joints is to apply direct needling on the affected area of those joints.

Generally, acupuncture therapy can more easily take effect for arthritis of larger joints rather than smaller joints, which may be related to fewer soft tissues and poorer blood circulation in the smaller joints. Moreover, needling is more difficult to strike the affected area precisely if joints were too small. It appears fewer acupoints are around small joints, especially at the regions of fingers or toes, while more acupoints are around large joints. In addition, it is difficult to attain stronger needling sensations when puncturing smaller joints. Therefore, in order to raise the stimulation amount at affected small joints, it is advised to stimulate regional reflex points as deep as possible, while applying advanced needling methods of either Multiple Needles at a Single Point (MNSP) or at a single zone (MNSZ). When there is swelling at the affected region, areas of regional acupoints or reflex zones often become enlarged. Meanwhile, a method such as MNSP can be easily applied if needed.

When carpal joints are affected, regional pain and swelling usually appear in the dorsum of the wrist, select Yangchi (TE4), Yangxi (LI5), and Yanggu (SI5) as master points. If some pain appears on the medial side, select Shenmen (HT7), Daling (PC7) and Taiyuan (LU9). Thus, any acupoints or reflex points on the region around the wrist can be selected. In addition, adjacent acupoints such as Waiguan (TE5) and Hegu (LI4) may also be associated.

For disorders of the hand or interphalangeal joints, acupoints on the dorsum of hand are often stimulated, but most of them are around metacarpophalangeal joints, while only a few are around interphalangeal joints. However, if needles were inserted from the palmar side, almost every portion of metacarpophalangeal joints and interphalangeal joints can be stimulated. Although the palmar skin is sensitive, it can still be achieved without pain as long as **Jin's painless needle-shooting method (JPNSM)** is

applied. In fact, the palmar side of each metacarpophalangeal joint and interphalangeal joint is considered a new zone that can be used to treat corresponding arthritis. According to classical TCM literature, there were only a few scattered acupoints, mostly around muscular areas at the palm of the hand. This might be related to the superficial sensitive regions of the extremities that are difficult to tolerate thicker needles used in the ancient times. For the same reason, the sole is more difficult to be approached with needles than the palm. When stimulating metatarsophalangeal joints of foot, it is easier to access from the dorsum of the foot. When treating arthritis of interphalangeal joints of the foot, which often occurs at the big toe (e.g., the 'hammer toe'), needles can be inserted from bilateral sides of the joint.

Bony ankylosis and malformation of joints are often severe consequences of rheumatoid arthritis at its late stage. In our experience, acupuncture also has certain effects for those suffering from ankylosis or malformation, especially in conjunction with *tuina*.^[250]

Considering the fact that this disease easily relapses, the need to stabilize results is especially important. According to our experience, patients are advised to follow-through with acupuncture until all symptoms are relieved, including regional tenderness, even when nearing a full recovery^[251]. The interval between each treatment course should generally be short, but a break of several days can be taken if the patient feels exhausted or the curative effect has reached a certain plateau. Moxibustion at Shenshu (BL23) can be applied daily or once every other day. It was observed that such treatment plan could ease local inflammations, eliminate swelling of joints, and prevent polyarthritis^[37]. In addition, patients are advised to keep affected joints warm, avoid catching cold or use of ice, and try to eradicate

as many factors that may induce relapses as possible.

As for the mechanism of acupuncture in treating this disease, acupuncture can definitely enhance the overall immune functions ^[252~254], improve blood circulation, and remove blood stasis ^[255].

13.8 Fibromyalgia

Fibromyalgia is a chronic musculoskeletal syndrome characterized by widespread or regional pain, tenderness, and stiffness in muscles, ligaments, tendons, and related connective tissues. The cause of this disorder is unknown. It most frequently affects the neck, shoulders, chest, legs, and the lower back, and pain is generally accompanied by sleep disorders, fatigue, gastrointestinal disorders, and depression. As that for rheumatoid arthritis and osteoarthritis, acupuncture has showed excellent effectiveness in controlling symptoms of fibromyalgia for a short-term.

[Therapy]

Select tender spots or sensitive points within the pain region. It is also suitable to select corresponding points on the contralateral side of the trunk or limb. Puncture four to eight points each session and propagate needling sensations to the pain region or its surroundings. For cases of cold syndrome, a heat-producing needling technique may be applied to obtain warmth. Retain needles for 30 min each session and apply 2~3 sessions weekly. Apply moxibustion via a ball of argyi moxa fixed on the needle handle or infrared radiation if necessary. For migratory pain, track down and stimulate each freshly emerged tender spots at the new pain region.

[Case Studies]

Case 19: Patient was a 41-year-old female. She had suffered from fibromyalgia for over 10 years and had multiple migratory pains on the entire body surface. During each onset, she had to take analgesics to relieve the pain. When she came for acupuncture, the pain was mainly located at the back, which had affected her walking for several weeks, and the back was difficult to be straightened. Examination showed a hypersensitive skin at the affected portions of the body, where even a slight touch could trigger a tremendous amount of pain. Ten needles were inserted perpendicularly into bilateral Dachangshu (BL25), Qihai (BL24), Zhibian (BL54), Tunshang (EX115), and Chengshan (BL57), at the depth of 1~2 *cun*, but without any needle-twisting or needle-thrusting manipulations. The patient instantly felt intense needling sensations after the needle-insertion. With 30 min of needle-retaining period, most of her pain immediately subsided. At the two-day-follow-up, she indicated the pain eased significantly but not completely relieved yet.

Case 20: Patient was a 41-year-old female. She had suffered from fibromyalgia for three years, and the pain migrated to the entire back, suprascapular area, as well as the hips and upper arms. She took various pain medications, physical therapy, steroid injections, without significant results. Acupuncture was applied twice weekly, totaling six sessions. Reflex points with tenderness such as bilateral Jianjing (GB21), Biniao (LI14), Shenshu (BL23), Chengshan (BL57), and Yanglingquan (GB34) were punctured. Through these treatments, her pain was almost completely relieved. At the 5-month-follow-up, the self-evaluation indicated she had a five-month pain-free period until some new pain emerged on the shoulders and neck. Afterwards, subsequent eight sessions of acupuncture were applied on Fengchi (GB20), Waiguan (TE5), and

Zusanli (ST36), until these pains eased completely.

【 Discussion 】

To date, there have been a considerable number of clinical trials about acupuncture for fibromyalgia reported. In 1999, Berman *et al.* at Univ. of Maryland, USA analyzed seven related studies. They found only one high quality methodological study suggesting that 'real' acupuncture is more effective than sham acupuncture for relieving pain, increasing pain thresholds, improving global ratings, and purgation morning stiffness of fibromyalgia syndrome, but the duration of post-acupuncture effects was not immediately known. The other six lower-quality studies were consistent with these findings ^[244]. A consensus statement of NIH stated that acupuncture is a sufficient adjunct method to treat patients with fibromyalgia.

In a recent study conducted by Mayo Clinic, USA, fifty patients diagnosed with fibromyalgia for whom other symptom-relief treatments were ineffective were randomly assigned to receive acupuncture or simulated acupuncture. Treatments were applied in six sessions over 2~3 weeks. All patients were given questionnaires before treatment, immediately after treatment, and at one and seven months after treatment to determine the degree of symptoms they experienced and how the disease affected their daily lives. Patients who received acupuncture experienced minimal side effects. Following treatments, symptoms of pain, fatigue and anxiety were most significantly improved in the patients given acupuncture. At seven months post-treatment, the patients' symptoms of pain, anxiety and fatigue had returned to baseline levels; the patients experienced the largest improvement at one month after the treatment ^[245].

The effectiveness of acupuncture for fibromyalgia can be determined through measurement of certain

objective parameters of tender spots. A preliminary study demonstrated a reduction in regional blood flow at those tender spots in fibromyalgia patients compared with healthy controls. In a study of twenty patients with fibromyalgia, Sprott *et al.* of Germany further observed that increased blood flow was registered at all tender spots after acupuncture. Skin temperature increased in 10/12 tender spots by a mean of 0.45°C. Number of tender spots was reduced from 16.1 to 13.8 after therapy. The pain threshold also increased in 10/12 tender spots ^[246]. In another study with twenty-nine fibromyalgia patients, Sprott *et al.* found that acupuncture could not only decrease pain levels and had fewer positive tender spots, but also decrease serotonin concentration in platelets and increase serotonin and substance P levels in serum. These results suggested that acupuncture is associated with changes in concentrations of pain-modulating substances in serum ^[247].

From our experience, since the main affected tissue of fibromyalgia is muscles, acupuncture can achieve effects easier than for pain of other tissues like sheaths of tendons and synovial bursae. Patients with fibromyalgia have increased sensitivity of muscles on the body surface, in other words, a decreased pain threshold of the body. During the examination before acupuncture treatment, tender spots at the affected region generally can be determined through light finger touches. The key to raise therapeutic effectiveness is to focus stimulation on such tender spots, and aim to eliminate them gradually. Self-assessed symptoms of patients will be improved with the alleviation of tender spots. Due to the higher sensitivity of most tender spots, needling sensations can be generated easily, additional electrical stimulation is usually not required. Moxibustion or infrared radiation may be incorporated with needling. Since most fibromyalgia patients frequently experience relapses, a longer

term or at least several courses of acupuncture, treatments are recommended. To raise the overall resistance of the body against inflammations, daily exercises are advised.

13.9 Tendonitis/Heel Pain

Tendonitis is a kind of painful inflammation that occurs at locations where tendons are attached to the bone. It is mostly caused by a violent pulling or repeated light pullings of tendons. Frequently seen pulled tendons are rotator cuff (i.e., the infraspinatus and biceps brachii) tendons of the shoulder, the carpal extensor tendon (the humerus lateral epicondylitis) and the carpal flexor tendon (humerus medial epicondylitis) of the elbow, tendons of the kneecap, lateral tendons of the popliteal fossa, the posterior tibialis of the leg, and Achilles tendon of the heel. Clinical manifestations of tendonitis are mainly regional pain, tenderness, swelling, limited mobility of affected joints, or weakness in the affected arms or legs due to pain. When suffering from Achilles tendonitis, if pain becomes worse during severe activities such as running, there is a higher risk of tearing the tendon. This section focuses on the treatment of Achilles tendonitis or heel pain, as for the treatment of other kinds of tendonitis, refer to Sections 13.1, 13.6, 13.10, and 13.12.

The heel pain is one of the principal symptoms of Achilles tendonitis. It can be caused by tearing or pulling of Achilles tendons due to running or other aerobic exercises on the hard floors without appropriate shoes or shoe pads. Some patients of heel pain may have bone spurs found, which may lead to the irritation of tendons. However, in spite of the presence of heel bone spurs, as long as acupuncture

is applied properly, satisfactory therapeutic effectiveness for this disease can be expected.

[Therapy]

Select local reflex points as master points, and combine with electrical stimulation or infrared radiation after the generation of needling sensations. When local reflex points manifest as large hard nodules, the method of MNSP or ENM (encircling needling method) can be applied.

For heel pain, reflex points with local tenderness or swelling are often found on the medial side and the bottom of the heel. Generally, they may emerge around Shuiquan (KI5), Zhaohai (KI6), and Rangu (KI2), as well as other portions inferior to these acupoints or even closer to the sole, such as 1 *cun* below Shuiquan (KI5). Apply **Jin's painless needle-shooting method** for the needle-insertion. Once the sensitive center of a tender spot is stricken, intense needling sensations of soreness and heaviness may be felt. During 30 min of needle-retaining period, electrical stimulation or infrared radiation may be combined with needling simultaneously. One can also puncture some associate points, such as Taixi (KI3) and Sanyinjiao (SP6) to generate needling sensations of numbness or electric-shock sensation that may be propagated to the sole. Acupuncture is applied once every other day for acute pain and twice weekly for chronic pain.

[Case Studies]

Case 21: Patient was a 74-year-old female. She had suffered from right heel pain for three weeks, which affected the walking and sleep. She was diagnosed with tendonitis caused by bone spurs and received localized cortisone injections as well as anti-inflammatory medications, all without significant results. Examination found swelling in the medial right heel, but did not show any changes in regional

skin temperature. When pressing the heel with fingers, there was remarkable tenderness on the basal area of the right heel. Use puncture methods outline above besides daily infrared radiation. Through only three sessions, her pain was completely relieved.

Case 22: Patient was a 45-year-old male. He had suffered from right heel pain for about one month that affected the walking. Examination showed slight swelling and tenderness on the medial side of his left heel. The most obvious tenderness was at the deep portion of the heel. When walking, the patient was accustomed to plant the heels on ground first. Acupuncture was applied three sessions weekly, and EA was applied for each session. Selected points were mostly tender spots of his left heel such as Shuiquan (KI5), 1 *cun* below Shuiquan (KI5), Zhaohai (KI6), 1 *cun* below Zhaohai (KI6), and Rangu (KI2), as well as other tender spots in the center of the bottom of the heel. For the needle-insertion of all these points, **Jin's painless needle-shooting method** was applied. At a depth of 1 *cun*, some needling sensations such as soreness and distension were felt. The needles were hooked to an electric stimulator and retained for 30 min. It was observed that an electric-shock sensation swept through the bottom of the feet when Shuiquan (KI5) was punctured each time. After four sessions of acupuncture, the patient felt better in the heel. After seven sessions, he was almost pain-free during walking. Through ten sessions of treatment, his heel pain was eliminated.

Case 23: Patient was a 62-year-old female. She had suffered from heel pain in both feet for one and half year. The pain was worse in the right heel and limited her mobility, as she could not flex the right foot. She had five cortisone injections in the heel for the coexisting bone spurs, receiving only temporary relief. Examination found two round walnut-sized hard nodules at the middle of Achilles tendons,

about 1 *cun* superior to Taixi (KI3), one per side with distinct tenderness. The larger nodule was on the right side. No. 32 filiform needles were inserted into the nodules as well as Chengshan (BL57), Feiyang (BL58), Sanyinjiao (SP6), and Taixi (KI3). During the 20 min needle-retaining period, infrared radiation was combined with needling. A 3 min of massage was also provided to the hard nodules after the removal of needles. After the initial session, the hard nodules became soft instantly, and the patient felt much better when walking. Later on, the same method was applied for 12 sessions until the left nodule disappeared, but the right side still had some swelling but the hard nodule no longer existed. It appears all of her mobility was back to normal and there was no pain when walking.

【 Discussion 】

For patients with Achilles tendonitis or heel pain that are not caused by sports injuries, they either have a poor walking habit (placing the heel on ground first) or have congenital flat feet. For the former, their entire body weights are placed onto the heels during walking. For the latter, there are also increased load over the heels due to reduced buffer action of the plantar arch. Accordingly, patients are at risk for inflammations or pains of the soft tissue in the heel including Achilles tendonitis, which frequently occurs in obese patients. Thus, it is helpful to change the walking habit by learning to place toes on ground first and try to walk softly. Patients with flat feet should also wear appropriate shoes or apply shoe pads to correct the mechanical structures of the feet.

As for the relationship between bone spurs and heel pain, generally, bone spurs can be either a consequence of an increased load on the heel for a long-time or a cause for irritating regional soft tissues including Achilles tendon. In other words, the existence of bone spurs increases risks of having

Achilles tendonitis, but it does not always cause pain. Many of our patients no longer felt any heel pain after acupuncture, but their regional bone spurs were not removed.

Thus, effects of acupuncture in treating Achilles tendonitis or heel pain are mainly realized through the mechanism of eliminating inflammation. The key of effective needling is to strike the precise locations of regional reflex points or tender spots in the deep portion of the sole. If cord-like or round hard nodules are found in chronic patients, needles must be inserted into the centers of hard nodules. It has been demonstrated that through repeated stimulation, most hard nodules of tenderness could be softened and gradually eliminated. Case 23 is an example of such.

However, needling the bottom of heel might not be welcomed by some patients due to the potential local pain caused by thicker and more sensitive skin. There are two ways to overcome this challenge. The first is to apply **Jin's painless needle-shooting method** to quickly shoot needles into the skin, and then deeply thrust needles to the centers of points. The second is to insert needles at the boundary between the medial side and bottom of the heel. This area, where reflex points of heel pain often appear, is one of most suitable needle-insertion locations; its skin is not as thick as that of the sole, so needles can be easily inserted into the bottom of heel.

13.10 Tennis Elbow/ Epicondylitis

The disorder titled “tennis elbow” was originally coined by statistics that indicated nearly half of all tennis players would suffer from it at some point of

their ball-playing lifetime. A condition caused by inflammation of tendons on the lateral side of elbow, it can be induced by certain repetitive movements of the wrist as well as over usage or sudden pulling of the extensor muscles of the forearm. The predominant lesion is enthesopathy – a pathological lesion at the lateral epicondyle (a bony prominence of the upper arm), which occurs three times more frequent than at the medial epicondyle, therefore it is often referred as the lateral epicondylitis. As for the medial epicondylitis, it is also known as “golfer's elbow”, a condition similar to tennis elbow but is frequently seen among golfers where the flexor muscles and forearm tendons are aggravated or pulled during golf swings. It has been demonstrated in certain high-quality studies that acupuncture has satisfactory therapeutic effectiveness for epicondylitis.

[Therapy]

Mainly apply needling according to any of the following two methods.

Method A: Select local and adjacent points. This is suitable for those with significant tender spots within a limited scope, or those with a longer disease course. Apply direct, superficial stimulation at regional tender spots. For the most remarkable tender spot, which is usually located on the affected epicondyle, apply ENM (encircling needling method) or MNSP (multiple needles at a single point) method, within a scope of 2 cm in diameter. Aimed to stimulate the center of the spot, four or five needles are obliquely inserted toward the center to generate needling sensations that can be propagated to its surroundings. Once needling sensations are generated, retain needles for 20 min without requiring any needle-manipulations. This is a key in achieving results. Besides, Quchi (LI11), Shousanli (LI10), Zhouliiao (LI12), and Waiguan (TE5) for the lateral

or medial epicondylitis, or Shaohai (HT3), Chize (LU5), Ximen (PC4), and Neiguan (PC6) for the medial epicondylitis can be associated. In intractable cases, either EA or a thermal therapy may be combined with needling. For those who have temporary worsening pain after the initial session, it is suitable to prolong the interval between two consecutive sessions slightly, but it is necessary to have acupuncture applied at least once weekly.

Method B: Select corresponding points on the contralateral upper limb or ipsilateral lower limb, which is applicable for those with spontaneous and diffuse pain at the affected region, or whose tender spots are distributed in a broader scope. It is also suitable for those with a limited mobility of forearm or suffering a temporary but worsening pain due to local needling. Apply an intense stimulation on these corresponding points. After the generation of needling sensations, instruct the patient to exercise the affected forearm for several minutes during the needle-retaining period.

The above two methods can be applied either alone or in combination. When used in combination, first stimulate the affected side, then the contralateral side or corresponding points. Other applicable complementary therapies are local heat/thermal applications including moxibustion or Chinese herbal plaster, as well as physical therapy. During the treatment, the affected arm should not be overused; any activity involving irritations of affected tendons should be minimized as much as possible.

【 Case Studies 】

Case 24: Patient was a 48-year-old male. He had suffered from lateral epicondylitis for two years. Pain in his arm was severe and greatly affected his writing and even sleep. Oftentimes, he was easily awakened at night due to the pain. He had taken several steroid

injections as well as physical therapy, all without much success. Examination found there was obvious tenderness at the lateral epicondyle. Acupuncture was applied twice weekly. The method of MNSP was applied on the most remarkable tender spot with insertions of five needles each time. Some associated points near the lateral epicondyle including Zhouliao (LI12) were also punctured. Through eight sessions of treatment, the patient had significant relief of local tenderness and pain. His self-evaluation indicated that ever since he came to acupuncture, the pain was less day-by-day. To stabilize results, he took four additional sessions at once weekly until most of pain in the arm subsided. At the 3-month-follow-up, he had no recurrence of the pain.

Case 25: Patient was a 54-year-old female. She had suffered from bilateral, medial epicondylitis for six months. Pain severely affected her work and even sleep. At night, she relied on pain medications for temporary relief of several hours. Examination indicated an obvious swelling and tenderness on the medial epicondyle around Shaohai (HT3). Acupuncture was applied twice weekly with MNSP method, two to three needles each time, on Shaohai (HT3) as well as nearby tense muscles. Needles were retained for 30 min after the generation of intense soreness and distension at the region. Through only two sessions of treatment, her local tenderness, swelling, and pain were greatly alleviated. After six sessions, all of her pain was relieved.

【 Discussion 】

For this disorder, main therapeutic principles of Western medicine are to relieve symptoms of pain, microbleeding and inflammation to promote the healing of injuries while aiming to rehabilitate the affected arm and prevent any relapses. One of most effective modalities is to first apply some ice packs in the acute stage, then apply non-steroidal

antiinflammatory medications and various thermal applications including ultrasound. In addition, it is advised to maintain a good rest of the affected arm as well as limit any activities that may induce pain. Local injection of steroids (e.g., Cortisone) is also an effective mean, unless more than two such injections are performed in a short duration ^[248].

In early 1980s, an evaluation about the effectiveness of conservative medical therapies for tennis elbow was conducted. It was estimated that 10% of patients remained symptomatic at discharge, 26% had recurrence of symptoms, and many were symptomatic at review. Over 40% of patients had prolonged minor discomfort, which affected some activities. Ultrasound was not as effective (53% improved) as steroid injection (89% improved), but recurrence was less frequent ^[256]. It was concluded that acupuncture would be an excellent alternative to steroid injections for tennis elbow patients. According to Brattberg, 21 out of 34 patients who were treated with acupuncture became much better or completely free of pain. Many of them had previously been given one or more steroid injections without improvement. In a control group of 26 patients who received only steroid injections, eight patients reported a corresponding improvement ^[257]. From our experience, however, it is difficult to cure this disorder with just several sessions of acupuncture. The key to raise therapeutic effectiveness is to select proper reflex points and needling techniques including depth of insertion and stimulation duration.

The optimal points for lateral epicondylitis may be around the affected epicondyle, the symmetrical site of the contralateral side, or the corresponding portion on the ipsilateral leg. The latter pertains to the method of selecting corresponding points (refer to Section 11.7). Molsberger and Hille of Germany studied the immediate analgesic effect of a single, non-segmental, acupuncture treatment on chronic

tennis elbow pain in a placebo-controlled, single-blinded trial completed by 48 patients. Those in the verum group were treated at non-segmental, distal points of the ipsilateral leg, whereas patients in the placebo group were treated with placebo acupuncture avoiding piercing through the skin with a needle. They observed that overall reduction in the pain score was 55.8% in the verum group and 15% in the placebo group. After one treatment, 19 out of 24 patients in the verum group (79.2%) reported pain relief of at least 50% (placebo group: six patients out of 24). The average duration of analgesia after one treatment was 20.2 hours in the verum group and 1.4 hours in the placebo group. The results are statistically significant ($P<0.01$), and indicated that non-segmental verum acupuncture had an intrinsic, analgesic effect for tennis elbow pain that exceeded that of placebo acupuncture ^[258]. In another randomized, double-blinded, controlled, clinical study, Fink *et al.* of Germany also found that acupuncture in which real acupoints were selected and stimulated was superior to non-specificity acupuncture with respect to reduction in pain and improvement in the functioning of the arm ^[259].

Concerning depth of needling, it may be determined by depth of selected acupoints or reflex points. For example, due to shallowness of tender points at the lateral epicondyle of humerus, deep needle-insertion cannot be performed, instead, only oblique or horizontal needling can be applied. However, deep needle-insertion can be applied at other tender points surrounding the elbow, such as Quchi (LI11) and Shousanli (LI10). Haker and Lundeborg of Sweden compared the pain-alleviating effect of classical deep needle-insertion with superficial needling in 82 patients suffering from lateral epicondylalgia. Each session was 20 min long, and two to three sessions weekly with ten sessions of treatment in all. Five acupoints were selected and

they are Shousanli (LI10), Quchi (LI11), Zhouliao (LI12), Chize (LU5), and Waiguan (TE5). After ten sessions of treatment, significant differences were observed in groups favoring classical acupuncture technique in relation to subjective and objective outcome. However, no such differences could be observed at follow-ups after three months and one year. It was concluded that classical deep needle-insertion was superior to superficial needling in the short-term symptomatic treatment of lateral epicondylalgia, but not at three-month and twelfth-month follow-ups ^[260].

When treating the medial epicondylitis with acupuncture, an appropriate posture of the arm is important. In our experience, it is best for the patient to lie down (supine), extend, and abduct the forearm with the palm upward with a soft cushion beneath the elbow. In this posture, regional tender spots can be fully exposed and punctured more easily. Actually, any part of the medial forearm with swelling or increased tension can be chosen as stimulation locations. If the swelling area is greater, the method of MNSP can be applied.

As for stimulation techniques besides needling, moxibustion, infrared radiation or seven-star needles for slight pricking of blood can also be incorporated. Self-acupressure at regional tender spots is also recommended, in which light finger pressure is applied for 3~5 min each time, 2~4 times daily until pain is no longer felt upon pressing.

13.11 Carpel Tunnel Syndrome

Carpal tunnel syndrome is a specific condition brought on by increased pressure or a pinched nerve at the wrist. Symptoms may include tingling,

numbness, weakness, or pain in the fingers, hand, and occasionally in the arm. These symptoms occur when pressure builds up from swelling in the median nerve of the wrist. Compared to other diseases and injuries, carpal tunnel syndrome is one of the leading causes of lost time at work in North America. In general, acupuncture has excellent therapeutic effects for this disease.

[Therapy]

Select points on either palmar or dorsal sides (*yin* or *yang* side) of the transverse crease of wrist. For numbness and tingling of the fingers, mainly select palmar (*yin* side) points (Group 1). For weakness of the wrist and pain of the forearm, mainly select dorsal (*yang* side) points (Group 2).

Group 1: The master point is Daling (PC7) with insertions of multiple needles, and associate points are Neiguan (PC6), Taiyuan (LU9), Yuji (LU10), and Shenmen (HT7). It is advised to propagate an electric-shock sensation to the fingertips.

Group 2: The master point is Yangchi (TE4) and associate points are Yangxi (LI5), Yanggu (SI5), Waiguan (TE5), Hegu (LI4), and Shousanli (LI10). It is advised to attain stronger needling sensations such as soreness and heaviness in the wrist and forearm.

Apply the above two groups of points alternately once every other day or every 3~4 days. Retain the needles for 30 min, and add an electrical stimulation if the needling sensations generated are not ideal.

[Case Studies]

Case 26: Patient was a 47-year-old male. He had suffered from pain in both wrists, and some numbness of his thumb, index finger, and middle finger for eight years. Diagnosed with carpal tunnel syndrome, the pain was worse on the right hand and wrist that seriously affected his work and daily life. Acupuncture was applied twice weekly on bilateral

Daling (PC7), Shenmen (HT7), Yangxi (LI5), Hegu (LI4), Waiguan (TE5), and Shousanli (LI10). After the generation of soreness and distension, needles were retained for 30 min. After only one session, the wrist pain was drastically reduced. Through 11 sessions, the wrist pain along with numbness of fingers was completely alleviated.

Case 27: Patient was a 41-year-old male. He had suffered from pain in both wrists, accompanying some numbness in the fingers for one month. Because of this problem, he had to take frequent breaks at work. Acupuncture was applied twice weekly using Group 1 points and therapy stated above. After the initial session, he had much less pain, and after four sessions, he was significantly better. At the eighth session, he could use both hands to do anything without pain or discomfort. The one-year-follow-up showed no relapses of the pain.

[Discussion]

The consensus statement released by NIH in 1997 has mentioned the possible effects of acupuncture in treating carpal tunnel syndrome^[211]. According to a study by Branco and Naeser of USA, total 36 hands of carpal tunnel syndrome patients who previously failed standard medical/surgical treatments were treated primarily with low-level laser acupuncture and microamps TENS on the affected hand, and secondarily with infrared low-level laser and/or needle acupuncture on deeper acupoints. Chinese herbal formulas were also applied on a case-by-case basis. Three sessions of acupuncture were applied weekly for 4~5 weeks. Results showed that post treatment pain significantly reduced ($P<0.0001$), and 33 of 36 hands (91.6%) no pain, or pain reduced by more than 50%. The 14 hands that failed surgical release were also successfully treated. Follow-ups were conducted after 1~2 years with those cases younger than 60, pain returned in only two of 23

hands (8.3%), but were successfully re-treated within a few weeks. It was concluded that possible mechanisms for effectiveness include increased adenosine triphosphate (ATP) on a cellular level, decreased inflammation, and temporary increase in serotonin^[261]. However, for this disease, until now, there is a lack of high-quality, large-sample acupuncture clinical trials.

To raise the curative effect for this disease, one must be familiar with the anatomical structure of the wrist and etiology of the carpal tunnel syndrome. Three sides of the wrist are carpal bones, only the fourth side (palmar side), is covered by a thin layer of soft tissue, of which the median nerve and nine tendons pass from the forearm into the hand, all fixed by the transverse carpal ligament. The small space in the wrist surrounded by the ligament and carpal bones is the carpal tunnel. Although the cause is unknown, an excessive employment of these tendons resulting in tendonitis is thought to be the principal cause of this disease. The median nerve controls some movements of the thumb, and supplies feelings to most of the thumb and the index finger, middle finger, and part of the ring finger. It is the most sensitive structure of the carpal tunnel to pressure. When the pressure inside the carpal tunnel is raised by regional inflammation of tendons or other pathological changes (e.g., degenerative arthritis) of the carpal bones, symptoms of numbness and tingling may occur in parts of the hand innervated by the median nerve. Other symptoms may include weakness of the hand (mainly the thumb), radiating pain to the forearm, and muscular atrophy of the forearm in the late stage.

Accordingly, most local reflex points of this disease and most approachable locations to the carpal tunnel for needling should be in the median of the wrist at the palmar side. This is why Daling (PC7) is often chosen as the master point. In this

disease, flexor tendons in the wrist are usually the first ones being affected. An optimal needling method for tendonitis is to puncture the tendon directly. Because different tendons of the wrist may be overused in different patients, it is suggested to puncture any affected tendons as accurately as possible. The indicator of striking affected tendons is the emergence of needling sensations on locations that have spontaneous numbness or tingling symptoms. When there are several tendons being affected, all of the affected tendons can be stimulated concurrently. Apply multiple needles on Daling (PC7) or associate its adjacent points if needed. Neiguan (PC6) is also an optimal location for direct needling of the median nerve.

Sometimes, reflex points of this disease may appear on the dorsum of the wrist and forearm, where they lodge mostly at the extensor muscles of hand and their tendons. It may be related to the propagation of carpal pain or weakness of hand movements. A loss of finger sensation and muscular strength usually can make patients use their forearm and thumb muscles more that may explain why the forearm muscle is also being affected.

Stimulating reflex points or acupoints of these regions, such as Yangchi (TE4), Yangxi (LI5), Yanggu (SI5), Waiguan (TE5), Hegu (LI4), and Shousanli (LI10), may facilitate the control of wrist pain, and hand weakness. In addition, muscles located at these regions are antagonistic to flexors at the palmar side, stimulation of these points is also the method of “puncturing the dorsal to treat the ventral.”

Because this disease is mainly caused by an excessive usage of the hand and wrist, it is advised to limit the usage of affected tendons, or change the habit of using the hand during treatment. Wearing a wrist brace is also recommended to ensure carpal protection. In the early stage of this disease, flexor

exercises of fingers, wrist and forearm muscles are still beneficial due to their muscular strengthening effects. Periodic light stretches of the wrist also can help improve regional blood circulation.

13.12 Tenosynovitis/Trigger Finger/Ganglion

Trigger (snapping) finger is a condition in which one of the fingers or the thumb catches in a bent position. The finger or thumb may straighten with a snap, like a trigger being pulled and released. If the symptom is severe, the finger may become locked in a bent position. It is a typical example of tenosynovitis in which affected tissues are mainly tendons that control the finger motion, such as the pollicar extensor tendon, the pollicar abductor tendon, or the flexor tendons of fingers. When the pollicar extensor tendon is greatly affected, it manifests radial pain at the wrist, and a limited bending motion of the thumb. When flexor tendons of the thumb or other four fingers are greatly affected, it is difficult to extend the corresponding finger. For most cases, this disorder is difficult to recover in a short time. Apply acupuncture in conjunction with other rehabilitation therapies such as regional massage can markedly enhance the therapeutic effectiveness.

Ganglion is mostly seen in the wrist and hand, as well as in other portions of the body. It usually appears at locations near the articular sac or tendon sheaths. When its size is small or occurred recently, acupuncture in conjunction with regional finger pressing may shrink or eliminate the ganglion. However, it is susceptible to reoccurrence.

【 Therapy 】

The main principle in treating tenosynovitis with acupuncture is to eliminate spontaneous pain or tender spots. First, select corresponding tender spots according to the affected tendons. For the pollicar abductor tendon, most tender spots emerge around Yangxi (LI5) and Lieque (LU7). For the pollicar extensor tendon, they may appear around Hegu (LI4) and Yangchi (TE4). For the pollicar flexor tendon, they may emerge around Yuji (LU10) and Taiyuan (LU9). For affected flexor tendons of other four fingers, tender spots or reflex points with hard nodules mostly emerge at the palmar side of the corresponding metacarpophalangeal joint. In addition, tender spots may be found at certain extending parts of the corresponding tendons, such as Waiguan (TE5) and Zhigou (TE6) for the pollicis extensor tendon affected; Pianli (LI6), Wenliu (LI7), Kongzui (LU6), and Shousanli (LI10) for the pollicis abductor tendon affected; Laogong (PC8), Daling (PC7), and Neiguan (PC6) for the flexor tendons of fingers. When puncturing tender spots of tendons, especially those metacarpal reflex points with hard nodules, it is advised to use thinner needles (e.g., No. 32) to decrease the needle-insertion pain. Retain needles for 30 min. Moxibustion or infrared radiation can also be combined with needling simultaneously. Acupuncture is applied once every other day or twice weekly until the pain or hard nodules subside.

In the acute stage of tenosynovitis, pain often radiates toward surroundings, making it difficult in determining the exact location of the primary lesion. In such cases, apply acupuncture at symmetrical points in the healthy side. After the pain has been limited or slightly eased, it is easier to determine and puncture the location with the primary lesion.

When treating the ganglion, the encircling needling method (ENM) is often applied at the affected region, namely inserting several needles

from the surrounding sides of the ganglion base into its center horizontally, as well as inserting a needle at its apex perpendicularly. In spite of needling sensations, one can repeat needle-thrusting to pierce the ganglion so that the contents from the ganglion might be drained. After the needles were removed, knead or squeeze the cyst for a few minutes with finger pressing.

Regional massage or acupressure is helpful in treating both tenosynovitis and ganglion. For tenosynovitis, instruct the patient to perform self-acupressure at regional tender spots or hard nodules, 3~5 min each time, 2~3 times daily. Finger pressures should be slightly heavier so that a remarkable soreness sensation can be generated. This is particularly important for patients with snapping finger. For patients with ganglion, regional kneading or massage after needling may help shrink and even eliminate some small ganglia instantly, while frequent regional massages can also reduce relapses.

【 Case Studies 】

Case 28: Patient was a 40-year-old male. He had suffered with tenosynovitis in the left index finger for six months that affected the mobility of the finger. When bending the finger, it often became “stuck” in a certain position. Examination found a bean-sized hard nodule beneath the skin at the palmar side of the index finger, with regional tenderness. For the treatment, the hard nodule and reflex points of Neiguan (PC6), Daling (PC7), Hegu (LI4), Ximen (PC4), and Shousanli (LI10) were punctured along with simultaneous application of infrared radiation during the needle-retaining period. Acupuncture was applied once every 3~4 days. By the second session, his pain and tenderness was dramatically improved and the hard nodule was completely subsided after seven sessions.

Case 29: Patient was a 54-year-old female. She had

suffered from a triggering finger at right ring finger for several months. Examination found a pea-sized hard nodule in metacarpophalangeal joints of the finger. For the treatment, bilateral Daling (PC7), Neiguan (PC6), Shenmen (HT7), Hegu (LI4), and the hard nodule of right ring finger were punctured. After the generation of needling sensations, needles were hooked to an electric stimulator and retained for 30 min. Acupuncture was applied twice weekly. After three sessions, she began to feel better and was significantly better after 12 sessions. Through 17 sessions, all symptoms of trigger finger except some slight finger numbness were alleviated.

Case 30: Patient was a 74-year-old female. She had suffered from a ganglion in the right anterior tibialis for about 16 months. The pain greatly affected her walking or running. She took local cortisone shots and physical therapy, but did not notice any significant changes. Examination found a golf ballsized hard nodule with swelling and obvious tenderness at the seamy side of her right ankle, near Zhongfeng (LR4). For treatment, the method of ENM was applied. Six needles were inserted into the nodule, of which five were around and one at the center of the nodule. To enhance the results, Sanyinjiao (SP6) and Taixi (KI3) were associated as well. After needles were removed, the local affected region was massaged for five min. Through only two sessions of acupuncture, the size of the nodule was significantly reduced, and the pain was much less. Through seven sessions, all symptoms of the ganglion had subsided.

【 Discussion 】

Tenosynovitis is often seen in the thumb. Local reflex points may appear at corresponding tendons of thumb. When one is having difficulty in determining which tendon of thumb was affected, the method treating the pollicar tenosynovitis by Master Jiao can be followed:

first puncture Mugen (EX130) and Hegu (LI4), then pierce Hubian (EX131) into Mugen (EX130), and Yuji (LU10) into Hegu (LI4), all without needle-retaining. Finally, puncture Yangxi (LI5) and Lieque (LU7) separately, and retain needles for 15 min.

Arichil *et al.* reported that snapping finger condition was improved remarkably by the rehabilitation of the lesion immediately after acupuncture. The stimulated points were in the symmetrical part of the lesion on the normal side, as well as Quchi (LI11), Shousanli (LI10), Waiguan (TE5), Hegu (LI4), and Yangchi (TE4) on the normal side. Because the affected joint could move normally during acupuncture, the rehabilitation including flexion-extension exercise and local massage was carried out simultaneously ^[262,263].

While treating tenosynovitis, one can stimulate reflex points on the affected side alone or in conjunction with symmetric points on the healthy side. As long as the pain at the affected region is diffuse without obvious hard nodules, needling corresponding reflex points at the healthy side may be effective. However, the main effect of this method is analgesia, allowing the patient to exercise the affected finger under a painless condition, and facilitating the recovery of normal motions. For the patient with obvious hard nodules, a direct stimulation of regional tender spots is still necessary. However, sometimes the direct stimulation might result in a temporary pain aggravation for several days, though the pain would disappear gradually through a break of several days between two consecutive sessions. Therefore, one should be aware of the possible, temporary aggravation of symptoms and appropriately adjust the spacing between consecutive sessions.

If the regional pain is intractable, moxibustion or other thermal therapies may be applied instead of needling. Because the pain of tenosynovitis is

generally superficial, local applications of Chinese herbal plasters, such as *Shang-Shi-Zhi-Tong-Gao* (a kind of analgesia plaster with Chinese herbs) are suitable and effective. Nevertheless, for patients with skin allergy, the period of applying this kind of plaster should be shortened. Once there is skin itch, remove it instantly. However, it can be applied again after the skin reaction disappears. For some patients, though the cutaneous anaphylaxis reaction remained, their regional pain eased, which suggests the cutaneous anaphylaxis reaction per se might become a type of therapeutic stimulation.

13.13 Injured Soft Tissues or Sprained Ankle

Clinically, soft tissue injuries such as bruised muscles, torn tendons and sprained ligaments, may occur alone or in conjunction with each other on the neck, shoulder, lower back, knee, ankle, elbow, wrist, or other parts of the body. This section focuses on general acupuncture principles for soft tissue injuries, especially sprained ankle.

Ankle sprain is mainly caused by a sudden pull or tear of the medial or lateral ligament of the ankle while walking or running. Tenderness, spontaneous pain, or swelling may appear at the anterolateral or anteromedial part of the ankle when these ligaments are sprained.

[Therapy]

Choose *Ashi* points or local tender spots as master points, and apply an intense needling stimulation, once daily. Attempt to strike the sensitive center within each point as accurately as possible. If tenderness migrates with the treatment, track down and

puncture all emerged tender spots until all of them are eliminated. When tender spots are located deeply within a larger scope, the encircling needling method (ENM) (refer to Section 11.2) can be applied. When tender spots shift with the regional movement or changes of posture, the resistance-needling method (RNM) can be applied (refer to Section 12.7). Regardless of the type of injury, acute or chronic, the degree of tenderness of reflex points or the regional swelling may ease gradually with effective stimulation. Within 24 hours of the injury, local ice pack may be applied, while after 24 hours, a combination of needling therapy and thermal therapy including moxibustion or infrared radiation should be applied. For those with swelling on the lower limb, instruct the patient to raise the lower limb above the level of the heart while resting to promote venous returns and reduce the swelling.

Regional swelling or tender spots often appear around Qiuxu (GB40), Zulinqi (GB41), Shenmai (BL62), and Jinmen (BL63) in patients of sprained lateral ligament of the ankle, or around Shangqiu (SP5), Gongsun (SP4), Rangu (KI2), and Zhaohai (KI6) in patients of the sprained medial ligament of the ankle.

[Case Studies]

Case 31: Patient was a 74-year-old male. He had suffered from a sprained lateral ligament of the left femur. Examination found significant local swelling as well as a fist-sized hard nodule just above Futu (ST32). Pain was intense when the nodule was touched even slightly. Local reflex points (including the center of the hard nodule and five other nearby tender spots) were selected as master points while Zusanli (ST36) was associated. Needles were retained for 30 min after connecting to an electric stimulator. Since the initial session, the size of the hard nodule was reduced and pain eased. Acu-

puncture was applied twice weekly. With each subsequent treatment, the hard nodule became increasingly smaller. It was reduced to a walnut-size by the seventh session, and was eventually eliminated by the eighth session.

Case 32: Patient was a 41-year-old male. He had suffered from a sprained tendon in the right plantar arch for two weeks. Pain affected his running or walking, and remained even after applications of ice pack and pain medication (Advil). Examination found the most tenderness emerged near Jinmen (BL63) and Rangu (KI2), but with no obvious swelling. The method of MNSP (multiple needles at a single point) (refer to Section 11.2) was applied on these two points. Three needles per point. Other associate points were Xuanzhong (GB39) and Sanyinjiao (SP6). After the generation of needling sensations, needles were connected to an electric stimulator and retained for 30 min. His pain was much less since the initial session, and the mobility of his foot was fully recovered through four sessions.

【 Discussion 】

In a study by Yuan *et al.*, based on changes of pain threshold and electromyography as indicators, the effective rate in treating 100 cases of soft tissue injuries with acupuncture was 85%. As for the relationship between therapeutic courses and effects, the effective rates were 74% and 90.50% through the first course and through more than two courses, respectively. There was a very significant difference ($P < 0.01$)^[264].

In our experience, RNM often could achieve dramatic effects for sport injuries of soft tissues. There are also many clinical reports about other acupuncture methods in treating ankle sprain^[265], including contralateral acupuncture^[266], needling Yangchi (TE4) that corresponds to the ankle^[267], and

regional acupressure^[268].

13.14 Sciatica

Sciatica is one of most commonly seen neuralgia. For patients of sciatica, whether they are primary or secondary, acute or chronic, radiculopathy or non-radiculopathy, acupuncture generally has certain therapeutic effectiveness. Of course, the secondary sciatica is more difficult to be cured unless the causes of pain first could be eliminated.

【 Therapy 】

There are mainly two types of needling therapy: puncturing local points and the opposite needling method (ONM). When puncturing local points, select tender spots at the lower back and buttock of the affected side, which may trigger radiating pain, as master points, such as Dachangshu (BL25), Zhibian (BL54), Ciliao (BL32), Huantiao (GB30), and Juliao (GB29). In addition, select tender spots on the radiating path as associate points. Some examples are: Chengfu (BL36), Yinmen (BL37), Weizhong (BL40), Chengshan (BL57), and Kunlun (BL60) for the pain on the posterior thigh and leg; Fengshi (GB31), Yanglingquan (GB34), Fenglong (ST40), Xuanzhong (GB39), and Qiuxu (GB40) for the pain on the lateral thigh and leg; Biguan (ST31), Futu (ST32), Liangqiu (ST34), Xuehai (SP10), Zusanli (ST36), and Taichong (LR3) for the pain on the anterior thigh and leg.

For ONM, select points at the healthy side, symmetrical to tender spots at the affected side, or distant points at the upper back, shoulder, or the upper limb corresponded to the lumbosacral area and the lower limb. Examples of the corresponding

points are: Tianzong (SI11) corresponds to Huantiao (GB30), Jianjing (GB21) to Juliao (GB29), Jianyu (LI15) to the major femoral trochanter, Quchi (LI11) to Yanglingquan (GB34), Shousanli (LI10) to Zusanli (ST36), and Hegu (LI4) to Taichong (LR3).

When puncturing acupoints or reflex points at the affected side, the stimulation intensity may vary according to individual body sensitivity: applying weak stimulation for acute patients with normal or hypersensitivity while applying intense stimulation including electrical stimulation for chronic patients with hyposensitivity. The needle-retaining period is around 30 min. When ONM is applied, an intense stimulation is required but needle-retaining is not required. For those with severe pain, one can first apply ONM to reduce the pain, and then puncture local tender spots of the affected side to enhance the effects. Acupuncture is applied once daily or once every other day, 1~2 sessions weekly to stabilize results until the spontaneous pain and most tender spots are eliminated.

For those patients with severe and intractable pain, apply auricular acupuncture alone or in conjunction with body acupuncture. Select auricular reflex points of *Sciatica*, *Buttock*, and *Lumbosacral vertebrae* at the ipsilateral or contralateral side, retain needles for 30 min or apply ANEM (auricular needle-embedding method) to stimulate both ears alternately every 2~4 days. Above auricular points are located at the infracrus anthelix or the anthelix, which pertains to the micro somatic reflex zones of the ears, and are required to be stimulated precisely to generate stronger pain sensations. Some patients may feel an immediate relief of sciatica.

Besides needling therapy, moxibustion or acupressure also can be applied on the above tender spots. Moxibustion is especially suitable for chronic patients with coldness on the lower limb or acute patients who are susceptible to relapses or

aggravation during the cold or humid weather. Moxibustion can be applied alone or shortly after puncturing, in which the sparrow-pecking moxibustion or moxa cones can be selected. Alternately, infrared radiation can be applied during the needle-retaining period. As for acupressure, it can be focused on the inversed triangle of lumbosacral region and the tender spots of the buttock. However, due to the muscularity in these locations and deep distributions of reflex points, it is difficult to stimulate them with fingers, thus one could apply a powerful electrical massager to perform this task.

Some sciatica is caused by disorders of the lumbosacral vertebrae, which is often accompanied by lumbago. In this case, acupuncture treatment for lumbago (refer to Section 13.4) can also be applied.

【 Case Studies 】

Case 33: Patient was a 55-year-old male. He had suffered from sciatica in the left side for six months. Soreness and pain were radiated from the left buttock down the lateral leg, which greatly affected his daily life. He could not walk without a cane, and had a history of acute sprain in the lower back, for which various medications were taken. However, there were no noticeable results. On examination, the patient had positive Lasegue sign on the left leg, which could only raised 50°, though without any muscle atrophy. X-ray results of the lumbosacral vertebrae were normal. For the treatment, mainly puncture tender spots of his affected side, such as Huantiao (GB30), Tunshang (EX115), Ciliao (BL32), Yangfu (GB38), and Feiyang (BL58). Sometimes, combine methods of the red-hot needling or NSN (nerve stimulation by needling) on “Sciatic spot” and “Fibular spot”. Acupuncture was applied once every two days, totaling 20 sessions over two months. The patient experienced less pain with each session, and by the end of the treatment, he could walk on his

own without any pain.

Case 34: Patient was a 60-year-old female. She had suffered from right sciatica for three months. Pain radiated from lumbosacral area to the lateral leg became worse at night. MRI results showed degenerative changes in the lumbosacral vertebrae. She took anti-inflammatory medications as well as chiropractic treatments, all without much results. Acupuncture was applied twice weekly, with needles mostly focused on bilateral Dachangshu (BL25), right Huantiao (GB30), Zhibian (BL54), Houling (EX157), Feilong (EX153), Fenglong (ST40), and Zuyicong (EX159). After the generation of needling sensations, retained the needles for 30 min and connected them to an electric stimulator, which induced a slight twitching valgus movement of the right foot. Since the initial session, she had four consecutive painless days. Through 11 sessions in one month, all of her pain was alleviated.

[Discussion]

Primary sciatica or otherwise known as sciatic neuritis is seldom seen. Clinically, the most frequent is the secondary sciatica, which occurs when the sciatic nerve is pinched by pathological changes of its surrounding tissues. There are two types of secondary sciatica: radiculopathic and non-radiculopathic according to different locations with pathological changes.

Radiculopathic sciatica is mainly caused by lumbar disc/discs hernia or spinal arthropathy, such as degenerative lumbar vertebrae. It often presents radiating pains, which can be aggravated by coughing, sneezing, or making effort to hold the breath. Most obvious tender spots are located at the surface of affected lumbar spinous process and the transverse process, while only a few slight tender spots are along the course of the sciatic nerve.

Pathological changes of non-radiculopathic

sciatica are mainly located outside the vertebral canal, generally near lumbosacral nerves plexus and the sciatic nerve. Examples of such are sacroiliac arthritis, piriformis syndrome, as well as others due to endometritis or oppression of tumor inside the pelvic cavity. Tenderness is often detected at the following nerve points: *Sciatic foramen point* at the superior border of the sciatic foramen, which corresponds to the Zhibian (BL54); the *Trochanter point* between the sciatic tuberosity and trochanter, which corresponds to Huantiao (GB30); the *Popliteal point* located at midline of the popliteal fossa, which corresponds to Weizhong (BL40); the *Fibular point* that is inferior to the fibular capitulum; the *Ankle point* at the lateral plantar nerve of the tibial nerve, which is posterior to the medial malleolus; as well as the *Metatarsal point* on the plantar center. As for muscular tenderness, it is most obvious on the muscle belly of gastrocnemius and the soleus. Moreover, there is also paraesthesia such as tingling, burning and numbness in the lateral leg and the dorsum of foot [62]. When treating various types of sciatica, regardless of radiculopathic or non-radiculopathic types, those with a dominant numbness are more difficult to attain effects than those with a dominant pain. For the former, obtain an electric-shock sensation through application of NSN at above neural points is an effective way (refer to Section 12.4).

Effectiveness of acupuncture in treating sciatica can be assessed via certain objective and subjective criteria. Objective criteria measure the degree of the raised straight leg, namely the Lasegue sign that shows positive when sciatica is active. Subjective criteria are self-evaluation of the patient, which may include any positive responses in the degree and duration of improvement in decubitus and after 10 min of standing, as well as the use of analgesics, and so on. In a double-blinded study, Duplan *et al.*

studied effects of acupuncture in treating 30 patients with acute sciatica. Patients were randomly assigned to one of two groups: 15 were treated on electrically detected points and 15 on “placebo” points. Objective and subjective criteria were analyzed before treatment and after five sessions of acupuncture. In the placebo group, no significant improvement was recorded. Conversely, in the treated group, study of objective and subjective criteria showed significant improvement ^[269].

Directly stimulate acupoints with positive reactions or tender spots, as well as gradually eliminating their tenderness is a key in alleviating various types of sciatica (refer to Section 9.4). When common acupoints or tender spots within the affected region or the course of radiating pain are ineffective, it is advised to pay attention to seek other extraordinary points. For those with insignificant tenderness at common acupoints, it is also advised to seek any tender spots across the entire body carefully. Shiota Bunshi of Japan discovered Daqie (EX139), 1 *cun* lateral to Yinmen (BL37), could be used to treat sciatica radiated along the BL meridian. He also observed that sciatica patients might have tenderness or hard nodules on certain points of lower abdomen, such as Daju (ST27) and Zhongji (CV3). All of these points were considered as the most effective master points for sciatica ^[88]. According to Master Jiao, in treating sciatica, he often stimulated tender spots around Huantiao (GB30), Juliao (GB29), Zhibian (BL54), Chengfu (BL36), Fengshi (GB31), Yinshi (ST33), Xiyangguan (GB33), Yanglingquan (GB34), Zusanli (ST36), Feiyang (BL58), and Kunlun (BL60). For those intractable cases, in addition to associating some *Bafa* points such as Houxi (SI3) and Shenmai (BL62), Master Jiao often added Eryang (EX138) as a master point, which is 1 *cun* above or below the point posterior to the midpoint between Fengshi (GB31) and Huantiao (GB30), in the midline

of GB and BL meridians.

Clinically, there is a type of intractable sciatica that mainly manifest numbness and soreness on the lateral side of leg and foot, which it seems only the superficial peroneal nerve, a branch of the sciatic nerve, is affected. For such cases, to our experience, it would be more effective to stimulate Houling (EX157) instead of Yanglingquan (GB34). Case 34 is an example of such. Tender spots of this type of sciatica are often distributed only on the peroneus longus or the posterior border of the fibula. In addition to Houling (EX157), other tender spots may emerge around Feilong (EX153), Zuyicong (EX159), Feiyang (BL58), and Fuyang (BL59). When puncturing these points, 0.5 *cun* of insertion depth is usually sufficient, and at this depth, the needle tip may have contacted the fibular surface. With additional electrical stimulation applied on these points, some twitching valgus movement of the foot may be induced.

For some chronic patients or those with lower sensitivity, it is often difficult to detect tender spots. Consequently, regular acupuncture usually takes effects slowly. For those cases, it is suitable to apply a series of measures to raise the overall body sensitivity, and combine with EA since the initial session. Although the pain might be temporary aggravated during the first few sessions, especially after receiving an intense stimulation at the affected region, subsequent continuous sessions would gradually attain the effects as long as the stimulation intensity was reduced and the interval between two consecutive sessions prolonged properly.

For patients with intractable sciatica, keep in mind that they might also have neurasthenia that is commonly seen in patients with other chronic pains. Once neurasthenia is healed, sciatica may be recovered sooner ^[88]. For such cases, there is often tenderness in the posterior head or the vertex.

Associate those tender spots or Baihui (GV20), Shenmen (HT7) and Sanyinjiao (SP6), as well as integrate with psychotherapy (refer to Section 15.2). In addition, for female patients with irregular

menses, attention should be simultaneously paid to the regulation of their menses. As for those with constipation, apply corresponding treatment.

Disorders of the Nervous System

14.1 Intercostal Neuralgia/ Chest Pain

Chest pain discussed in this section is mainly due to somatic causes, such as intercostal neuralgia, thoracic bruise/sprain and costal chondritis, those of visceral causes such as angina pectoris or gastric disorders refer to subsequent corresponding sections. Intercostal neuralgia may occur in the area innervated by one or more intercostal nerves that frequent relapses after triggered by breathing motions. Clinically, most intercostal neuralgia is of the secondary type, which is caused by pathological changes of the surrounding tissues, such as spondylarthrititis, thoracic scoliosis, malformation of the spine, scars due to chest surgery, or herpes zoster (shingles). Thoracic sprain is often resulted from an improper upper arm movement or posture, and the pain is similar to the intercostal neuralgia. Chest pain of costal chondritis is usually limited at the costal capitis or the connection area between the costal capitis and the manubrium of sternum, where swellings and obvious tenderness may be manifested.

[Therapy]

Mainly apply body acupuncture on distal or local points, which may be combined with any of the following techniques: ANEM (auricular needle-embedding method), seven-star needles, cupping, acupressure, and herbal plasters.

Distant points within somatic reflex zones of ipsilateral or bilateral sides: For lateral chest pain, select tender spots or sensitive acupoints within lateral somatic zones, such as Sanyangluo (TE8), Zhigou (TE6), Waiguan (TE5), Yanglingquan (GB34), and Qiuxu (GB40). For anterior chest pain, select points within anterior somatic zones, such as Neiguan (PC6), Ximen (PC4), Zusanli (ST36), and Jiexi (ST41). Choose one point per each of the upper and lower limb, or only combine points on the upper limb and the affected region. Generally, apply intense stimulation without retaining needles. After the generation of needling sensations, aim the needle tip towards the chest region. Manipulate the needle for 3~5 min continuously to propagate needling sensations to the proximal or the affected region, as much as possible.

Local points at the affected region of chest or

around the edge of corresponding ribs: This is especially suitable for those with obvious local tenderness within a limited scope. In addition, points on the spine (GV points or central reflex zones) that connect with corresponding ribs, such as Dazhui (GV14), Shenzhu (GV12), and Zhiyang (GV9) can be associated. Select 4~6 points each session and retain the needles for 30 min. For those with weak needling sensations, electrical stimulation or infrared radiation may be applied during the needle-retaining period.

For intractable patients with severe, persistent pain and poor analgesia response to various therapies, ANEM can be combined with the aforementioned body acupuncture. Select several reflex points at the ipsilateral or contralateral ear, such as *Chest*, *Lungs*, and *Spine*. Stimulate them on both ears alternately once every other day.

At the hypersensitive region of thoracic skin or the surface of swollen costal cartilage, apply the tapping method with seven-star needles to prick out a little bit of blood, or cupping, once daily. When the tender spot is in a limited scope, apply acupressure and various herbal plasters, such as *Shang-Shi-Zhi-Tong-Gao*. During acupressure, apply an appropriate amount of finger pressure, from light to heavy, with rotating and kneading motions of the index finger on the tender spot, 3~5 min each session. Patients may also be taught such techniques and perform self-acupressure daily.

【 Case Studies 】

Case 35: Patient was a 36-year-old female. She had suffered from chronic chest pain in her left side for over one and half year. Pain was initiated by a surgery that removed an aortic aneurysm. She was disabled and diagnosed as post-thoracectomy syndrome. Examination showed a scar about four inches in length from the left upper back to the

armpit. Pain occurred along the scar and often radiated to the left breast, shoulder, and the cervical area. Because of the chest pain, especially at night, she could only sleep between 3~5 hours. She took various pain medications, steroid injections, physical therapy, and even rhizotomy, all without much results. For acupuncture, eight tender spots or hard nodules besides the scar were selected and punctured. In addition, Dazhui (GV14), bilateral Shenzhu (GV12) and Fengchi (GB20), as well as left Zhigou (TE6) were associated. Since the initial session, the pain was immediately relieved for about 4 hours before it recurred. Two days later, Electrical stimulation was combined with the same needling as that of the initial session. Paired electrodes were placed across the scar, totaling four pairs. After the second session, her pain eased for almost 20 days until it relapsed. Later on, acupuncture was applied 1~2 times weekly, and 18 sessions were completed in 4 months. During that period, her pain only recurred sporadically but was mostly under control. The patient was very satisfied of the results when she was discharged from the treatment a short while later.

Case 36: Patient was a 19-year-old female. She had suffered from chest pain due to costal chondritis for two years. Pain affected much of her arm mobility and sleep. She took various anti-inflammatory medications without much improvement. Examination showed her main tenderness was around the edge of sternum and between the 4th~8th intercostal spaces at the right midaxillary line. There were obvious tenderness and swelling at the affected region. Acupuncture was applied twice weekly. For each session, 5~7 tender spots of the affected area were selected and punctured superficially (0.3~0.5 *cun*). Needle-manipulations were ceased instantly as long as a local heaviness was generated. The needles were retained for 30 min while combining with

infrared radiation. At the same time, bilateral points of Zhigou (TE6) were deeply punctured, and needling sensations were propagated to the elbow. She felt significant improvements after only two sessions, and no longer had pain around the sternum area after the fourth session. Since the fifth session, ENM (encircling needling method) was applied on tender spots of her right ribs. After 12 sessions, all of the chest pain was completely subsided.

[Discussion]

For chest pain due to somatic causes, regardless of intercostal neuralgia, thoracic sprain, or costal chondritis, acupuncture treatment most likely can take effects with similar methods. Because intercostal neuralgia or costal chondritis most often occurs on the lateral side of the body, their reflex points often appear within lateral somatic reflex zone, of which points of *Shaoyang* meridians of hand or foot, such as Sanyangluo (TE8), Zhigou (TE6), Waiguan (TE5), Yanglingquan (GB34) and Qiuxu (GB40) can be selected. Although a number of clinical trials have already documented remarkable effects of these points for chest pain, any comparative studies on the effects of acupoints between upper or lower limbs have yet to be seen.

However, from the experience of acupuncture anesthesia, puncturing points of the upper limbs may achieve better results for thoracic analgesia. By completing 1 048 cases of pneumectomy under acupuncture anesthesia, the Tuberculosis Institute of Beijing, China observed that the selection of upper limb points such as Sanyangluo (TE8) had better thoracic analgesia effect (85.7%) than that of lower limb points (50%) with a significant difference ($P < 0.02$)^[41]. Thus, when treating various somatic chest pains including intercostal neuralgia, it is also suitable to select Sanyangluo (TE8) as the master point, and combine with electrical stimulation after

the generation of needling sensations for 30 min.

Costal chondritis mostly occurs at the front chest, and manifests regional swelling and tenderness of the affected costal cartilage. For these cases, puncturing tender spots on the affected region or its surroundings is preferred. When the tenderness is located in the deep portion of the spot, apply the method of ENM or MNSZ (refer to Section 11.2). When the skin surface is hypersensitive or the tenderness is located superficially on the spot, the tapping method of seven-star needles can be applied at the affected region. In addition, various thermal therapies such as moxibustion or infrared radiation can be incorporated with needling during the needle-retaining period. In addition, cupping or external applications of herbal plasters may be applied after the removal of needles, which can help to reduce the inflammation. If the pain spreads to the anterior chest in a broader scope, associate points of distal reflex zones, such as Neiguan (PC6) and Ximen (PC4) of the anterior somatic zone located within upper limbs.

Keep in mind that most points of the chest and the upper back are relatively superficial. Deeply hidden inside those regions are the heart and lungs, two of the most essential life organs. Therefore, when puncturing points of the chest and upper back, the depth of insertion must be carefully controlled to avoid serious acupuncture accidents (e.g., pneumothorax). In these superficial areas, unlike the points of the extremities, it is generally more challenging in performing various needle-manipulation techniques, especially the heat-or cool-producing methods that stimulate several layers of a single point. Nevertheless, it is still necessary to generate needling sensations in order to attain effective stimulation. According to our experience, first, when selecting points of the chest and upper back, it is crucial to locate reflex points accurately, and then

puncture corresponding reflex layers, neither overly deep nor superficial, to generate a certain extent of needling sensations. Second, apply more needle-twisting but less lifting-thrusting methods during needle-manipulation, or combine with needle-scraping methods to generate and maintain needling sensations. Third, it is required to retain needles, particularly when puncturing points of the upper back. These locations are relatively close to the chain of sympathetic nerves. After a needle-retaining period of 20 min, some skin redness may appear around the needles, which often can serve as a precursor to indicate better results when treating visceral diseases or acquiring somatic analgesic effects (refer to Section 9.4).

14.2 Lateral Femoral Cutaneous Neuritis

Lateral femoral cutaneous neuritis is also known as meralgia paraesthetica. It generally manifests as subjective paraesthesia on the lower 2/3 of the anterolateral thigh, such as formication, tingling, or pain, which can be aggravated when walking or standing. There is an area of various sizes with dysesthesia at the affected region. To date, the causes of this disease are still unclear, but it is thought they might result from a pinched lateral femoral cutaneous nerve when it passes through the inguinal ligament or deep fascia of thigh, which is frequently seen in the middle-aged obese men as well as in the pregnant women. It also can be caused by surgeries or injuries at the pelvic cavity or groin regions.

[Therapy]

Select tender spots at the affected region with

numbness or pain in the anterolateral thigh, such as Fengshi (GB31) and its surrounding points Fengshishang (EX140), Qianjin (EX141), Shangfengshi (EX142), and Qianfengshi (EX143), as well as Xuehai (SP10) and Futu (ST32). If puncturing these points does not generate desired effects, apply electrical stimulation through surface electrodes placed on the skin of these points, 30 min per session, 2~3 sessions weekly. In addition, the seven-star needles may be combined with needling to prick out a little bit of blood at the affected skin, once daily or once every other day, with ten sessions as a course of treatment.

[Case Studies]

Case 37: Patient was a 49-year-old female. She had suffered with numbness of the lateral, right thigh for several days. The cause was unclear. Tender spots of Fengshi (GB31), Futu (ST32), and Xuehai (SP10) were selected and punctured. Her numbness was much less after only one session of treatment, and completely subsided through two sessions.

Case 38: Patient was a 48-year-old female. She had suffered with numbness and pain of the right, lateral mid-thigh for over a year. The pain began when she was six-month pregnant, and remained ten months after the birth of her child. Regional tender spots were punctured during first ten sessions without much improvement. For another 12 sessions, electrical stimulation with skin surface electrodes was applied on tender spots, twice weekly. First, her pain eased, and then it was followed by the alleviation of numbness gradually. At the 3-month-follow-up, the patient had not experienced recurrence of symptoms.

Case 39: Patient had suffered from lateral femoral cutaneous neurosis due to radiotherapy that was used for prostate cancer (refer to Section 22.4).

【 Discussion 】

Acupuncture has excellent therapeutic effectiveness for this disease, either in a short-term or in a long-term. Reflex points of this disease are mostly superficial, thus when using filiform needles, it is suitable to puncture the reflex points obliquely or horizontally rather than deeply. When applying electrical stimulation, it is preferred to use surface electrodes. It is also suitable to tap the affected skin with the seven-star needles. Tender spots may not appear at the affected region unless there is accompanying pain. If there is no pain, manifestation of local reflex points may just be numbness instead of tenderness. Optimal needling sensations generated by stimulation at reflex points are similar to numbness or tingling sensations occurring in the affected region. For this disease, it is also applicable to combine acupuncture with point-injection therapy ^[270].

14.3 Peripheral Neuropathy

Peripheral neuropathy, which manifests mainly symptoms of pain, numbness, or paraesthesia, can be caused by either radiculopathy or diabetes, and is frequently seen among HIV patients. Acupuncture can be effective for peripheral neuropathy of various causes.

【 Therapy 】

Select local tender or numb spots on the affected extremities, or their adjacent, somatic reflex zones. If no obvious tender spots are detected, common sensitive acupoints can be chosen. For patients due to radiculopathy, corresponding somatic reflex zones such as acupoints of GV and BL on the neck or

lumbosacral areas can be associated simultaneously.

For pain and numbness of the forearm and dorsum of hand, choose acupoints on the lateral side of forearm (*yang* side), such as Shousanli (LI10), Cuoshan (EX124), Sidu (TE9), Waiguan (TE5), Yanglao (SI6), Yangchi (TE4), and Zhongzhu (TE3). For numbness of fingers, choose acupoints on the medial side of forearm or wrist (*yin* side), such as Shaohai (HT3), Neiguan (PC6), Daling (PC7), Shenmen (HT7), and Laogong (PC8). For those with cervical radioculopathy, tender spots on the posterior neck or Tianzhu (BL10), Dazhui (GV14), and Jianzhongshu (SI15) can be associated.

For numbness of the dorsum on the foot or toes, choose acupoints on the anterolateral legs and feet, such as Zusanli (ST36), Yanglingquan (GB34), Xuanzhong (GB39), Qiuxu (GB40), and Taichong (LR3). For numbness of the sole, choose acupoints on the medial side of legs and feet, such as Diji (SP8), Sanyinjiao (SP6), Taixi (KI3), Shenmai (BL62), and Gongsun (SP4). For those with lumbosacral radioculopathy, tender spots at the lumbosacral area or Yaoyangguan (GV3) and Ciliao (BL32) can be associated.

Retain needles for 30 min after the generation of needling sensations. For those with regional burning feelings, either the method of cool-producing needling or EA can be applied. For those with regional coldness or cyanosis on the skin, either the method of heat-producing needling or infrared radiation can be combined with retaining needles. For chronic patients, apply acupuncture once every other day or twice weekly until symptoms subside.

Acupressure or massage can also be combined with needling. Kneading selected points with a heavy finger pressure prior to needling may facilitate the generation and propagation of needling sensations. General massage on the affected extremities for 5~10 min daily may help to improve regional

blood circulation.

【 Case Studies 】

Case 40: Patient was a 68-year-old female. She had suffered from neck pain that radiated to the posterior head and both hands. The pain accompanied numbness of fingers, which was worse on the left side, for over a year. MRI results showed multiple bulging discs from C3~T1, especially around C5~C6. Diagnosed with spondylopathy and neuropathy, she took several pain medications, but without much results. Examination found obvious swelling and tenderness around Dazhui (GV14). Both of her hands had a cold, purple-colored skin. Acupuncture was applied twice weekly. Dazhui (GV14), bilateral Jianzhongshu (SI15), Quyuan (SI13), Waiguan (TE5), and Yangchi (TE4) were punctured. After the generation of needling sensations, needles were retained for 30 min while combining with infrared radiation. Since the initial session, the fingers of the right hand began to recover some feelings. With subsequent sessions, her fingers in both hands began to have more feelings. Moreover, the skin temperature on the dorsum of the hand was higher than that before acupuncture. However, because of a common cold she caught prior to the eighth session, her fingers became a bit numb once again, but it subsided after few sessions. The patient had 20 sessions of acupuncture in total, and her self-evaluation indicated though there was occasional finger numbness, she was generally satisfied with the results as she could once again play piano without any pain.

Case 41: Patient was a 59-year-old female. She had suffered from neuropathy and poor blood circulation in her feet due to diabetes for many years. Symptoms of constant numbness, pain, and cold skin were worse on the right side for almost six years. All of her toes were numb and lost all feelings. Symptoms

of the left foot started only five months ago, with numbness in the big toe. Acupuncture was applied twice weekly. Bilateral Zusanli (ST36), Xuanzhong (GB39), Jiexi (ST41), Qiuxu (GB40), and Taichong (LR3) were punctured. Needles were retained for 20 min along with application of infrared radiation. After the fifth session, she started to improve as her right toes recovered normal feelings. Through ten sessions of acupuncture, her left foot was better as well. Her right foot also could tolerate the temperature of a hot water bath. Later on, she received acupuncture continuously for almost 11 months, and took Chinese herbs (*Huoxue Pian*) to improve circulation of the extremities. At the 14-month-follow-up, the patient's numbness and pain of the feet were mostly under control, though she still had occasional recurrence of mild pain of the feet.

【 Discussion 】

Abuaisha *et al.* of UK treated 46 diabetic patients of chronic, painful, peripheral neuropathy with acupuncture to determine its efficacy of analgesia and long-term effectiveness. All these patients initially received up to six courses of classical acupuncture analgesia over a period of ten weeks. Twenty-nine (63%) patients were already on standard medical treatment for painful neuropathy. Forty-four patients completed the study with 34 (77%) showing significant improvement in their primary and/or secondary symptoms ($P < 0.01$). Follow-ups for a period of 18~52 weeks showed that 67% of these patients were able to stop or reduce their medications significantly. During the follow-up period, only eight (24%) patients required further acupuncture treatment. Although 34 (77%) of patients noted significant improvement in their symptoms, only seven (21%) noted that their symptoms cleared completely. All patients but one finished the full course of acupuncture treatment

without side effects. There were no significant changes either in the peripheral neurological examination scores during the course of treatment. Accordingly, the authors thought that acupuncture is a safe and effective therapy for the long-term management of painful diabetic neuropathy ^[271].

Acupuncture also can improve the condition of neuropathic human immunodeficiency virus (HIV) or acquired immunodeficiency syndrome (AIDS) patients ^[272]. Galantino *et al.* of USA used noninvasive EA in treating HIV-related peripheral neuropathy. Non-invasive skin electrodes were placed on the leg acupoints of Kunlun (BL60), Zusanli (ST36), Yongquan (KI1), and Taichong (LR3), and a low-voltage current passed for 20 min daily for 30 days. There was improvement in the condition of all seven patients. They felt much better and reported feelings of increased physical strength ^[273]. However, in a randomized controlled trial by Shlay *et al.*, neither acupuncture nor Amitriptyline was more effective than placebo in relieving pain caused by HIV-related peripheral neuropathy ^[274].

In treating experimental diabetic neuropathy, the efficiency of EA was better than that of TENS therapy. The slowing of motoneuron conduction velocity was prevented or corrected through four and six weeks treatment in EA and TENS group respectively. The pain threshold was lowered in both the control group without any treatment and the TENS group, but elevated in the EA group, their differences were of significance ($P < 0.05$) ^[275].

For those with peripheral neuropathy caused by radiculopathy, effects of acupuncture are related to causes of one or more pinched nerves. When the cause was mainly due to inflammatory swelling of soft tissues surrounding the nerve root, acupuncture can eliminate the inflammation and alleviate the symptoms of numbness and pain on the extremities. If the nerve root is pinched by certain organic causes,

such as tumor pressure, then it might be difficult to achieve effects with acupuncture alone. If that is the case, one may consider surgery as soon as possible to relieve the pressure immediately (refer to Section 9.2).

14.4 Reflex Sympathetic Dystrophy

Reflex sympathetic dystrophy (RSD) is often caused by trauma, otherwise known as posttraumatic pain syndrome or posttraumatic sympathetic dystrophy, which manifests severe burning pain (causalgia), hyperesthesia, excessive perspiration, as well as pathologic changes of the bone, skin, and muscles at the region of trauma or area innervated by the same nerve. It is also called chronic regional pain syndrome. It occurs mostly on the limbs, and the trigger trauma may be external injuries, sprain, fracture, and surgical operation, injuries of blood vessels or nerves, as well as cerebral damage. Patients diagnosed with posthemiplegic omalgia, shoulder-hand syndrome or shoulder-arm syndromes are actually categorized under this disease. To date, there are five to six million people in the USA are suffering from this disease, but it is often poorly understood clinically, and not timely recognized at its early stage ^[276, 277]. If this disease cannot be treated at its early stage, it will rapidly spread to the entire affected limb and result in irreversible changes of regional bones and muscles. About 50% of patients had pain lasting from half a year to several years. Acupuncture generally has satisfactory therapeutic effectiveness for this disease, especially at its early stage.

【 Therapy 】

There are mainly two methods of point selection. First, choose local reflex points or acupoints on the affected extremities or within their corresponding somatic reflex zones (anterior, lateral, or posterior zones). Second, choose points within central reflex zones at the midline of the back, such as acupoints of GV, and within central reflex zones of the limbs. For the affected upper limb, Tianzhu (BL10), Dazhui (GV14), Shenzhu (GV12), Bingfeng (SI12), Tianzong (SI11), Jianyu (LI15), Binao (LI14), Qingling (HT2), Quchi (LI11), Shousanli (LI10), Cuoshan (EX124), Waiguan (TE5), Neiguan (PC6), Shenmen (HT7), Hegu (LI4), Yanglao (SI6), Zhongzhu (TE3), and Houxi (SI3) may be selected. For the affected lower limb, Mingmen (GV4), Yaoyangguan (GV3), Zusanli (ST36), Yanglingquan (GB34), Fenglong (ST40) and Feiyang (BL58), Xuanzhong (GB39), Qiuxu (GB40), Taichong (LR3), Diji (SP8), Sanyinjiao (SP6), and Shangqiu (SP5) may be selected. Choose 6~8 points each session, and retain needles for 30 min after the generation of needling sensations. Because of the hypersensitivity at the local body surface, the stimulation should be generally mild to ensure patients can tolerate needling sensations. This disease is often intractable, so a longer course of treatment may be required. It is advised to keep continuous treatments for several months until most symptoms ease completely.

The decision to combine electrical stimulation or infrared radiation during the needle-retaining period is based on different stages of this disease. For those with a higher skin temperature, skin redness, and burning sensations at the affected region, electrical stimulation can be combined with needling. As for those with cold skin, cyanosis or muscle atrophy, electrical stimulation can be applied alone or in conjunction with infrared radiation.

For those with severe pain and hypersensitive

tactile at the region, ONM (opposite needling method) or ANEM (auricular needle-embedding method) can be incorporated. When applying ONM, select the symmetrical point or the most remarkable tender spots on the healthy side. After the generation of needling sensations, retain the needles for 30 min. It is applicable to have greater stimulation intensity on the healthy side than that of the affected side.

When applying ANEM, choose reflex zones of the corresponding limbs on the ears, such as *Shoulder, Elbow, Wrist, Knee, and Ankle*, as well as auricular central zones, such as *Sympathetic, Shenmen, Lumbosacral vertebrae, Cervical vertebrae, Brainstem, Brainpoint, and Subcortex*. Stimulate them on both ears alternately every 3~4 days, three points each time.

【 Case Studies 】

Case 42: Patient was a 49-year-old female. She had suffered from chronic and sustaining pain in her left foot for six years caused by an ankle sprain. Diagnosed as RSD on the left foot, she was unable to walk due to the raised regional muscle atrophy. She tried sympathetic neural blockade, steroid injections, walking cast, pain medications, as well as an arthroscopic surgery to remove some malacia cartilages. However, none of them seemed to help her excruciating pain and coldness in her left foot. The examination found her left foot neither can flex nor extend fully. Moreover, there were no voluntary movements of toes, and obvious tenderness and coldness of the skin could be felt from the lower leg to the dorsum of foot. Acupoints at the affected side such as Zusanli (ST36), Yanglingquan (GB34), Fenglong (ST40), Xuanzhong (GB39), Qiuxu (GB40), Jixi (ST41), Kunlun (BL60), Shangqiu (SP5), and Taichong (LR3) were selected and punctured. After the generation of needling sensations, needles were retained for 30 min along with infrared radiation.

When puncturing Zusanli (ST36), needling sensations was propagated to the dorsum of foot. After needles were removed, the affected area was massaged for 5 min using an electric vibrator. Since the initial session, the pain was much less. Through 11 months of treatment twice weekly, her regional muscle atrophy and skin temperature gradually recovered. By the end of her treatment, she could move the left foot at will without any pain and can walk or run like a normal person.

【 Discussion 】

Over the years, there have been many clinical reports on the good therapeutic effects of acupuncture for RSD^[278-282]. Chan and Chow reported in 1981 that 20 patients with established, post-traumatic sympathetic dystrophy were treated with EA after physical therapy, with or without oral medication, and had failed to produce satisfactory relief of symptoms. Out of these patients, 14 (70%) experienced marked and permanent improvement^[278]. Korpan *et al.* of Austria reported in 1999 that a double-blinded, placebo-controlled prospective trial was performed in 14 patients suffering from RSD. They were suffering clinically and scintigraphically from acute RSD of the upper limb lasting more than one but less than six months. Patients were randomly assigned to either classical acupuncture (group A) or sham acupuncture (group S), which was applied five weekly sessions for three weeks and required 30 min of needle-retaining period each session. Both groups received the same defined standard treatment. The current state of pain as well as clinical parameters was almost identical in patients of group A and of group S at the beginning. Results showed that during therapy, clinical parameters as well as pain improved in both groups and reached near normal levels after six months. Owing to the small number of patients in this study, no differences

between sham and treatment group could be found. In the end, the researchers expressed their desires to conduct future studies on effects of acupuncture on clinical parameters through treatments of more patients in both groups and a longer term of follow-ups^[280].

Over the past few decades, we have accumulated a rich experience in treating many cases of RSD with good results. Careful and precise selection of sensitive points is crucial. Most points for RSD are generally from the *yang* side or meridians, but points of the *yin* side or meridians should not be neglected, including Neiguan (PC6) and Qingling (HT2) on the upper limbs as well as Sanyinjiao (SP6) and Diji (SP8) on the lower limbs. Those *yin* side acupoints can also achieve marked effects on the regional vasomotor function, as well as assisting the *yang* side points to intensify stimulation for all nerves innervating the affected limb. Opposite needling method (ONM) has significant applications for patients who cannot tolerate more intense needling stimulation at the hypersensitive affected side. Moreover, ONM is also suitable for those who have sympathetic reflex symptoms of the healthy side, which often occurs along with a longer disease course. In addition, auricular acupuncture is especially suitable for those in need of analgesia and improvement of the functional state of ANS (refer to Section 11.7), it could also be selected either as a primary method or combined with needling for RSD.

When patients have local raised skin temperature, dyskinesia or muscle atrophy, apply EA can often achieve better results. Guo *et al.* of China treated 40 cases of shoulder-hand syndrome of apoplexemic hemiplegia with EA and filiform needle acupuncture (FNA) respectively. Results showed that EA had better results in treating posterior hand swelling, rising hand skin temperature and pain caused by the bending of fingers than that with FNA ($P < 0.05$).

Finger and shoulder joint improvement (functional scoring increased for 3 points or more) in EA was also better than that of FNA ($P < 0.05$). The total marked effective rate was higher in the EA group (75%) than that in FNA (50%) ($P < 0.05$). It suggested that EA produced rhythmic muscle contraction that had a “shoulder-hand pump” like action, and is significant in eliminating posterior hand swelling and preventing atrophy of hand muscles^[282]. EA has been reported to induce significant cooling effects on the skin temperature of the hand and finger in normal subjects, but the effects were not related to the stimulation frequency, because either high frequency EA (100 Hz) or low frequency EA (4 Hz) produced similar effects^[208]. However, for patients with local declined skin temperature and cyanosis, EA can still be applied to raise the skin temperature through improving its blood circulation. This is because EA stimulation is not absolutely resulting in cooling effects. Functional states at the affected region, such as the basic skin temperature or sympathetic vasomotor appearance prior to EA can obviously influence the effects of EA.

14.5 Trigeminal Neuralgia

Trigeminal neuralgia (TN) is defined as a chronic and severe electric-shocking and burning pain at one side of the face. Attacks are initiated by tactile irritations in a trigger area of the trigeminal nerve and are perceived within borders of the nerve's innervations. TN is classified as symptomatic when the etiology is known and as idiopathic when the etiology is unknown. TN is a chronic condition which initially goes into spontaneous remissions but these become fewer as the condition progresses. Today, acupuncture either alone or in combination

with other therapies has gained increasing attention in the treatment of TN.

【 Therapy 】

Needling therapy for TN can be applied at tender spots, which reside on the body surface including the ears, or selected nerve trunks (points). Tender spots can be chosen from the face, the extremities, and auricles, on either affected or healthy sides of the body. Nerve trunks (points) are selected at the region of the affected side.

For body acupuncture, select Xiaguan (ST7) and Yifeng (TE17) as master points. Apply a perpendicular puncture on Xiaguan (ST7) at depth of 1.5 *cun* and an oblique puncture on Yifeng (TE17) to attain intense needling sensations on the lower half of the face. Select 3~4 associate points according to the scope of radiating pain or locations of trigger points, which may be Sibai (ST2), Yingxiang (LI20), Dicang (ST4), Shuigou (GV26), Jiache (ST6), Taiyang (EX4), Sizhukong (TE23) or any *Ashi* points. For distant point selection, choose bilateral or opposite Hegu (LI4), Zusanli (ST36), Waiguan (TE5) or Houxi (SI3), 1~2 acupoints per session. Retain the needles for 30 min. For chronic cases, combine with moxibustion or infrared radiation on the affected region during the needle-retaining period. At the acute stage, do not apply heat on the region. For severe pain, EA may be incorporated.

For auricular acupuncture, detect the most sensitive points, such as *Mouth*, *Cheek*, *Subcortex*, *Shenmen*, and *Brainstem*, choose 2~3 points each time. Stimulate them on both ears alternately, twice weekly. Sometimes, patients may have remarkable effects when the point of ipsilateral *Mouth* was punctured and numbness or electric-shock sensations on the face were induced, which might be caused by “striking” a branch of trigeminal nerve or the facial nerve on the auricle.

For stimulation of nerve trunks (points), when the first branch of trigeminal nerve (eye nerve) is implicated, choose the “supraorbital nerve point” at the supraorbital foramen, near Zanzhu (BL2). Needles should be punctured obliquely outward and downward at depth of 0.2~0.3 *cun*. Pluck the needle handle slightly left and right. Once it is stimulated, electric-shock sensations may radiate to the forehead.

When the second branch of trigeminal nerve (maxillary nerve) is implicated, choose “infraorbital nerve point” at the infraorbital foramen, near Sibai (ST2). Locate the hollow spot of infraorbital foramen by fingers, then point the needle slightly upward and outward at depth of 0.3~0.5 *cun*. Pluck the needle handle slightly left and right. Once it is stimulated, electric-shock sensations may appear on the facial portion between the lower eyelid and upper lip.

When the third branch of trigeminal nerve (mandibular nerve) is implicated, choose the “mental nerve point” at the mental foramen, near Jiachengjiang (EX72). First, determine the position of mental foramen, and then insert a needle obliquely at a 45° forward and downward (depth of 0.2~0.4 *cun*). Pluck the needle handle upward and downward. Once it is stimulated, electric-shock sensations may radiate to the mandibular portion.

【 Case Studies 】

Case 43: Patient was a 48-year-old female. She had discomfort in the right cheek near the foramen of nose and mouth dimes for one month. The discomfort came after she went to a beauty parlor and an electrical skin stimulator touched her face. She was diagnosed with third branch trigeminal nerve suffering with neuralgia. Although there was only slight pain, it was bothersome as the local skin sensitivity was obviously raised, and a slight touch could trigger significant pain. For the first ten sessions, acupuncture was applied twice weekly and

then once weekly to stabilize results. After only one session of treatment, she was much better. After 25 sessions, she did not have any discomfort or pain in the face. However, seven months later, the patient had a recurrence of pain in the area as before, which worsened when eating, talking, or moving the jaw. Through another nine sessions of acupuncture, the pain eased again. The patient had two recurrences of pain in the next 18 months, but each time, her pain eased after about ten sessions of acupuncture with the same needling methods as before.

Case 44: Patient was a 38-year-old female. She had suffered from right trigeminal neuralgia for eight years with unknown causes. Sometimes, a constant pain could last for several consecutive days, and it could be triggered by talking, eating, drinking, a simple touch to the face, or even the cold air. At times, when the pain was severe, she might even faint. She had seen a dentist and received pain medications, local injections, and facial muscle tractions, all without success. Following the aforementioned technique, acupuncture was applied twice weekly. After the second session, the pain was much less. Ten sessions later, the pain was completely gone. To stabilize the results, acupuncture was applied once weekly for the following year and totaling 102 sessions until she discharged. During that time, even though the patient had three recurrences of the pain, each time the pain was relieved with several consecutive sessions of acupuncture.

【 Discussion 】

There are various forms of conventional treatment for TN: medications such as anticonvulsants, local ganglionic opioid analgesia (GLOA) at the superior cervical ganglion or sphenopalatine ganglion, percutaneous intervention at the trigeminal ganglion as well as neurosurgery. However, none of these

procedures has been found to be the most suitable method.

Among various reports on the acupuncture effects in treating TN [283, 287, 288, 290], Beppu *et al.* evaluated effects of a meridian acupuncture treatment on TN in 10 patients who visited an outpatient clinic at Tsurumi University Dental Hospital from 1985 to 1990. Five of patients suffered from idiopathic and five from symptomatic TN. Patients underwent the meridian treatment by acupuncture alone or acupuncture combined with moxibustion. The acupuncture method used was primarily basic treatment employing only needles without electrical stimulation. The meridian acupuncture treatments were repeated from two to four sessions monthly. Five patients were restored to a pain-free state. The other five patients noted a decrease in pain, but with some level of pain remaining (significant pain in one patient). It was concluded that meridian acupuncture treatment is useful and can be a therapeutic approach in the management of TN [283].

Spacek *et al.* of Germany made a retrospective analysis of the data of 39 patients who had sought treatment for TN from 1993 to 1994. Patients were divided into three groups. Group A ($n=17$) had received Carbamazepine and acupuncture, group B ($n=11$) had received Carbamazepine and GLOA + acupuncture, whereas group C ($n=11$) had received Carbamazepine and GLOA without acupuncture. All subjects had taken Carbamazepine for at least four weeks and their plasma levels were within therapeutic range. Acupuncture was applied once weekly. GLOA was carried out with 0.045 mg Buprenorphine at the superior cervical ganglion or the sphenopalatine ganglion as a series of at least five injections. Results showed that most patients without improvement were from the group that did not receive acupuncture (C), while the combined use of acupuncture and Carbamazepine with/without

GLOA achieved additional therapeutic effectiveness in the treatment of TN. The addition of acupuncture seemed to have a superior effect to GLOA. Results concluded that the use of acupuncture is an effective additional therapy for the treatment of TN [284].

Costantini *et al.* of Italy treated 104 cases of idiopathic or secondary TN with EA. Utilizing cycles of 12 sessions, EA was applied on local and distal points or on *Ashi* points. They concluded that acupuncture is an effective treatment in all kinds of secondary TN, while, in the idiopathic form, its validity is conditioned by preceding medical treatments and by beginning of the disease. Applying acupuncture and infrared laser reflex therapy in treating more than 700 patients with craniofacial neuralgias, they also found that the best results were achieved with patients who chose acupuncture as the first therapeutic approach, while patients who underwent other previous medical and/or surgical treatment had a worse response [286].

Although most pain of TN could ease with effective treatment of acupuncture, there still could be relapses. However, acupuncture is still able to provide relief for its relapse. Sometimes, manual needling or EA might temporarily worsen the pain, particularly after a direct stimulation of nerve trunks (points). In this case, encourage the patient to continue with the treatment, and modify the treatment plan accordingly, such as selecting substitute acupoints, reducing stimulation intensity, or extending the intervals between two sessions. The pain would be gradually eased and became under control. In addition to classical acupuncture, this disease can also be treated by the pricking blood method with cupping [289] or laser acupuncture [290].

14.6 Bell's Palsy

One of the most common causes of peripheral facial palsy is facial neuritis, otherwise known as “Bell's palsy”, which could also be caused by external injuries of the facial nerve. It is advised to apply acupuncture as soon as possible in the disease's early stage to attain optimal therapeutic effects, but it does have certain effects for the disease's sequelae [292~299].

[Therapy]

Choose local points at the affected face as master points, and several distal points on the extremities as associate points. When stimulating the facial region, directly puncture trunks or branches of the facial nerve or the trigeminal nerve, as well as the affected facial expression muscles. The following methods can be applied alone or alternately.

The first method is perpendicularly puncturing reflex points or neural points. Local reflex points of facial palsy often appear at the area behind ear and the anteroinferior area of earlobe at the affected side. The area centered at Yifeng (TE17) has a radius of 0.5 *cun* and include points of Houtinghui (EX51), Ergen (EX62), and Anmian1 (EX58), together, it can be called **Yifeng zone**. The facial nerve passes through the deep portion of Yifeng zone, and may often accompany local swelling and tenderness in the acute phase and hard nodules in the sequelae phase. Insert a needle into the center of the hard nodule. When there are no hard nodules detected, insert the needle obliquely toward posterosuperior side of the point for 1~1.5 *cun*. Choose Fengchi (GB20), Chimai (TE18), or Xiachimai (EX49) as associate points for pain behind the ear in the acute phase, and *Vertigo-auditory area* of scalp zones (the horizontal puncture) for vertigo. Other associate points may be Qianzheng (EX63), equivalent to the *Facial nerve point*, Jiachengjiang (EX72), equivalent

to the *Mental nerve point*, Sibai (ST2), equivalent to the *Infraorbital nerve point*, Xiaguan (ST7), equivalent to the Trigeminal nerve point, and Zanzhu (BL2), equivalent to the *Supraorbital nerve point* (refer to Sections 12.4 and 14.5). When puncturing Qianzheng (EX63), perpendicularly insert the needle 0.2~0.3 *cun* deep, then pluck the needle handle upward and downward.

The second method is facial point-piercing method where a horizontal puncture is applied. For example, pierce Quanliao (SI18) into Jiache (ST6), Shuigou (GV26) into Dicang (ST4), Yingxiang (LI20) into Sibai (ST2), Yuyao (EX31) into Yangbai (GB14), Yintang (EX2) into Zanzhu (BL2), and Sizhukong (TE23) into Taiyang (EX4). In this method, a filiform needle pierced an acupoint into another acupoint or two needles pierced from two points going head-to-head. The latter is also called **Duici** or head-on needling method. All needles should be horizontally inserted and placed within the muscle layer, especially at the cheek, avoid piercing the muscle into the oral cavity.

In the above two methods, generally use filiform needles of size No. 32, and retain them for 20~30 min. It is also suitable to combine with electrical stimulation, moxibustion, or infrared radiation. If the generation of needling sensations is not remarkable, thick needles (e.g., No. 28) may be applied. When the local nerve degeneration or the mobility of the facial muscles start to recover and electrical stimulation is applied on the face, muscle twitching may appear upon stimulation on the *Facial nerve point*.

As for the association of distant points, select Hegu (LI4) and Waiguan (TE5) of the upper limb, located in the lateral somatic zone around the ear. Because the front side of the face pertains to the anterior somatic zone, it is also appropriate to select Zusanli (ST36) of the lower limb in that zone according to the TCM principle of *choose acupoints along the*

meridians. However, for each treatment, it is advised to select only one pair of acupoints (bilaterally) at the lower or upper limb. Hegu (LI4) often is the first choice.

Above treatments can be applied once daily for patients of a shorter disease course (within one month), or 2~3 times weekly for those with a longer disease course.

【 Case Studies 】

Case 45: Patient was an 18-year-old female. She had suffered from Bell's palsy in the right side for two days after a common cold. Tender spots with hard nodules were detected at Yifeng (TE17) on the affected side. Selected right Yifeng (TE17) as the master point, right Qianzheng (EX63), Sibai (ST2), Taiyang (EX4), Jiache (ST6), Yangbai (GB14), and left Hegu (LI4) as association points. When Yifeng (TE17) was punctured once daily, there were intense local warmth and soreness that occasionally radiated to her lips, as well as significant muscle twitching. The facial skin temperature was higher compared with that on the healthy side. Moreover, point-piercing techniques were applied. Pierced Jiache (ST6) into Dicang (ST4) and pierced Yangbai (GB14) into Zanzhu (BL2). The method of equal tonification and purgation was applied to all of above points and the needles were retained for 15 min. After only two sessions of acupuncture, she was much better. Through 14 sessions in 2 weeks, the Bell's palsy was completely recovered.

Case 46: Patient was a 42-year-old male. He had suffered from Bell's palsy on the left side for 18 months. He had received the conventional medical therapy for nine months without success. Examination found his left nasolabial groove was overly superficial, and he could not even raise the left eyebrow, wink, close eyes, or pout completely. With blowing, an obvious distortion of the nasolabial

groove was observed. The skin temperature of his left cheek and forehead was lower than that of the healthy side, and marked muscle atrophy was observed. There were certain paraesthesia in his left face and thus he could not play trumpet. Sometimes his speech was affected. Acupuncture was applied once every 1~2 days. For each session, 8 points were selected and stimulated by the aforementioned incorporations of electrical stimulation, local infrared radiation, and manual needling. After 7 sessions, the patient began to notice some movements of his paralyzed facial muscles. Through 118 sessions of acupuncture lasted over a period of 11 months, the muscle atrophy and blood circulation on his left face was much improved. The patient was also able to talk normally, and wink or pout extensively. His left eyelid could completely shut during sleep. Meanwhile, only some mild symptoms remained, such as unable to completely raise his left eyebrow and tightly shut the left eyelid. It was observed when EA was applied around his left upper lip, local muscle twitching was not obvious, which might indicate that certain neuromuscular degenerations remained within such areas.

【 Discussion 】

Because this disease affects the facial appearance, the patient often strongly desires the problem to be dealt as soon as possible. The outcome of the treatment may be based on the severity of disease and whether if the patient could receive timely and effective treatment. Generally, no dependence of treatment effects on the disease etiology was noted except cases of Bell's paralysis of vascular etiology, where the outcome was worse. A less favorable outcome was also observed in patients over age of 60 and in cases of paralysis relapses^[291]. To make the prognosis of this disease, one way is to measure the electrical excitability of the facial nerve that can

be performed 2 weeks past onset. Mild cases have no degeneration of the facial nerve, so they can recover completely within 1~2 months, while those with partial degeneration need 3~6 months to recover. If a complete degeneration is still in existence after two months, the recovery process will be slower and may need at least one year or even longer. However, disappearance of the electrical excitability on the neuromuscular portions of face at the early stage of this disease does not necessarily indicate there is no hope for recovery. Of course, if a patient does not recover after 6 months, then the chance for a complete recovery might be slim. In general, about 80% cases of this disease recovered in 2~3 months since the beginning of the onset [62].

To raise the curative rate of this disease, it is best to apply integrative therapies at its early stage so that neuromuscular degeneration of the face can be minimized. In addition to acupuncture, local applications of heat and infrared radiation, oral use of steroids such as Prednisolone at the early stage (within 72 hours since the appearance of symptoms) is often helpful to lessen the damage, and shorten the disease course. In some patients, occurrence of this disease may be related to viral infections, thus some Chinese herbs with anti-viral functions, such as *Banlangen* (*Isatidis Radix*) may be taken simultaneously with acupuncture treatment. Since many patients are extremely weak in the acute phase, ensure the patients are receiving good rest at night while taking sufficient proteins. During the treatment, it is recommended for the patient to reduce time spent at visual tasks such as watching TV, doing computer work and readings. Massage and heat application on the affected region and surrounding areas of the ear are applied 2~4 times daily. Besides, Vitamin B complex (B₁, B₆, B₁₂, and so on) can be orally taken or injected, while some Chinese herbs that could help invigorate *qi* (e.g.,

Buzhongyiqi Wan) or promote blood circulation (e.g., *Huoxue Pian*) could be taken to enhance the results.

There is an obvious relationship between the curative effect and the timing of acupuncture. If acupuncture is applied in the first week or within 10 days of its first onset, then it is easier to achieve a complete recovery of the affected facial nerve. The lesion degree of facial nerve is directly related to acupuncture response. Patients with partial neuromuscular degeneration of the face have better needling responses and accordingly higher curative rate than those with complete degeneration. If patients cannot receive effective treatments earlier and allow the disease course to last for over one month, then they are likely to recover slower. If the disease course lasts for over three months and symptoms of facial palsy are still marked, it indicates that the degeneration is rather serious, and it is more difficult to recover completely with acupuncture alone. In some cases, however, even though the facial palsy has lasted for over one year, continuous sessions of acupuncture can still facilitate its recovery to a certain degree, thus it is suggested that the patient should have patience and not abandon the treatment plan too soon.

On the other hand, evaluating the degree of facial degeneration can be used to guide the clinical therapy. For example, the initial needling can focus on portions with partial degeneration as a breakthrough to take some effects, and then stimulate those portions with complete degeneration. The treatment plan can also be adjusted according to changes of neuromuscular degeneration after each treatment. Although most acupuncture practitioners have no electromyography (EMG) equipment in their clinics, they can still make some rough estimates on the degeneration level via observations of facial points response to low frequency EA stimulation. Pairs of Yangbai (GB14)–Taiyang (EX4), Yifeng (TE17)–

Dicang (ST4), Xiaguan (ST7)—Sibai (ST2) are such choices. Different degrees of the facial degeneration may be indicated by various levels of extent in muscular contractions along each needle. When the muscle twitching is marked, the degeneration and the lesion may be light, and vice versa.

14.7 Facial Spasm

Facial spasms (or muscle twitching) could be either primary or secondary. The primary one is commonly seen in the clinic and develops slowly with unknown causes. It is difficult to be self-healed. For some patients, it may be a sequelae of facial neuritis. When it occurs, there are often intermittent spasms of the ocular orbicular muscle that may gradually spread to other facial muscles at the same side. Of them, muscle twitching at corners of mouth is most easily noticed. The degree of muscle twitching may vary. It may be worsened due to fatigue, nervousness, or voluntary movements, while unable to be self-controlled. The muscle twitching usually ceases after the patient falls asleep. The effectiveness of acupuncture for facial spasm is related to its history and severity. Results are more remarkable for those at the early stage or without serious symptoms and less for those with a longer course of disease or suffering from extensive facial spasms.

【 Therapy 】

Point selections and needling methods for this disease are similar to facial palsy, but there are certain differences. First is to avoid electrical stimulation on facial points of the affected side. Second is to apply needling at acupoints or reflex points located on distal portions of the body,

especially those on the extremities, which maybe more effective than those on local portions. In addition, symmetrical points at the healthy side, the bilateral auricular points, or the lower 2/5 of *Motor area* in scalp acupuncture may be associated. Third is the stimulation may need a greater intensity.

During the initial treatment course, select and puncture facial points of the affected side. Master points are Yifeng (TE17), Qianzheng (EX63), and Xiaguan (ST7), in which needles are inserted perpendicularly to seek stronger needling sensations that can radiate toward the face. Associate acupoints are selected according to locations of spasms, such as Sibai (ST2), Yingxiang (LI20), Dicang (ST4), and Taiyang (EX4), in which needles are inserted along the skin by the piercing method. Retain the needles for 20 min after the generation of needling sensations. Infrared radiation can be incorporated with needling at the affected side. The treatment is applied once daily or once every other day with one course of treatment composed of ten sessions.

If results are not as desired, then change point selections to distal points for the second course of treatment, such as bilateral Hegu (LI4) or Houxi (SI3) as master points, plus Waiguan (TE5). Puncture them with intense stimulation, then retain the needles for 30 min, during which the stimulation is strengthened periodically, once every 5 min.

The above two methods can be applied alternately or in combination. In addition, NTN (nerve trunk needling method) can be applied at the affected region. According to locations of facial spasms, choose *Supraorbital nerve point*, *Infraorbital nerve point*, *Mental nerve point* (refer to Section 14.5) or *Facial nerve point* (refer to Section 14.6).

If body acupuncture is not effective, then auricular or scalp acupuncture may be integrated. When applying auricular acupuncture, seek reflex points near or at *Mouth*, *Shenmen*, and *Brainstem*. With

ANEM or APPM, alternately stimulate both ears every 3~4 days.

[Case Studies]

Case 47: Patient was a 53-year-old male. He had suffered with spontaneous twitching of the left upper eyelid for several months. Selected and slightly punctured left Fengchi (GB20), Yifeng (TE17), Taiyang (EX4), Sizhukong (TE23), Xiaguan (ST7), Yintang (EX2), and bilateral Shenmen (HT7). Needles were retained for 20 min, during which the infrared radiation was applied on the affected side. The neck was massaged for 3 min after the needles were removed. The patient was much better after three sessions of treatment, and all of his twitching symptoms subsided through five sessions. Follow-up on his condition after 6 months resulted in no relapse of the symptoms.

Case 48: Patient was a 24-year-old female. She had suffered from peripheral facial paralysis in the left side for one month due to an auto accident. Examination showed a surgical scar on her left lower face along with regional facial paralysis. Her nasolabial groove became shallow, and could neither pout nor open the mouth to show the teeth. She could, however, open and shut her left eye, although not completely. Over a period of six-month acupuncture treatment, she totaled 35 sessions. The first 15 sessions were applied once every 3~4 days, then once weekly until her facial symptoms were alleviated. When she was discharged from acupuncture, there were no signs of facial nerve dyskinesia although there was occasional numbness or distension at the affected region. At the 8th month, she had a relapse of muscle twitching at her left lower lip for two weeks and resumed acupuncture. The same acupuncture treatment as before was applied and the symptoms completely subsided after only two sessions. Follow-up on her condition in 2 years

resulted in 95% recovery of facial paralysis with no muscle twitching, although occasional recurrence of distension remained on the face.

Case 49: Patient was a 55-year-old female. She had suffered from spontaneous muscle twitching in the left cheek for four years, and the facial discomfort greatly affected her speech. She had tried EA at another clinic for almost a year with satisfactory results. However, a recent recurrence of twitching was extremely severe so she sought us out for treatment. Left Yifeng (TE17), Fengchi (GB20), Sibai (ST2), Yintang (EX2), bilateral Hegu (LI4), and Zusanli (ST36) were punctured. The needles were retained for 30 min, during which infrared radiation was applied. At the beginning, acupuncture was applied once every 3~4 days. The patient started to have fewer symptoms by the 10th session, and then gradually improved with each additional session. By the 16th session, acupuncture was reduced to once weekly. By the 20th session, she estimated about 50% of her symptoms was gone, and the muscle twitching was much less. In the following two months, her conditions continued to improve, even to the point that no more twitching was felt at all. However, a short while later, she had a severe relapse of twitching that lasted for several consecutive days, and she subsequently ceased the acupuncture treatment at that time.

[Discussion]

Because facial spasms with a longer course are usually intractable, the patients are advised to start acupuncture treatments as early as possible. Efficacy can be observed sooner if acupuncture treatment starts within the first three months of its onset. Some patients might have had peripheral facial palsy prior to the facial spasms, while some patients might suffer from neurasthenia or stress concurrently. Moreover, facial spasms are sometimes resulted from the

electrical stimulation on the face, such as the application of TENS for cosmetic purposes. Thus, when applying EA for peripheral facial palsy, its stimulation neither should be overly intense nor applied too often to avoid possible conversion of facial palsy to twitching. When treating facial spasms, EA or other types of electrical stimulation are not suitable.

This disease has a tendency of relapse even if patients might have attained some therapeutic effectiveness or recovered completely after acupuncture. However, reapplying acupuncture may still have effects for its relapses. If none of the aforementioned acupuncture methods can control symptoms of facial spasm, then it is advised for the patient to take further examinations or to attempt other therapies.

At the early stage of this disease, many patients may only have twitching of the eyelid (blepharospasm), which makes it difficult to be distinguished from occasional tremors of the eyelid. Fortunately, both disorders have similar treatment methods using acupuncture. In general, acupuncture is good for simple blepharospasm^[300], but not as good for extensive facial spasm spanning over a broad region.

Because facial spasm usually turns worse when one is nervous and subsides after falling asleep, some acupoints with relaxation effects may be effective. Nepp *et al.* of Germany performed acupuncture in five patients with simple blepharospasm, 10 times once weekly. Local points with higher sensitivity and points with empiric relaxation effects were selected. Though there were fluctuations of dystonia, both measurements by the Visual Analogue Scale (VAS) and by the Elston-Score showed marked improvements after treatments^[301].

Applying strong stimulation at distal acupoints might raise the curative effect of blepharospasm. Li *et al.* of Changchun reported that acupuncture at

Houxi (SI3) in treating this disease (175 cases) had better effectiveness than that of mainly injecting Vitamin B₁₂ at local acupoints (45 control cases). The total effective rates for these two groups were 98.8% and 75.6%, respectively, and had significant difference ($P < 0.001$), as well as the curative rates were 64% and 26.6%, respectively^[302]. Puncturing Houxi (SI3) located at central reflex zones of the hand usually can generate an intense needling sensation.

A combination of body acupuncture and auricular or scalp acupuncture may raise the curative effect in treating this disease. Li and Peng of Changsha reported that a combined method of acupuncture with pressure on otopoints (the combination group) was used to treat 86 patients with facial spasm, and simple acupuncture and pressure on otopoints were respectively applied in other two groups of patients as controls. The total effective rates of the combination group, the acupuncture group, and the pressure on otopoints group were 95.4%, 92.1% and 62.5% respectively; and the cure rates were 38.4%, 15.8% and 5% respectively. The differences in results of the three groups showed statistical significance, indicating that the effectiveness of the combined method is better than other two therapeutic methods^[303]. When applying scalp acupuncture, apply stimulation at the lower 2/5 of the motor area, which represents the face, may have better results in inhibiting central facial twitching. Bilateral scalp stimulation is optimal for blepharospasm because the upper half of the facial muscles has bilateral central innervations.

14.8 Headache

Headache is a common indication of acupuncture.

There are many types of headaches, all of which can be categorized by particular causes or properties, but most can be treated with similar methods of acupuncture, and have remarkable results.

【 Therapy 】

In general, select and puncture acupoints within somatic reflex zones corresponded to the headache locations:

Temporal (migraine) headaches: Taiyang (EX4), Touwei (ST8), Xiaguan (ST7), Waiguan (TE5), and Zulinqi (GB41);

Fore headaches: Yintang (EX2), Shangxing (GV23), Neiguan (PC6), Zusanli (ST36), and Taichong (LR3);

Occipital or vertex headaches: Fengfu (GV16), Baihui (GV20), Dazhui (GV14), and Houxi (SI3);

Full headaches or with uncertain locations: Fengchi (GB20), Hegu (LI4), and Shenmen (HT7).

When headaches are severe, apply auricular acupuncture at the selected master points *Subcortex* and *Brainstem*, and 1~2 associate points corresponded to the locations of headache and other symptoms, such as *Vertex* for vertex headaches, *Taiyang* for temporal headaches, *Forehead* and *Stomach* for fore headaches, *Occiput* for occipital headaches, *Shenmen* or *Heart* for accompanying hypertension or insomnia. If headaches are chronic, ANEM or APPM can be applied. Alternately stimulate both ears every 3~5 days, select 3~4 most sensitive points at each session.

Seek reflex points that may appear at the neck and upper back and apply moxibustion or acupressure if needed. These reflex points often appear at the area from Tianzhu (BL10) to Dazhu (BL11), presenting tenderness or hard nodules in strip-shapes.

【 Case Studies 】

Case 50: Patient was a 30-year-old female. She had suffered from migraine headache in the right temple

for three and half years. During each onset, her main symptoms were local pressures on the head and nausea. In the last nine months, these symptoms became worse, and there was a recurrence every 3~4 weeks. Headaches could last for 1~2 consecutive hours unless pain medications were taken. Acupuncture was applied once weekly. Taiyang (EX4), Hegu (LI4), Fengchi (GB20) and Yintang (EX2) were punctured. Just prior to the third session, though she was in excruciating pain, she immediately received pain relief after the session. However, severe headaches came back two days later. For that subsequent session, certain therapeutic adjustments were made. One change was to deep puncture at Taiyang (EX4) instead of superficial needling. Another change was to associate bilateral Zusanli (ST36). The reason for such changes is that the patient's bilateral Taiyang (EX4) seemed plumped, similar to many patients of migraine headache, and there were certain level of tension around that point. Superficial needling might be insufficient to attain maximal effects. Indeed, the patient felt much better with the new methods, and did not have any headaches for the subsequent two weeks following her fourth session. Through ten sessions of continuous treatment, all of her migraine headaches vanished. Her bilateral Taiyang (EX4) neither plumped nor tensed, which indicated a fully relief from the pressure inside the point.

Case 51: Patient was a 48-year-old male. He had suffered from catatonic headaches for more than ten years, in which a distention-pain with squeezing sensation was sustained in the vertex and occipital region. Other accompanying symptoms were dizziness and weakness of the extremities, which became worse recently. He took medications without significant relief. ANEM was first applied. During the point-probing process at the left *Subcortex*, *Brainstem*, *Occipital*, *Bladder*, and *Apex*, he instantly

felt less pain. At the 5-day-follow-up, he indicated there were no more headaches. Continuous ANEM at the subsequent two sessions were applied to stabilize the results. At the 3-month-follow-up, there were no relapses of the headaches.

Case 52: Patient was an 80-year-old female. She had suffered from right fore headaches as well as diplopia in the right eye due to a fall. She had been to one of the premier hospitals in the country, Mayo clinic, USA, and was on pain medications for 6 months without any relief. Acupuncture was applied once every other day. Bilateral Fengchi (GB20), Hegu (LI4), as well as right Taiyang (EX4), Touwei (ST8), Shangxing (GV23), Yintang (EX2), and Waiguan (TE5) were punctured. After only three sessions, her headaches were much less. After seven sessions, the headaches were completely relieved. After thirteen sessions, her diplopia symptoms also subsided. Thereafter, acupuncture was reduced to twice weekly in the next three months, totaling 45 sessions to stabilize results. At the 2-year-follow-up, the patient showed no relapses of headaches or diplopia.

【 Discussion 】

To date, there have been numerous clinical studies about the effectiveness of acupuncture for headaches, with most focusing on migraine or tension types. Analgesia effect of acupuncture in the treatment of recurrent headaches has been widely realized [304]. Lenhard and Waite reported in 1983 that acupuncture induced a significant reduction in the number and duration of migraine headaches, with 40% of the subjects showing a 50%~100% reduction [305]. In 1999, Gao *et al.* of Harbin, China conducted a comparative study on the treatment of migraine headache with acupuncture at both distal and local acupoints versus conventional drug therapy. They found that overall effective rates for acupuncture and control groups were 93.8% and 62.5%, respectively, indicating a

significantly greater effect in the former ($P < 0.01$) [306]. Hesse *et al.* of Denmark compared effects of puncturing myofascial trigger points in the neck region to Metoprolol in migraine prophylaxis. Both groups exhibited significant reduction in attack frequency ($P < 0.01$), but no difference was found between groups regarding frequency or duration of attacks [307]. Baischer of Austria reported a long-term outcome of acupuncture in 26 patients with chronic migraine. Data showed there was an improvement greater than 33% for 18 patients (69%) at post treatment and 15 patients (58%) at 3-year follow-up, while the drug intake reduced to 50% and did not re-increase until the follow-up [308].

To determine the effectiveness of acupuncture in treating headaches, many researchers compared results by applying sham (placebo) acupuncture and true (verus) acupuncture. Some studies showed that true acupuncture was significantly more effective than that of the sham acupuncture in reducing headaches [309], and analgesia action of acupuncture is related to an increase in activity of the opioidergic system. For example, by investigating the effectiveness of acupuncture in 22 children with migraine, Pintov *et al.* of Israel found that true acupuncture treatment (12 cases) led to significant clinical reduction in both migraine frequency and intensity. A gradual increase in panopioid activity was also found in plasma that correlated with the clinical improvement, whereas no significant changes were found in plasma panopioid activity in the placebo acupuncture group (10 cases) [310]. However, some studies showed that no statistically significant differences between acupuncture and placebo groups were found [311, 312]. According to a review on acupuncture for idiopathic headache by Melchart *et al.* of Germany, in eight of the 16 trials comparing true and sham (placebo) acupuncture in migraine and tension-type headache patients, true acupuncture was reported to be

significantly superior. In four trials, there was a trend in favor of true acupuncture; in two trials, there was no difference between those two interventions; and other two trials were not interpretable^[313]. We concur with the notion that true acupuncture is more effective than that of sham acupuncture. Those studies that could not detect any differences might be resulted from poor manipulation skills of acupuncture practitioners, or the non-specificity actions of certain acupoints in analgesia.

Headaches with different types possess certain reflective characteristics, which need to be carefully noted during the treatment. For example, patients with tension headaches often have obvious tenderness of the trapezius muscle, which could be reduced with headache altogether in physiotherapy^[314]. Thus, when treating tension headaches, focus the stimulation on certain acupoints or reflex points located at the trapezius muscle, such as Tianzhu (BL10), Fengchi (GB20) of the neck, Dazhui (GV14), Jianzhongyu (SI15), Feishu (BL13), Jianjing (GB21), and Quyuan (SI13) of the upper back. In patients of migraine headaches, certain tenderness may appear at Tianzhu (BL10) and Tongtian (BL7), which are the “particular effective points” for moxibustion according to Shirota Bunshi of Japan. From our experience, many patients with either tension or migraine headaches had plumped Taiyang (EX4) at the affected side during onsets. Moreover, pricking blood after the removal of needles often occurred at that location along with an instant relief of headaches. With more sessions of acupuncture, such headaches will gradually become under control, and return the regional tension of Taiyang (EX4) to normal. This suggests that causes of some headaches might be related to the abnormality of regional vascular tension, such as unilateral or bilateral cephalic hypertensions.

Therefore, for those with headaches that may be

due to an increased blood pressure in the head, puncturing Taiyang (EX4) or pricking blood at other superficial veins of the temporal region are applicable.

Fore headaches often accompany symptoms of nausea or upset stomach. This suggests that forehead is one of reflex zones of the stomach. However, headache is either a result or a cause of upset stomach, so it needs to be differentiated according to other signs such as tongue appearance. If the headache is due to dysfunction of gastrointestinal tract, those acupoints or reflex points used for gastrointestinal diseases should be stimulated concurrently. For example, Yintang (EX2) is a point that could be punctured with the needle tip pointed at the nose, obliquely inserted 0.2~0.3 *cun*. Many patients had regional skin redness after needles were retained for 20 min or slight pricking blood after needles were removed. This usually is a good precursor to show effectiveness.

For patients with migratory headaches, it usually is not necessary to select points of the head, instead, may select some points within central reflex zones of limbs and points related to the symptoms. If migraine headaches are associated with menstrual cycle or any diseases of the reproductive system, carefully locate and stimulate reflex points within urogenital reflex zones, such as Sanyinjiao (SP6), Yinlingquan (SP9), and Ququan (LR8) on the limbs and Xiaochangshu (BL27) at the lumbosacral area.

An advantage of applying ANEM to treat headaches is that the needling stimulation can be sustained longer than that of body acupuncture. Therefore, it is particularly suitable for patients with frequent headaches but unable to receive body acupuncture in time, or for those who was ineffective with body acupuncture. In 1975, we reported that 40 cases of neurogenic headache were treated with ANEM. Through 1~6 sessions of treatments, 29 cases

displayed remarkable effectiveness, and their headaches were alleviated completely without recurrence in three months. 8 cases were effective as their headaches eased instantly but with occasional recurrence. 3 cases were ineffective ^[316].

14.9 Apoplexy/Hemiplegia

To date, acupuncture has been widely applied for the rehabilitation of dyskinesia in patients with apoplectic hemiplegia. Although there still are arguments regarding its effectiveness ^[316, 318], acupuncture serves as an important rehabilitation mean for many types of apoplectic hemiplegia patients in the world, particularly in China. According to statistics from the First Teaching Hospital of Tianjin Univ. of TCM, China, when applying a special acupuncture technique called “*Xing Nao Kai Qiao*” to treat 71 893 cases of apoplexy, there was a 85% recovery rate ^[319, 320]. Generally, it is advised to start acupuncture as early as possible in order to recover the mobility of most mild apoplexy cases, and to improve hemiplegia sequelae in cases with severe apoplexy.

【 Therapy 】

Stimulation locations for hemiplegia may be chosen from almost all commonly used acupoints on the extremities, head, and the neck. Generally, choose acupoints according to corresponding paralyzed portions or muscles with either hypotonia or hypertonia. These points are mostly located at *yang* meridians (the posterolateral upper limb and the anterolateral lower limb) for hypotonia and *yin* meridians (the anterolateral upper limb and the posterolateral lower limb) for hypertonia. Apply

finger pressing to detect the most sensitive spots before the needle-insertion.

For paralysis of the lower limb, select Zusanli (ST36) as the master point of *yang* meridians, Biguan (ST31), Futu (ST32), Fengshi (GB31), Xiyangguan (GB33), Yanglingquan (GB34), Fenglong (ST40), Tiaokoupang (EX160), Xuanzhong (GB39), Qiuxu (GB40), Kunlun (BL60), and Taichong (LR3) as associate points. Select Diji (SP8) as the master point of *yin* meridians, Xuehai (SP10), Sanyinjiao (SP6), and Taixi (KI3) as associate points.

For paralysis of the upper limb, select Cuoshan (EX124) and Baxie (EX132) as master points of *yang* meridians, Jianyu (LI15), Naoshang (EX119), Qinglengyuan (TE11), Tianjing (TE10), Yingxia (EX123), Quchi (LI11), Shousanli (LI10), Sidu (TE9), Waiguan (TE5), Yanglao (SI6), and Hegu (LI4) as associate points. Select Qingling (HT2) as the master point of *yin* meridians, Chize (LU5), Quze (PC3), Ximen (PC4), Shaohai (HT3), Daling (PC7), Taiyuan (LU9), Shenmen (HT7), Shaofu (HT8), and Laogong (PC8) as associate points.

For facial palsy, select Yifeng (TE17), Qianzheng (EX63), Sibai (ST2), Yingxiang (LI20), Jiache (ST6), and Dicang (ST4). For aphasia, defect of the visual field, and other symptoms of central lesions, select Fengchi (GB20), Yifeng (TE17), Fengfu (GV16), Tianzhu (BL10), Yamen (GV15), Baihui (GV20), and Sishencong (EX1).

Choose 10~12 points each session, alternately stimulate either *yang* or *yin* meridians according to different types of paralysis (flaccid or rigid) as well as the diseases course. Stimulate the paralyzed side each session, but the healthy side is also crucial for patients at the acute stage or with sequelae of rigid paralysis and should be stimulated as well. For those at the acute stage, select points on the head, neck, and the extremities as master points. It is not required to employ too many points at the healthy

side, usually it is sufficient to select 2~4 acupoints that reside on the extremities or symmetrical portions of the paralyzed muscles per session.

Either manual needling therapy or EA is suitable in treating paralysis with hypotonia. For the former, choose **pulsating points** as master points and attain muscular twitching around the needle or a jerking response of the limb. For EA, apply pulsating current with the continuous wave to attain slight muscular twitching to a certain extent. If needed, the method of **PPEA (point-probing with EA)** may be applied (refer to Section 12.3). EA is not suitable for paralyzed portions with hypertonia; instead, applications of point-piercing method or heat-producing needling technique are suitable. However, for paralysis with either hypotonia or hypertonia, EA can be applied to points of the healthy limbs.

During treatment, the stimulation intensity and the duration of needle-retaining period should be adjusted individually and timely. A light stimulation may be started at the acute stage, and then gradually be raised to attain strong needling sensations and propagations at the sequelae stage. When puncturing paralyzed portion with hypotonia, needles may be removed instantly after the generation of muscular twitching or other needling sensations. However, when applying EA on paralyzed portions with hypotonia or manual needling on that with hypertonia, a 20~30 min of needle-retaining period is preferred.

Scalp acupuncture can be adopted alone or in conjunction with body acupuncture. Select and puncture *Motor area*, *Foot motor sensory area*, and *Sensory area* on the scalp as master points. Adopt the **needle-twirling** method at a frequency of 200 times/min for 5 min and repeat it for 5 min at an interval of 5 min, totaling 3 times during 30 min of needle-retaining period. These needles can also be hooked to an electrical stimulator for 30 min after the first

time of needle-twirling. During scalp acupuncture, it is advised to have patients perform some active exercises of their paralyzed limbs.

Regardless of body acupuncture or scalp acupuncture, continuous treatment should be applied once daily at the acute stage, and once or twice weekly at the recovery or sequelae stage.

Besides, acupressure, moxibustion, and exercises can be incorporated to the treatment. Before needling, knead the selected points with a heavy finger pressure to achieve certain sensations of soreness and distension or muscular twitching. It is also suitable to apply massages with an electrical massager on paralyzed limbs or scalp zones after acupuncture daily. For patients with muscle atrophy, either moxibustion or thermal therapy can be combined with needling. Once the recovery stage begins, voluntary or passive exercises of paralyzed limbs should be performed regularly. If a patient cannot perform voluntary movements of paralyzed limbs, the patient might seek assistance from another to perform passive exercises of those limbs. Meanwhile, let the patient perform active exercises of the healthy limbs. As long as there is a slight sign of voluntary motion in the paralyzed muscles, patients should be encouraged to exercise the affected portion of the body by themselves.

Acupuncture can be applied for each stage (acute, recovery, sequelae stages) of apoplexy, and five principles of association treatment will be described later in the discussion.

【 Case Studies 】

Case 53: Patient was a 73-year-old female. She had suffered from hypertension for many years and had a cerebrovascular accident that resulted in hemiplegia of the left side. She was diagnosed as cerebral embolism via CT, which was at the tempo-parietal region of the cerebral middle artery in the right side,

mainly at the anterior parietal region and the temporal lobe was involved less than the parietal lobe. The patient was in the hospital when she started acupuncture one week after the accident in the acute phase. At that time, she was semiconscious and showed slow responses. She could not raise the left arm but still had movement in all fingers. The patient was able to raise the left lower limb to 30° voluntarily, but could not sustain at that position even for a short time. Her Babinski's sign was negative. She had mild left facial palsy, a defect of left visual field, and a breakdown but apprehensible speech, as well as serious depression. The above-mentioned techniques of body acupuncture and electrical stimulation were applied three times weekly. After the initial acupuncture session, she had obvious relief from the symptoms, such as raised muscular strength of the left lower limb, and she was able to stand up and slowly walk with a cane. Three days later, she started physical therapy, occupational therapy, and speech training in a combined effort. After the second acupuncture session, the symptoms eased significantly, and she could walk without cane for a longer time. After the seventh session, she could lift the left arm over the head and move the fingers at will. She was discharged from the hospital as well as took a break from acupuncture after the tenth session. At that time, some symptoms such as weakness of the left limb, poor balance during walking and mild left facial palsy still remained. One month later, she resumed acupuncture seeking relief of the above residual symptoms. Through the 30th session of treatment, she was near full recovery, and eventually she was discharged from acupuncture after the 46th session. At the 1-year-follow-up, the patient indicated her hemiplegia was fully recovered and had no relapses.

Case 54: Patient was a 65-year-old female. She had suffered from serious hemiplegia in the right side

and aphasia due to apoplexy for over 11 months. She was diagnosed with cerebral infarction of the left temporal lobe via CT. When starting acupuncture, she continued with physical therapy, speech training, and other forms of rehabilitation. The mobility of her right lower limb showed obvious improvement, and she could walk on her own with a cane. She could also pronounce some simple words, but unable to move the right upper arm at will. The above techniques of body acupuncture and EA were applied twice weekly, 30 min each session. Through 30 sessions of continuous treatment over 3 months, then patient could finally move her right arm, and could raise it to the chest level while standing straight. However, such results only became stable after another course (10 sessions) of acupuncture. Afterwards, she continued acupuncture, totaling 130 sessions over 9 months, but the recovery process seemed slow at times. When she eventually was discharged from acupuncture, she could move her right arm up to the shoulder level at will and could swing the arm back and forth, as well as extend and bend the right wrist with ease. However, her fingers still could not move voluntarily and she needed the cane for walking due to the poor mobility of the right lower limb, though it was already stronger than that before acupuncture.

[Discussion]

Mechanisms of acupuncture in treating apoplexy/hemiplegia have been discussed in detail previously (refer to Section 4.4). Here we only analyze and discuss how to raise the therapeutic effectiveness of acupuncture for apoplexy/hemiplegia.

In general, regardless of body acupuncture or scalp acupuncture, the therapeutic effectiveness is related to the properties and locations of the pathological lesion, as well as the length of disease course. The more serious the cerebral lesion, the

poorer the rehabilitation outcome will be. Apply acupuncture at an early stage may dramatically decrease the degree of cerebral lesion and achieve quicker and better results by combination with subsequent rehabilitation.

For example, the rehabilitation outcome of hemiplegia sequelae due to cerebral thrombosis is often better than that due to cerebral embolism or hemorrhage. Acupuncture may have significant effectiveness for patients with a shorter disease course (less than three months), and most effective for those within one month. If the disease course is longer than three months, it may be difficult to be cured. If the lesion scope is large, or located at bilateral or deep portions of the brain (e.g., the basal nuclei or the internal capsule), or has multiple focuses or recurring, the outcome is often poor.

The determination of cerebral lesion in contemporary medicine can be achieved through advanced diagnostic measures such as CT or MRI. Chen and Fang of Shanghai, China, observed the relationship between CT results, clinical findings and the effect of acupuncture treatment in 108 cases of hemiplegia caused by stroke. It was found that early treatment (first 3 weeks) with acupuncture produces better result (improvement in 90.9% of the patients treated) than the treatment initiated three weeks after stroke (improvement in 71.4% of the patients treated) ^[322]. Naeser *et al.* of Boston Univ., School of Medicine, USA also observed that stroke patients who received acupuncture could be correctly classified regarding beneficial response to acupuncture, versus poor response, based on CT results of the lesion site data alone. Patients with beneficial response had damage to less than half of the motor pathway areas on CT scan, especially in the periventricular white matter area at the level of the body of the lateral ventricle ^[323].

For patients of apoplexy, it is critical to begin acupuncture as early as possible because of the

positive effects of early acupuncture shown in many documented clinical trials. It is known that earlier diagnosis of ischemic apoplexy such as cerebral infarction within six hours and timely application of anti-clotting therapy will greatly reduce the incidence of serious sequelae. In accordance with this recognition, Shi and Li *et al.* of Tianjin Univ. of TCM, China, demonstrated that for patients of apoplexy, either due to hemorrhage or ischemia, the earlier the acupuncture treatments they received, the better therapeutic effectiveness they had ^[320, 321]. Acupuncture applied at the early stage of apoplexy generally has no adverse effects besides having various health benefits, such as promoting the absorption of intracranial hematoma, speeding up the formation of collateral circulation, decreasing the lesion of reperfusion, and protecting brain cells, and so on. It was proposed that daily acupuncture should be applied since the first day of stroke, and continued during all stages of the acute, recovery and rehabilitation. According to our experience, patients who had already passed the acute stage with stable conditions but were still under the spinal shock period usually could attain the most effective results from acupuncture. Sometimes, the mobility of fully paralyzed limb could be dramatically recovered instantly after just one or two sessions of acupuncture.

Hu *et al.* of Taiwan, China carried out a randomized controlled trial of acupuncture in treating 30 cases of acute apoplexy. Basing on the same supportive treatment, these patients aged 46~74, with onset of symptoms within 36 hours were randomly assigned to a treatment with or without acupuncture. Acupuncture was applied three times weekly for four weeks. A significantly better neurological outcome was observed in the acupuncture group on day 28 and day 90. The improvement in neurological status was the greatest in patients with a poor neurological score

at baseline ^[324]. Johansson *et al.* of Lund Univ. Hospital, Sweden, randomized 78 patients with severe hemiparesis of the left or right side within ten days of stroke onset: 40 patients assigned to a control group receiving daily physiotherapy and occupational therapy, and 38 patients assigned to a group that, in addition, they treated with sensory stimulation (acupuncture) twice weekly for ten weeks. Results showed that patients given sensory stimulation recovered faster than the control group, with a significant difference for balance, mobility, activity of daily living, quality of life, and days spent at hospitals/nursing homes ^[325]. Magnusson *et al.* of the same hospital further investigated postural control in 48 patients who survived more than two years after stroke onset. They found that the course of sensory stimulation enhanced recovery of postural function, and this enhancement still was significant two years after the lesion and treatment ^[326].

There are also many reports indicating that acupuncture provides an additional therapeutic benefit, including significant improvement in motor function, and better quality of life, when given to stroke patients during their rehabilitation program in the subacute phase (median time from onset of stroke to inclusion in the study was 40 days) ^[327]. Kjendahl, Sallstrom *et al.* of Norway reported that acupuncture not only had therapeutic benefit for stroke patients in the subacute stage, but also continued to have effects one year after discharge from the rehabilitation center. Forty-five stroke patients, median 40 days post-stroke, were randomized into two groups: one acupuncture group and one control group. All these subjects received an individually adapted, multidisciplinary rehabilitation program. The acupuncture group received an additional treatment with 30 min of classical acupuncture, four times weekly for six weeks. Results showed that there was a significantly

greater improvement in the acupuncture group than in the control group, both during the six-week treatment period, and even more so during the following year ^[328].

Of course, emphasizing the notion that there are better results when acupuncture is applied at the earlier stage of apoplexy does not mean acupuncture at the sequel stage does not have effectiveness for hemiplegia sequelae of apoplexy. In fact, whether the stages are acute or sequelae, patients can always benefit from acupuncture therapy. In a report by Naeser *et al.*, two chronic patients with beneficial response first began receiving acupuncture at three and six years post-stroke, respectively. Most improvements were sustained for at least four months after the last acupuncture treatment ^[323]. Such examples are commonly encountered clinically.

Combining our experience along with our peers, the following five associate principles are summarized in treating apoplexy with acupuncture:

14.9.1 Association of points on the hemiplegia side with those on the healthy side

For patients of hemiplegia sequelae of apoplexy, stimulating both healthy and hemiplegia sides of the body mostly stems from the consideration that bilateral sides of the human body are closely connected, thus, puncturing acupoints of any single side or limb will induce effects on bilateral sides and the rest limbs of the body. It is thought that puncturing the healthy side of the body can strengthen the effects attained via puncturing the paralyzed side, including facilitating the formation of corresponding compensatory areas on the healthy side of the brain. As for the effectiveness of acupuncture on the healthy side of the hemiplegia patient, there have been many clinical and laboratory studies. Zhang treated 100 cases of hemiplegia using only acupuncture on the healthy side of limbs, and

reported that the total effective rate was 94%^[173]. Liu observed that the improvement of cerebral blood flow in the diseased side by opposite needling method (ONM) was greater than that by general needling^[174]. In treating 90 patients of cerebral infarction, Li *et al.* found that the instant improving effect of the cerebral blood flow in the group of ONM was superior to that in the group of non-opposite needling. Accordingly, they thought that the cerebrovascular influence of acupuncture was realized through stimulation of sympathetic nerve at the ipsilateral side^[121] (refer to Section 11.7).

Puncturing the healthy side of the body is particularly important during the acute stage of apoplexy or when treating sensory loss or hypertonia of the paralyzed limbs. During the acute phase of apoplexy, stimulation of the healthy limbs may improve the cerebral blood supply and decrease the cerebral damage to reduce stroke sequelae. When a patient has sensory loss of paralyzed limbs, acupuncture applied on that side cannot easily generate needling sensations, namely acupuncture information is more difficult to be inputted from the paralyzed side, while stimulating corresponding points of the healthy side can ensure therapeutic inputs.

14.9.2 Association of points on the extremities and with those on the head and neck

Points located on the extremities are mostly within distal central reflex zones while points of the head may pertain to regional central reflex zones. For example, those main lines or zones of scalp acupuncture are categorized by the functional localization of their adjacent cerebral cortex. Thus, association of points at both of those locations can ensure the input of therapeutic information into the body from at least one location. In addition, EA on points of the neck such as Fengchi (GB20) or Fengfu

(GV16) has been proven to improve blood supply of the vertebral artery, which is relevant in treating acute apoplexy.

Li and Xiao of Beijing, China divided 64 patients into two groups: an acupuncture group, and a control group. All were treated with medications to reduce intracranial pressure and hemostasis. The acupuncture group received scalp acupuncture additionally. The results showed that function recovering of limbs and speech in the acupuncture group was markedly better than that of the control group. Blood viscosity, thromboxane and endothelin level of the acupuncture group lowered obviously, as compared with the control group, the difference was significant ($P < 0.05$). It indicated that the cerebral blood flow was markedly improved in the acupuncture group. They experienced that scalp-acupuncture is safe and effective in treating acute cerebral hemorrhage and is particularly effective in recovering limb paralysis and speech disturbance caused by cerebral hemorrhage^[330].

14.9.3 Association of points at yang meridians with those at yin meridians

When treating patients of hemiplegia with acupuncture, it is common to select acupoints of *yang* meridians as master points, and those of *yin* meridians as associate points, but the effects of *yin* meridians should not be neglected.

In recent years, acupuncture practitioners at Tianjin Univ. of TCM, China, obtained marked results in treating hemiplegia patients with a special acupuncture method named as *Xing Nao Kai Qiao*, which emphasizes on selecting acupoints of GV and *yin* meridians, such as Neiguan (PC6), Shuigou (GV26), and Sanyinjiao (SP6) as master points and Jiquan (HT1), Chize (LU5), and Weizhong (BL40) as associate points. They also established strict criteria on the needling direction, depth, needle-manipulation

techniques, stimulation intensity, and stimulation duration for these acupoints.

Master Jiao, Mian Zhai also valued the application of acupoints of *yin* meridians in his treatment of paralysis in upper limbs. Qingling (HT2), Chize (LU5), Quze (PC3), Ximen (PC4), Shaohai (HT3), Daling (PC7), Taiyuan (LU9), Shenmen (HT7), Shaofu (HT8), and Laogong (PC8) were some of his favorite points. Among them, he preferred Qingling (HT2), which is located 3 *cun* above the medial end of the elbow crease, close to the edge of ulnar artery. When needling Qingling (HT2), ask someone to help bend the elbow of the patient so that the medial side of the elbow is facing upward and expose the point. After locating Qingling (HT2) with the thumb, first knead it with a heavy pressure, then insert a needle at a depth of 2~3 *cun*. Direct the needle tip towards the distal, quickly twist the needle with the method of **equal tonification or purgation** to propagate needling sensations to the ring finger and the little finger, and then withdraw the needle immediately.

Besides, another frequently used master point by Master Jiao for paralysis of the upper limb is Cuoshan (EX124) (refer to Section 13.4). For paralysis of the lower limb, Master Jiao's experiential point is Tiaokoupang (EX160), located 0.5 *cun* outwardly lateral to Tiaokou (ST38). Piercing Xuehai (SP10) into Xiyangguan (GB33) was also frequently used.

In patients of hemiplegia, because acupoints of *yang* meridians are mostly located at areas of hypotonia while acupoints of *yin* meridians are mostly located at areas of hypertonia, association of them can facilitate the balance of muscular tension, which is beneficial to recover normal activities of limbs. Thus, this kind of association is also an association of stimulation on the paralyzed and stiffed portions of the body.

14.9.4 Association of needle-manipulation techniques with electrical stimulation

Needle-manipulation techniques in treating apoplexy/hemiplegia are mainly classical **connecting *qi* and dredging the meridian (CQDM)** and the heat-producing methods, as well as the point-piercing method and the needling method at pulsating points, which are developed in modern times.

Dr. Zheng, Kuishan is an expert at applying the method of CQDM to treat apoplexy/hemiplegia. For example, in treating paralyzed upper limbs, he often first punctured bilateral Fengchi (GB20), Dazhui (GV14), and Fengmen (BL12) of the upper back, then orderly punctured Jianyu (LI15), Quchi (LI11), Shousanli (LI10), Waiguan (TE5), and Hegu (LI4), respectively.

The formula of **12 point-piercing** proposed by Dr. Wang, Leiting, another acupuncture expert, is particularly applicable for those with hypertonia and muscle contraction of a longer disease course over half a year, and is suitable in alleviating stiffness of corresponding joints. They are as follows: Piercing Jianyu (LI15) into Binao (LI14); Yefeng into Jiafeng; Quchi (LI11) into Shaohai (HT3); Waiguan (TE5) into Neiguan (PC6); Hegu (LI4) into Laogong (PC8); Yangchi (TE4) into Daling (PC7); Huantiao (GB30) into Fengshi (GB31); Xiyangguan (GB33) into Ququan (LR8); Yanglingquan (GB34) into Yinlingquan (SP9); Xuanzhong (GB39) into Sanyinjiao (SP6); Qiuxu (GB40) into Shenmai (BL62); Taichong (LR3) into Yongquan (KI1). Besides these, Dr. Wang also has other point-piercing formulas, such as piercing Fengchi (GB20) into Fengfu (GV16) for speech dysfunction; Jianyu (LI15) into Jiquan (HT1) for frozen shoulder; Shangqiu (SP5) into Zhaohai (KI6) for adduct or abduct foot; Jiexi (ST41) into Zhongfeng (LR4) for foot drop^[90].

When puncturing the *pulsating points* to treat

apoplexy/hemiplegia, points of the *yang* meridians on the paralyzed side are often used. It was reported by Wang that in treating 32 patients of hemiplegia due to cerebral infarction, selecting Jianyu (LI15), Quchi (LI11), Hegu (LI4), Huantiao (GB30), Yanglingquan (GB34), and Guangming (GB37) had good results. Twenty cases of them recovered almost completely and the total effective rate was 93.75% [90]. Our experience also demonstrated that the method of puncturing pulsating points is particularly suitable for paralysis with hypotonia. However, it is not necessary to select too many pulsating points for each session, 2~3 points for each of the upper and lower limbs are sufficient. Attempt to attain muscle twitching around the needle or some pulsating responses, such as "jerks of the limb" as much as possible. After removal of the needles, many patients of hemiplegia sequelae may have instant enhancement of the muscle strength, or some patients at the acute stage may show initial recovery of certain mobility (refer to Section 12.5).

Although in treating apoplexy/hemiplegia until now, manual acupuncture to attain the generation and propagation of needling sensations are always advised, applications of EA has been increasingly popular due to its convenience. According to Shi *et al.* of Shanghai, China, 42 acute ischemic stroke patients were randomly divided into two therapeutic groups: a medication group and an EA plus medication group. The results showed nearly all of acute ischemic stroke patients in both groups eventually recovered, at least partially, but the clinical functional recovery in the EA and medication group was significantly better than in the medication group ($P < 0.01$). In the laboratory, by applying the model of acute ischemic stroke in rats, they found that EA could promote the recovery of the somatosensory evoked potential [331]. Moreover, Wong *et al.* of Taiwan attained good results by applying EA through adhesive surface electrodes.

They randomized 128 patients within 2 weeks of stroke onset to receive comprehensive rehabilitation plus EA ($n = 59$) or comprehensive rehabilitation only ($n = 59$). EA was applied by electrical stimulation of acupoints through adhesive surface electrodes five times weekly. Patients treated with EA had a shorter duration of hospital stay for rehabilitation and better neurological and functional outcome than the control group had, with a significant difference in scores for self-care and locomotion ($P = 0.02$) [332].

Manual acupuncture and EA have different features in treating paralysis, and they can be applied in combination to enhance the results. In most situations, manual acupuncture can definitely attain intensive needling sensations. However, many apoplectic patients due to the sensory defect in the paralyzed side or aphasia cannot feel or express their needling sensations. For those cases, whether *deqi* is actually generated depends on the pulsating responses around the needle, the regional muscular twitching, or jerks of the limb stimulated that may be observed. EA can induce a steadily regional muscular twitching, though the body may easily adapt it. If muscular twitching still does not appear with an increasing intensity of EA, may apply PPEA (point-probing with EA)(refer to Section 12.3).

14.9.5 Association of acupuncture, massage, and exercise

Generally, effects of moxibustion in promoting rehabilitation of the mobility in patients with hemiplegia are not as remarkable as to that of acupuncture, but thermal therapy including moxibustion has actions in at least the following three aspects. First is the improvement of blood circulation of the paralyzed extremities, which can prevent disuse myatrophy. Second is the alleviation of pain symptoms in some patients of hemiplegia. Third is the instant ease of muscular tension to a

certain degree in the paralyzed joints of hypertonia.

Massage therapy mainly can be divided into general massage and acupressure. For hemiplegia, effects of acupressure are better than that of general massage. Those acupressure practitioners who are able to accurately locate acupoints and provide strong finger pressure even can attain good results comparable to general acupuncture. Acupressure is also suitable for the relatives of the patient to assist with the rehabilitation. If one does not possess sufficient finger strength, an alternative way is to use an electric massager for acupressure.

Combining acupressure with acupuncture to treat hemiplegia can enhance the overall rehabilitation effects. Kneading acupoints prior to needling not only is helpful to locate stimulation spots accurately, but also can promote the generation and propagation of needling sensations. It is particularly useful in treating patients with hypoesthesia on the paralyzed side of the body. Acupressure or general massage applied daily and routinely or after acupuncture can also promote the recovery of the motor function, and prevent or treat disuse myatrophy. In addition, stimulating the sole or perform daily standing exercises are beneficial in the rehabilitation of paralyzed lower limb.

In the rehabilitation of hemiplegia, physical exercises are indispensable, which includes active and passive exercises, but the passive exercise should be carefully done. Chen and Wu of Fujian, China reported that in 83 patients with post-hemiplegia shoulder pain, the pain in 62.7% of them was due to improper passive exercise at the early stage of hemiplegia. They considered that the passive exercise at a large range was a risk factor to cause shoulder pain. They suggested that a pain-free exercise of shoulder joint should be limited within a range of 90~120 degrees, and the massage could be applied immediately after needling, as well as

conducting a passive exercise of the paralyzed limbs during the needle-retaining period at the healthy side of the body ^[329].

14.10 Tremor/Parkinson's disease

Tremor is an unintentional (involuntary), rhythmic, alternating movement that may affect any muscle of the body and is a common symptom of nervous system diseases. The causes of tremor could be physiological, functional, or pathological and is generally classified on a clinical symptoms and etiological basis. Most tremors are in the fingers, and often occur in the eyelid, corners of the mouth, and the tongue. However, tremors in the lower limbs and trunks are seldom seen. Common clinical tremors include anxiety tremor due to functional causes, cerebellar tremor and Parkinson's tremor, both due to pathological causes. The anxiety tremor and cerebellar tremor are most noticeable when the person has intentional behaviors, such as grabbing a bite, thus they pertain to the **intention tremor**. Among them, the cerebellar tremor may accompany other cerebellar signs such as ataxia and dystonia. On the contrary, Parkinson's tremor occurs when the limbs are kept still, and can be inhibited by voluntary movements, thus it pertains to the **still tremor**. Hypertonia and hypokinesia are often accompanied with Parkinson's tremor. Generally, regardless of the type of tremor, it is worsened during nervousness or emotional disturbance, and disappears during sleep.

[Therapy]

Mainly stimulate distal central reflex zones on the

affected extremities, and associate local central reflex zones on the surface of the spine and the head.

When applying body acupuncture, select points on the limb with tremor: Quchi (LI11), Shousanli (LI10), Hegu (LI4), and Shenmen (HT7) for the upper limb, Zusanli (ST36), Yanglingquan (GB34), Xuanzhong (GB39), and Qiuxu (GB40) for the lower limb. Associate bilateral Fengchi (GB20) and other points within central reflex zones on the midline of the head and back (GV), such as Baihui (GV20), Naohu (GV17), Dazhui (GV14), and Shenzhu (GV12) for the tremor in either upper or lower limbs. Treatment for the facial tremor is similar to that of the facial spasm (refer to Section 14.7). For symptoms of the rigidity in Parkinson's disease, select reflex points with tenderness at locations with hypertonia. Stimulation is mostly provided through manual needling but can also be combined with electrical stimulation, moxibustion, and acupressure. Generally, the stimulation amount should be greater, which can be realized by prolonging the needle-retaining period (30~60 min) or increasing the stimulation intensity via stronger needle-manipulations or in conjunction with electrical stimulation.

When applying scalp acupuncture, select bilateral *Chorea-trembling controlled area* and contralateral *Motor area* of the upper or lower limb. Electrical stimulation is incorporated with needling after manipulations of the needles.

The above treatment is best applied once daily, and at least twice weekly until certain therapeutic effects are attained.

【 Case Studies 】

Case 55: Patient was a 77-year-old male. He had suffered from tremors in both hands for over ten years that became worse gradually, especially on the left hand. Tremors were more remarkable when

using the hand to reach objects, thus it greatly affected his daily life such as taking meals. His neurological diagnosis excluded Parkinson's disease, and he was treated with medications (Diphenhydramine) without obvious effectiveness. The aforementioned body acupuncture including EA was applied at bilateral Quchi (LI11), Shousanli (LI10), Hegu (LI4), Shenmen (HT7), Fengchi (GB20), and Fengfu (GV16). After removal of needles, massage was applied at the midline of the back (GV). Such treatments were applied twice weekly, ten sessions for a course of treatment. After the initial session, the tremors immediately eased significantly. When taking meals, the tremors were almost unnoticeable until the third day, when the tremors recurrent but were still milder than that before acupuncture. The tremors were almost completely gone by the end of the first course of treatment, but recurred after 20 days after initially discharging from acupuncture. The patient then took another course of treatment, in which the treatment method was same as before, and the point selections were revised several times to enhance the results, such as applied Waiguan (TE5) and Baihui (GV20) as associate points. However, therapeutic results in the second course were not as remarkable as that of the first course. By the end of second course, his self-evaluation showed a decreased degree of tremors and a reduced frequency of relapse compared with that before acupuncture, in addition, his meal-taking or hand-using behaviors were no longer affected. Reexamination found he was able to stand straight with hands horizontally raised to the chest level without any tremors, and the nose-pointing test could be completed smoothly and quickly.

Case 56: Patient was a 68-year-old male. He suffered from tremors in both hands and in the right foot for six and half years, but became worse in recent years. He could not write, drink water, and take meals with

his hands. He was diagnosed as Parkinson's tremors and had no significant effects after taking medications. The above body acupuncture were applied at bilateral Shousanli (LI10), Shenmen (HT7), Fengchi (GB20), Fengfu (GV16), the right Zusanli (ST36) and Xuanzhong (GB39) besides massaging at the midline of the back (GV). Acupuncture was applied twice weekly, totaling nine sessions. He started to feel eased tremors after the third session, and a significant reduction through the fifth session. At that time, he was very pleased. However, shortly after, the tremor relapsed and went back to the previous state before acupuncture, which immediately discouraged him and resulted in the abandonment of his treatment plan after the ninth session.

【 Discussion 】

Acupuncture has certain therapeutic effectiveness for anxiety and cerebella tremor. It is usually easier to acquire effectiveness for a mild tremor at an early stage or with a shorter disease course than that of a severe tremor at a late stage or with a longer disease course. Tremor patients due to anxiety or hyperthyroidism often have strengthened sympathetic tones and increased epinephrine secretion, of which the latter can raise the sensitivity of muscle spindle. The mechanism of acupuncture in treating the anxiety tremor might be related to its relaxation effect on the whole body including the decline of sympathetic tones.

In general, acupuncture effect for Parkinson's disease is not remarkable, especially for patients with a longer disease course and severe symptoms. Until now, there have not been high-quality clinical studies with a relative large sample using acupuncture for Parkinson's disease. A combination of body acupuncture and scalp acupuncture or *tuina* might enhance its therapeutic effectiveness. Zhang reported that 53 cases of Parkinson's disease were

treated with a combination of body acupuncture and scalp acupuncture. After one course of the treatment, 11 cases had remarkable effects (20.8%) and 30 cases had amendment (56.6%). It was observed that the results had certain relationship with the clinical type of the disease (results are better for those that mainly manifest symptoms of rigidity than those manifest symptoms of tremors). Moreover, effects usually could be seen during the first course of treatment. If there were no effects after the first course of treatment, the outcome was poorer^[333]. In treating primary Parkinson's disease using *tuina* and acupuncture, Walton-Hadlock of USA observed various degrees of relief in symptoms of tremor and rigidity, as well as decreased dyskinesia, improved balance and circulation, regardless of the stage of the disease, and in several cases enabled a reduction of conventional medications^[334].

Based on certain effectiveness of acupuncture for patients of muscular rigidity, acupuncture is assumed to have roles in easing Parkinson's disease, especially for patients at an earlier stage or those with mild symptoms. Though this assumption lacks clinical proof yet, acupuncture is still regarded as one of alternative therapies that could be integrated with contemporary medicine in treating Parkinson's disease.

In addition to scalp reflex zones, other acupoints of GV located at the midline of the head or spine surface (central reflex zones) also can be selected in treating tremors, such as Baihui (GV20), Naohu (GV17), Dazhui (GV14), and Shenzhu (GV12). The first two points can be punctured, while the subsequent two points can either be punctured, heat stimulated (moxibustion) or massaged. It was reported that moxibustion at Shenzhu (GV12) had certain therapeutic effectiveness on tremor. We found that some patients who received moxibustion at that point might have had itching sensations rather

than warmth, and instant relief of tremor on the upper limbs after treatment.

To enhance effects of acupuncture on refractory tremors, besides changing the stimulation points or combining with other stimulation means, increasing the stimulation amount is a viable way. However, it varies based on the specific causes of the disease. For functional tremors such as anxiety tremors, an increase of stimulation amount can be realized through prolonging the needle-retaining period while not increasing the unit stimulation intensity. On the contrary, for pathological tremors, it is suitable to raise the unit stimulation intensity. In addition to various forms of needle-manipulation techniques with intense stimulation, EA is a simple and practical method of choice. Nevertheless, keep in mind that the neuromuscular sensitivity of the tremor portion of the body is generally higher in comparison with other portions of the body or in healthy subjects. Even a very low intensity of EA often could induce twitches of the stimulated muscle in tremor patients. This indicates tremor patients may have a lower motor excitation threshold, or a decreased feedback control of mobility. Therefore, when applying EA to treat tremors, the electrical stimulation intensity needs to be adjusted according to the individual stimulation location and the patient. Otherwise, an excessive twitching of muscles might make the patient uncomfortable and consequently refuse the treatment.

Considering that acupuncture may have better effects for paralysis or hypotonia than that for tremors or Parkinson's disease with hypertonia, we thought that acupuncture might have a greater excitation effect than inhibition effect in the regulation of neuromuscular excitability. Nevertheless, this is just a clinical impression and needs to be verified in further studies.

14.11 Multiple Sclerosis

Multiple sclerosis (MS) is a chronic disease that occurs in the brain and spinal cord. MS patients may have extensive demyelination conditions in the white matter of nervous centers with complex and varied symptoms, such as dyskinesia or autonomous nervous dysfunctions including urine retention or urinary incontinence.

Acupuncture has been applied in conjunction with other physiotherapies or alternative therapies to treat MS, and has certain therapeutic effectiveness in rehabilitating the motor functions of patients at its early stage or in stabilizing symptoms in patients at its middle or late stages.

【 Therapy 】

Point selections and needling methods for treating dyskinesia due to MS are similar to that for apopleptic hemiplegia, in which direct needling is generally applied on the affected limbs. Below are some commonly used points:

For fatigue or paralysis of the lower limb: Biguan (ST31), Futu (ST32), Fengshi (GB31), Xuehai (SP10), Zusanli (ST36), Yanglingquan (GB34), Fenglong (ST40), Xuanzhong (GB39), Qiuxu (GB40), and Taichong (LR3).

For fatigue or paralysis of upper limbs: Jianyu (LI15), Quchi (LI11), Shousanli (LI10), Waiguan (TE5), and Hegu (LI4).

For fatigue of lower or upper back: Feishu (BL13), Pishu (BL20), Shenshu (BL23), and Qihai (BL24).

Apply weak stimulation, retain needles after slight needling sensations are generated, or in conjunction with an electrical stimulation at a low intensity, continuous waves. It can be observed that needle handles are pulsating slightly with the twitching muscles beneath the needles due to the electrical stimulation. Continuous acupuncture can be applied

once, twice or thrice weekly.

[Case Studies]

Case 57: Patient was a 47-year-old female. She had suffered with weakness in her left upper and lower limb, and a lack of coordination in the left hand. She had similar onsets 19 years ago and was near complete recovery after taking steroids. Diagnosed as MS with MRI, she took another round of steroids for one week, but without significant results. Acupuncture was applied twice weekly, and she began to feel better after the initial session. By the end of the first course (ten sessions), she had stronger limbs, better hand coordination, and returned to work as usual. To stabilize the results, subsequent sessions were applied once weekly for four consecutive months, then changed to once every two weeks for another two months. She felt good until seven months later when some fatigue of her left side relapsed. The patient went back to acupuncture once weekly and again was much improved after another four sessions.

Case 58: Patient was a 58-year-old male. He had suffered from MS for three years with a weak leg and forearm of the right side that affected his walking. He also had regional skin coldness. He took Cortisone for 30 days without obvious effects. Acupuncture was applied twice weekly at Fengshi (GB31), Futu (ST32), Zusanli (ST36), Fenglong (ST40), Qiuxu (GB40), Quchi (LI11), Shousanli (LI10), Waiguan (TE5), and Hegu (LI4) of the right side. Needles were hooked to an electric stimulator and retained for 30 min after regional needling sensations of soreness and distension were generated. He had stronger right limb after the fourth session and felt markedly better after the sixth session. Through 14 sessions, the patient's walking returned to normal and his right hand could complete general tasks although the right arm and leg was still slightly

weaker than that of the left side.

[Discussion]

Recently, there have been new studies reporting success of acupuncture for MS. Ludianskii observed in a trial of 317 patients with disseminated sclerosis that there was a high therapeutic potential of acupuncture during the stage II~IV^[335]. According to Steinberger, 28 MS patients were treated by acupuncture. The ages of these patients ranged from 24~60 years and the results of the treatment were satisfactory. However, because of the remarkable characteristics of spontaneous remissions in this disease, the treatment was difficult to be evaluated. He also found that all patients had a peculiar behavior: increased sensibility of the skin by acupuncture. The needle-insertion provoked periodic spasms of clonus and even tonic-clonic contractions of muscles at the limbs. This phenomenon was obvious and could be used as an early sign in diagnosing MS^[336].

In addition to acupuncture, one can also apply acupoint block therapy with Procaine to treat this disease. In a pilot study followed by a double-blinded, placebo-controlled randomized study, Gibson RG and Gibson SL of Scotland treated a randomized group of 61 patients suffering from any type of MS using the injection of small amount of Procaine without Adrenaline, into specific trigger points in the ankles and around the greatest circumference of the skull. Results are that 65% of the 40 patients in the pilot study and 76% of the 21 patients in the double-blinded trial benefited from this treatment as assessed by Kurtzke Scale (KS) improvements. On long-term follow-up of two to three and half years, more than 50% of patients continued to show improved KS ratings. Improvements could be rapid. No toxic side effects were noted when injections were applied at a frequency

of once or twice weekly. Accordingly, this neural therapy is an effective, nontoxic, and inexpensive treatment for MS that can confer both immediate and long-term benefits ^[337].

14.12 Alzheimer's Disease

Dementia in seniors can be either primary or caused by cerebral injuries. The primary one is Alzheimer's disease, which currently affects about 50% of senior over age 85, and 10% of seniors over age 65 in the USA. This disease can strike anyone, regardless of gender or race. Early stage symptoms of Alzheimer's disease include confusion, memory disturbance, attention problems, spatial orientation, personality change, language difficulties, and unexplained mood swings, until the final stage where the patient loses abilities to perform daily activities and becomes bedridden and requires around the clock care.

【 Therapy 】

Body acupuncture and scalp acupuncture can be applied alone or in combination.

When applying body acupuncture, alternately or concurrently stimulate points located at central reflex zones on the head and the extremities, especially on the hand, such as Yintang (EX2), Baihui (GV20), Sishencong (EX1), Tianzhu (BL10), and Fengchi (GB20) of the head, or Hegu (LI4), Yanglao (SI6), Houxi (SI3), and Shenmen (HT7) of the hand. Retain needles or connect them to an electric stimulator for 20 min after the generation of needling sensations. Treatment is applied once every other day or twice weekly for several consecutive months or half a year.

When applying scalp acupuncture, stimulate corresponding representative zones, such as *Speech*

zones for those with speech difficulty or *Sensory zone* for those with tardy reactions. After inserting needles into subcutaneous tissues, continuously twirl needles for a few minutes. Retain the needles for 20 min and repeat the needle-twirling technique once every five min to strengthen the stimulation. EA instead of manual needling also can be adopted.

【 Discussion 】

According to Zhang *et al.* of Chengdu, China, 62 cerebral traumatic dementia patients were randomly divided into two groups: an acupuncture group with puncturing Houxi (SI3) and Shenmen (HT7) (32 cases) and a physiotherapy group (30 cases). Results showed that marked effective rate and effective rate of the acupuncture group were 46.9% and 81.3% respectively, significantly higher than 10.0% and 30.0% of the physiotherapy group ($P < 0.01$). Results confirmed that the cognitive function of cerebral traumatic dementia patients could be effectively raised with acupuncture. Combining acupuncture with acupoint-injection of Aceglutamidi, Chen of Shanghai treated 38 cases of senile dementia. Results showed that therapy was effective for cases of multi-infarct dementia, the rate of success was 42.85%, and of improvement was 42.86% and the total efficacy rate was 85.71%. In addition, it was observed that the component of high-density lipid-cholesterone increased significantly after the treatment ^[339]. It was also reported that there were certain therapeutic effectiveness when acupuncture was combined with inhalation of Chinese herbs and oxygen in treating 50 cases of senile dementia ^[340].

Generally, it takes patience and time to treat this disease using acupuncture. To raise therapeutic effectiveness, one must first have the patient cooperate with speech or memory training, such as more reading, thinking, talking, and so on. Clinically, to assess the level of cognitive impairment of an

Alzheimer's patient accurately, some simple memory tests can be applied, such as inquiring the name, birthday, current age of the patient or of the patient's closest kin. The correct answers will be used to determine whether acupuncture is beginning to take effects. The difficulty of questions may be gradually increased after some simple questions have been answered correctly. Until now, many animal experiments have demonstrated that either manual needling or EA can improve the memory, and have investigated the corresponding mechanisms.

14.13 Epilepsy

Epilepsy is a chronic brain disorder that induces a tendency of recurrent seizures (must have two or more occurrences before a person can officially diagnosed), it is also known as a seizure disorder. It is estimated one in ten people will experience a seizure at sometime in life. Epilepsy is one of many indications of acupuncture. It was observed that acupuncture has a curative rate of up to 92% or above for epilepsy, and that needling could markedly control the epilepsy's symptoms, reduce the duration and frequency of its recurrences, as well as improve the electroencephalogram (EEG) of the patient [344, 345].

【 Therapy 】

Body acupuncture, scalp acupuncture or auricular acupuncture can be applied alone or in conjunction with each other. For body acupuncture, central reflex zones located at vertex and midlines of the soma (GV and CV) are primary locations of stimulation, while other points within central reflex zones on the extremities can also be selected. Commonly used

acupoints are Baihui (GV20), Yintang (EX2), Fengchi (GB20), Dazhui (GV14), Jinsuo (GV8), Houxi (SI3), Shenmen (HT7), Zusanli (ST36), Sanyinjiao (SP6), and Taichong (LR3). Apply intense stimulation for acute onsets and weak stimulation for preventive purposes. Retain needles for 30 min or even longer if needed.

When applying scalp acupuncture, one should first determine the affected location based on the abnormality of EEG, and select corresponding central scalp zones for stimulation. For example, choose the midline of forehead as well as Line 1 and Line 2 lateral to forehead for temporal lobe epilepsy. Select midline of the vertex as well as Line 1 and Line 2 lateral to the parietal lobe for vertex epilepsy. Select upper-midline and upper-lateral line of the occiput for occipital lobe epilepsy. Penetrate the scalp until the hat-shaped aponeurosis, and twirl needles faster at the frequency of 200 times/min for 1~2 min, then retain needles for one hour. During the needle-retaining period, twirl needles twice to strengthen the stimulation. One also can hook up needles to an electric stimulator after the first manual stimulation, applying either sparse-dense wave or the continuous wave for 20 min, at a moderate intensity that can be tolerated by the patient [90].

When applying auricular acupuncture, points of *Shenmen*, *Subcortex*, *Heart*, and *Kidney* of auricular reflex zones could be selected and punctured with ANEM, twice weekly, alternately on both ears.

In addition to needling, one also can apply moxibustion at reflex points with tenderness or increasing tension on the midline of the back (GV) and its nearby areas (BL). Either the sparrow-pecking moxibustion or moxibustion with moxa cone is suitable, once daily. Some commonly used points are Shenzhu (GV12), Zhiyang (GV9), Jinsuo (GV8), Mingmen (GV4), Xinshu (BL15), Ganshu (BL18), and Shenshu (BL23).

【 Case Studies 】

Case 59: Patient was a 49-year-old female. She had suffered from epilepsy for thirteen years, with more frequent relapses in recent years, once every 1~2 months, each time lasting for several days. The relapse might be related with her menstrual cycle as they occurred mostly before the menstruation. Certain relapses were also triggered by her stress. Each relapse was transient, which manifested in occurrences of frozen motion, salivation, and unconsciousness, lasting around a half minute each time then recovered spontaneously. She took anti-epilepsy medications but without significant results. MRI showed her brain was normal. Body acupuncture was applied as above, once every other day for two months. Afterwards, the incidence of her relapses was significantly reduced to once weekly in the following three months. During that period, she did not experience any relapses. Later on, acupuncture was applied twice monthly for another 6 months, and was near full recovery except for a single relapse due to excessive stress.

【 Discussion 】

There have been many successful clinical trials regarding acupuncture for epilepsy. Moreover, anti-epilepsy effects of body acupuncture or EA and their mechanisms have been documented in ample animal experiments.

Zhang of Hainan reported that applying acupuncture in treating 550 cases of epilepsy, 190 cases was cured clinically, 130 cases had remarkable effectiveness, 190 cases had effectiveness, and 40 cases did not have any effects, the total effective rate was 92.8%. Among 510 cases that had abnormality of EEG before the treatment, 410 cases recovered to normal through the treatment^[344]. Zhou of Henan College of TCM treated 60 cases of epilepsy with acupuncture, and reported that the effective rate was 96.7%, markedly

higher than that (60.0%) in the control group who took orally Phenytoin Sodium^[345].

Chen *et al.* of China treated 70 cases of epilepsy mainly by applying scalp acupuncture. Through clinical observation, it was found that there was a remarkable effectiveness rate of 46.9% and effectiveness rate of 67.7%. Moreover, the scalp acupuncture could alleviate many symptoms of epilepsy, shorten the relapse time, ease the degree of relapse, extend the intervals between relapses, as well as acting on improving the abnormal EEG simultaneously. Through observation of 114 patients, they found that 11 normal EEG cases had no changes after acupuncture, while other 103 cases with some alternation of EEG previously, all had changes, and among them, 72.6% of patients manifested the phenomenon of asynchronization, namely the epilepsy discharge stopped or reduced after acupuncture. That indicated that acupuncture indeed has a significant therapeutic action on epilepsy. In addition, those cases with a milder abnormality of EEG had lower changing rate after acupuncture than those with more obvious abnormality of EEG. There was very significant statistical difference ($P < 0.001$) of acupuncture effects among the cases with different EEG, while types of the epilepsy relapses were not directly related to the changing rate of EEG after acupuncture^[346, 347].

However, there are only a few clinical trials on acupuncture in treating epilepsy reported in the West. In a controlled clinical study by Kloster *et al.* of Norway, 29 patients with chronic intractable epilepsy were randomized into two groups: 15 were given classical acupuncture and 14 were given sham acupuncture. Results showed that there was a reduction in seizure frequency in both groups, which did not reach a level of statistical significance. There was also an increase in the number of seizure-free weeks in both groups, which reached a level of

significance in the sham group. Thus, they have not been able to prove a beneficial effect of acupuncture in chronic intractable epilepsy ^[353]. However, those results probably were due to small samples. It was observed that epilepsy patients often complicate with neurosis. Sviridova and Oleinikov reported their observations of neurotic states in 51 patients suffering from epilepsy. The primary types of neuroses were neurasthenia, hysteria, or neurosis of obsessive states. Recommendations were given on the treatment of such patients using psychotherapy (including hypnotherapy) and acupuncture combined with basic anticonvulsion treatment ^[354].

The needling stimulation during the inactive period of epilepsy generally should not be intense, instead, apply a method that generates mild but consistent needling sensations within a longer duration of needle-retaining period. For those with epilepsy related to menses, it is recommended to

have daily acupuncture prior to menses, especially at Sanyinjiao (SP6). Other reflex points around Baihui (GV20), Sishencong (EX1), and Yintang (EX2) of the head's central reflex zones are usually selected as master acupoints for epilepsy.

Shirota Bunshi of Japan applied moxibustion at tender spots for multiple cases of mild or severe types of epilepsy and observed a considerable amount of effectiveness, particularly among adolescent patients. According to Bunshi's experience, the most effective points for epilepsy are Shenzhu (GV12), Jinsuo (GV8), Ganshu (BL18), Shenshu (BL23), Fengfu (GV16), Baihui (GV20), Benshen (GB13), Shousanli (LI10), Shenmen (HT7), Zusanli (ST36), and Yanglingquan (GB34). For pediatric patients, only Shenzhu (GV12), Jinsuo (GV8), and Ganshu (BL18) are required to be stimulated ^[88].

Mental Disorders

15.1 Insomnia

Insomnia is a common sleeping disorder that manifests as difficulties in either falling asleep or remaining asleep, and it could be the consequence of a disturbed sleep-wake cycle. When a person has sleepless nights at least three nights weekly for one month or longer, it is defined as chronic insomnia. Acupuncture is a simple and effective therapy for insomnia without any side effects. As reported with many clinical trials, its success rate is around 90%.

【 Therapy 】

Apply body acupuncture, auricular acupuncture, or moxibustion alone or in conjunction with each other. Sometimes, one may adopt the method of chronoacupuncture, which is administered at different times according to circadian rhythms of physiological functions or pathological changes in patients.

For body acupuncture, choose points in central reflex zones on the extremities and the head. When the treatment is given before bedtime, select points of the head as master points, such as Baihui (GV20), Anmian1 (EX58), Fengchi (GB20), and Zanzhu (BL2), as well as Hegu (LI4) and Taichong (LR3) as associate points. Apply a stronger stimulation if possible. If it is difficult to acquire intense needling sensations,

needle-retaining period may be prolonged up to 1 hour to raise the stimulation amount. When the treatment is given during the daytime, select points on the extremities as master points, such as Shenmen (HT7), Shenmai (BL62), Neiguan (PC6), and Sanyinjiao (SP6), as well as associate points of Yintang (EX2) and Fengchi (GB20). Use a milder stimulation if possible and retain needles for 20~30 min, once daily. During the needle-retaining period, moxibustion can be combined with needling through a ball of argyi moxa fixed on the needle handle.

For auricular acupuncture, apply ANEM or APPM on tender spots within auricular reflex zones, such as *Subcortex*, *Shenmen*, *Heart*, and *Kidney*, alternately on both ears every 3~5 days. Instruct the patient to rub or press embedding tack needles or pellets to generate certain regional pain or warmth before bedtime.

For patients with a longer course of disease, 3~5 courses of treatment may be required to achieve stable results.

【 Case Studies 】

Case 60: Patient was a 48-year-old female. She had suffered from insomnia for more than 2 years, which might be related to depression. She took hypnotic medications (Ambien and Remeron) almost every night and could only sleep for 2~3 hours. During the day, she is often fatigued and tears easily. Body

acupuncture was applied as above twice weekly. In the meanwhile, her hypnotic medications were stopped. After the initial session, she felt better. Through the third session, she was able to quickly fall asleep at night and the effect lasted for four consecutive nights, but she still could be easily awakened. Her sleep period was prolonged to seven hours per night by the seventh session, and to a normal eight-hour good night sleep after ten sessions. She no longer felt fatigued during the day and was extremely satisfied with her acupuncture results.

Case 61: Patient was a 74-year-old male. He had suffered from chronic insomnia for more than 36 years, and had difficulty in falling asleep without taking sedative medications that resulted in fatigue, poor concentration, and tinnitus during the day. He once tried behavior therapy and the hypnotic pillow, without great results. Body acupuncture was applied as above twice weekly, and sedative medications were stopped. After the initial session, he felt much better and had a sound sleep for two consecutive nights. However, because his insomnia was fluctuating during the first 4~10 treatments, he soon became discouraged with the treatment. Through our explanation and encouragement, he continued with the treatment plan and gradually felt better again after the 12th session. Afterwards, the patient took a break of two months and his self-evaluation showed a great improvement compared with that before acupuncture. To stabilize results, he took another ten consecutive sessions once weekly. By the end of the second course of treatment, he could sleep for more than six hours every night and no longer needed any sedatives.

【 Discussion 】

There are many success reports regarding acupuncture for insomnia. Points selected vary

depending on practitioner's preference and the type of insomnia. Shenmen (HT7) and Anmian1 (EX58) are often being publicized in many clinical trials^[355]. Oleinikov also observed that an increased hypnogenicity phenomenon was demonstrated under a combined therapy of acupuncture and hypnosis in treating 117 patients with different neuroses (neurasthenia, hysteria, obsessive)^[356].

The stimulation points and intensity in treating insomnia may vary according to the specific time of acupuncture treatment, namely the preexisting psychological state of the patient. When acupuncture is provided before sleep or at the time when patient expects to sleep but cannot fall asleep, one may select hypersensitive acupoints or reflex points, especially those located on the head or face, and apply more intense stimulation to depress the excited patient. For example, stimulating Anmian1 (EX58) and Zanzhu (BL2) of the head with a strong intensity, which may induce local needling sensations of distension and heaviness, often can help the patient fall asleep sooner. However, most of insomniacs come for acupuncture during the daytime, and do not expect to fall asleep right away even though they may already be extremely tired due to several sleepless nights. For these patients, it is better to apply a weak stimulation that usually pertains to the excitative and select points of the extremities as master points, such as Shenmen (HT7) and Shenmai (BL62), which may make the patient either fall asleep easier or attain a full night of sound sleep. For patients with intractable insomnia, it is optimal to apply acupuncture in the evening to raise the effectiveness. Master Jiao often used Neiguan (PC6), Shenmen (HT7), and Sanyinjiao (SP6) to treat the mild cases, as well as Zanzhu (BL2) and Shenmai (BL62) to treat the serious cases. It was said that as long as the needles were manipulated for 10 min, the patient fell asleep right away. Actually, this is

one type of chronoacupuncture [3].

ANEM or APPM as well as moxibustion also belong to types of the weak stimulation, and are suitable for insomniacs who come in for acupuncture during daytime. In one of our previous studies in 1974, 36 cases of insomnia of various causes were treated by ANEM. They had difficulties in falling asleep or kept asleep with a total sleep time of less than four hours per night. Among those, 31 cases often took sleep medications of a small dosage but the quality of sleep was still unpleasant. Through auricular acupuncture, 24 cases had a sound sleep of eight hours per night, 9 cases had a sound sleep of six hours per night but still dreamt often and had difficulty in being kept asleep, and 3 cases had no effectiveness. This method worked for patients with a shorter disease course. Most of them could take effect through 1~3 courses of treatment, and other accompanying symptoms, such as dizziness and fatigue eased accordingly. This method is simple to operate and applicable for those who has chronic disorders of liver or kidneys and should not take hypnotic medications long-term [357].

Shirota Bunshi of Japan observed that most insomniacs had hypersensitive skin in the posterior neck and head. Even with a slight touch of hand, they would feel uncomfortable. He once treated an insomniac due to hypertension by applying moxibustion at Tianzhu (BL10) and Fengfu (GV16) of the head. This patient had a sound sleep that night accompanied with reduced blood pressure. Bunshi also found that applying 5~7 *zhuang* of moxibustion at Baihui (GV20) before bedtime could produce remarkable effects on insomnia [88].

Soaking the feet in hot water before bedtime is another simple yet effective therapy for some insomniacs. The mechanism may lie in the facilitation of more blood flow toward the feet to reduce the hyperemia of the head. This method is

especially applicable for insomniacs who are brainworkers and/or have frequent cold feet. Indeed, soaking the feet in hot water for 5~10 min will help relax the mind so that the insomniac may fall asleep easier. Currently, the popular foot massage, or foot reflexotherapy seems to have similar effects for insomnia, which mainly consist of pressing the region around Yongquan (KI1) for 5~10 min until the sole becomes warm [91,92].

In the past, evaluation of acupuncture effects on insomnia was mostly subjective, namely, being dependant on the subjective assessment of one's sleep. Nowadays, objective analysis of sleep has being conducted with various types of polysomnography. According to Montakab of Germany, 40 patients with primary difficulties in either falling asleep or remaining asleep were randomized into two groups, one received true acupuncture, the other received sham acupuncture (or acupuncture at non-acupoints) for 3~5 sessions at weekly intervals. The outcome of therapy was assessed by an objective measurement of the sleep quality by polysomnography in a specialized sleep laboratory. Results showed a statistically significant effect only in patients who received the true acupuncture [357].

As for the mechanism of acupuncture in treating insomnia, it is obviously related to the regulatory actions of acupuncture stimulation on the sleep-arousal process. The sleep-arousal cycle is one of most important circadian rhythms of the human body, which is controlled by the biological clock [181,182]. The sleep and arousal are resulted from effects of ascending inhibitory or excitatory system of the brainstem on the cerebral cortex, respectively. Induction of two phases of sleep, i.e., the slow wave sleep (**none-rapid eye movement, NREM**) and paradoxical sleeps (**rapid eye movement, REM**), are related to actions of certain central neurotransmitters in the brainstem, such as 5-serotonin system and the

noradrenalin system ^[6], as well as the involvement of other sleep-promoting substances ^[359]. There have been many researches of the acupuncture regulatory effects on 5-serotonin, noradrenalin, and other central neurotransmitters, but it is still unclear about the difference of acupuncture influence on those two phases of sleep, and whether the adjustment of other sleep-promoting substances or of the biological clock are involved in the process of acupuncture to improve sleep.

15.2 Neurosis/Nervousness/ Anxiety

Neurosis includes anxiety, catatonia, and phobia, which can also be categorized as neurasthenia, hysteria, and obsession. Neurasthenia is the most common type of neurosis, it mainly manifests as anxiety, insomnia, nervousness, fatigue, loss of appetite, excited, and memory reduction. Chronic anxiety may evolve into phobia. When nervousness or mental disturbance is converted to somatic symptoms, hysteria occurs. In addition, anxiety and depression often coexist with each other and can evolve into serious complications of either disorder. However, both of them are indications of acupuncture and can be treated similarly. This section focuses on neurosis, while the next section will discuss depression and other psychosis.

【 Therapy 】

Select tender spots within central reflex zones on the extremities and the head. Besides needling therapy, moxibustion, acupressure, or ANEM can be incorporated.

When applying body puncture, select bilateral

Zusanli (ST36), Sanyinjiao (SP6), Shenmen (HT7) or Neiguan (PC6), Fengchi (GB20), as well as Yintang (EX2) or Baihui (GV20), totally nine points each session. Needles are superficially inserted into the subcutaneous portion to generate slight needling sensations, and are retained for 30 min or longer if desired. This group of point association was named after us, as **Jin's nine points needling method (JNPNM)**. Moxibustion is administered mainly on tender spots at the midline of the vertex and the back (central reflex zones or GV). Common tender spots are located on Baihui (GV20), Xinhui (GV22), Dazhui (GV14), Shenzhu (GV12), Shendao (GV11), Zhiyang (GV9), and Jinsuo (GV8). Determine the length of interval between two consecutive sessions according to the severity of symptoms, either once daily or once every other day, or twice weekly.

If some stiffness and tenderness is accompanied on the cervical and suprascapular regions, apply massaging after acupuncture or instruct patients to massage themselves daily to relax the regional muscular tension. For accompanying insomnias, ANEM may be combined with needling.

【 Case Studies 】

Case 62: Patient was a 37-year-old male. He suffered from anxiety for over seven years and was on the anti-anxiety medication (Paxil). This medication had side effects that made the patient lethargic, moreover, he often was fatigued during the daytime. For acupuncture, JNPNM was applied once every 3~4 days. He felt much better after the first two treatments, and no longer had anxiety symptoms after four sessions.

Case 63: Patient was a 46-year-old female. She had suffered from phobia with panic attacks for over a year. She solely relied on medications to perform any routine daily activities during the onsets. With the latest onset, she did not take any medications, and

received just acupuncture therapy with JNPNM, once every 3~4 days. After only 2 sessions of acupuncture, she felt much better, but her hands still had tremors, even after the fourth session. Those symptoms gradually subsided through the eighth session and completely alleviated after totaling 14 sessions, and the patient was satisfied with her acupuncture results.

Case 64: Patient was a 43-year-old male. He had suffered with symptoms of serious emotion fluctuations, as well as depression and insomnia for eight months. Diagnosed as anxiety, he could not fall asleep at the night unless taken a small dosage of Lorazepam (an anti-anxiety medication). Although the medicine was effective for the sleep, it always made him feel drowsy the next morning, thus he disliked taking it. To quit sedative medications, he came to acupuncture for relief. JNPNM was applied in combination with massage on the posterior shoulder and neck after removing needles, once daily. After the initial session, he had excellent results for two consecutive days, and felt very relaxed. He had a sound sleep without sedative medications for the first time in many nights. Through 10 consecutive sessions, there were marked effects. To stabilize effects, the interval between two treatments was gradually prolonged from twice weekly to once weekly after 20 sessions, then twice monthly after 30 sessions and finally once monthly after 40 sessions. During the six months of treatment, he received 45 sessions in total. Although he still had occasional emotion fluctuations and anxiety, most of his symptoms were under control following each subsequent treatment. At the 7-year-follow-up, he had no relapses of symptoms and he was satisfied with the results.

[Discussion]

To treat neurosis with acupuncture, it is

recommended to apply a comfortable and weak stimulation intensity because the neurotic patient is usually hypersensitive, and requiring slight or no strong stimulation intensity. The above stated JNPNM (Jin's nine points needling method) belongs to the weak stimulation and is used extensively in our own clinical practice. In general, it has satisfactory therapeutic effectiveness for neurasthenia, anxiety, catatonia, psychosis and other forms of neurosis.

In the neurotic patients, it is common to observe reflex points with tenderness within central reflex zones appear on the extremities and the head. When they have various somatic or visceral symptoms, other reflex points can also appear within corresponding somatic or visceral reflex zones. Patients of neurasthenia often have marked tender spots on the head, which are extremely sensitive, even a slight touching of hair may induce a jerk of the head. Hypersensitive points with strong tenderness may also appear on the midline of the back (spine), such as Shenzhu (GV12), Shendao (GV11), Zhiyang (GV9), and Jinsuo (GV8), as well as on Xinshu (BL15), Geshu (BL17), and Ganshu (BL18) bilateral to the spine. For patients with serious neurasthenia, most tender and harden reflex points may appear at Juque (CV14) of the upper abdomen, Tanzhong (CV17) in the midway between the nipples, or on the major pectoral muscles^[88]. When treating neurasthenia, careful examination of the entire body surface should be performed by pressing and touching to seek sensitive tender spots. Avoid selecting too many points, in general, no more than 9~11 points each session. Besides needling, other stimulation means such as moxibustion or acupressure can be associated. Because neurotic patients mostly have sleeping disturbance or insomnia, improving their sleep conditions is critical in reducing their symptoms. For such cases, ANEM often is the first choice.

When Master Jiao treated neurasthenia, for

patients with dizziness, distension of the head, insomnia and amnesia as main symptoms, Baihui (GV20), Sishencong (EX1), Shangxing (GV23), Toulinqi (GB15), Neiguan (PC6), Shenmen (HT7), and Sanyinjiao (SP6) were punctured. At times, Tongli (HT5) and Dazhong (KI4) could be used instead of HT7 and SP6. For those with dyspepsia and poor appetite, Zhongwan (CV12), Liangmen (ST21), and Zusanli (ST36) were associated; for those men with the kidney-deficient lumbago and spermatorrhea, Qihai (CV6), Guanyuan (CV4), Shenshu (BL23), and Zhishi (BL52) might be added. For those with excessive dreams at night and were easily awakened, moxibustion was incorporated with needling at Shenzhu (GV12), Lingtai (GV10), Pohu (BL42), and Hunmen (BL47). For those with palpitation, moxibustion was incorporated with needling at Xinsu (BL15).

Besides the above acupuncture therapies, psychotherapy can also be associated. For those melancholy or introversive cases, if one can make them laugh frequently, their neurosis might be easier to recover. For example, Shirota Bunshi of Japan once applied moxibustion in conjunction with tickling under the armpit to treat patients of obsession [88].

To date, acupuncture has shown marked effects of relaxation and sedation for neurotic patients. Shuaib and Haq applied EA in treating 40 neurotic patients, and found that the degree of relief from neurotic symptoms was most marked in symptoms of restlessness, tension, mental and physical fatigue, loss of appetite and irritability, in that order. Obsessed symptoms showed a poor response. It was concluded that EA is a useful adjunct in the treatment of psychoneurosis [358]. Acupuncture also has good effect on the fatigue symptom. Kochetkov *et al.* have demonstrated that acupuncture is an effective method of treating asthenic states in 121 neurotic patients. A considerable improvement has been

observed in 67% of the patients [361]. Lanza observed the effectiveness of acupuncture as a positive reinforcement of biofeedback for anxiety and muscle tension relief in 24 cases who presented with neurosis. Results showed that acupuncture improved the emission of learned behavior [362].

In a randomized, placebo-controlled clinical trial, Bennett applied auricular acupuncture to treat anxiety and depression in 40 female workers with internalized stress, and found acupuncture could alleviate the symptoms of affective dissonance including relevant upset, restless, and nervousness, etc [363]. Apchel found that the antistressor effect of acupuncture strongly depended on the initial functional state of aqualung swimmers. The effect was higher in the calm group and lower in the anxious group. However, in those aqualung swimmers placed under extreme conditions, the antistressor effect of acupuncture was stronger when their initial state was anxious [364].

Among neurotic patients who came to our clinic, most of them could fall into a quiescent state like taking a nap during the needle-retaining period, some even began to snore just few minutes after needles were inserted. Of course, certain severe cases were unable to relax at the initial treatment, but with more sessions, the patients gradually could achieve the desired relaxation and fall into the quiescent state quicker.

There are many studies on the mechanism of relaxation or the sedative action by acupuncture. According to Chen of USA, a marked degree of mental relaxation by sequential EA was shown in 85 clinical cases of chronic physical disorders, such as intractable pain, headache, with most disorders complicated by reactive depression. Some of the cases were psychosomatic disorders. The percentage of improvement from slight to remarkable between mental disorders (78.8%) and physical disorders

(77.1%) was about equal. It was thought that the mental relaxation could enhance release of serotonin and it has been reported that cerebral serotonin has antidepressant and analgesic effects. Stimulation of Zusanli (ST36) and Fengchi (GB20) could increase intracerebral blood flow, which might increase the quantity of serotonin released indirectly [365].

15.3 Hysteria

Hysteria is one of more frequent neurosis, in which nervousness or psychological disturbances can evolve to somatic symptoms, such as palsy, blindness, dysphonia, or other dysfunctions that have unknown causes but could occur suddenly. Actually, these “dysfunctions” may not really exist, as they are merely subjective feelings of patients themselves. In treating acute onsets of hysteria, acupuncture has exceptional therapeutic effectiveness, especially in conjunction with the “hint drop” therapy to the patient, which often can immediately make the patient recover normal functions.

【 Therapy 】

Select acupoints that could generate intense and predictable needling sensations as master points, such as Hegu (LI4) or Zusanli (ST36). When puncturing Hegu (LI4), a regional intense soreness and distension can be expected to occur along with twitching of the index finger simultaneously. When puncturing Zusanli (ST36), soreness and distension also can be generated and may be propagated down to the dorsum of the foot. Such points are mostly located on the extremities. Not too many points are needed, usually 1~2 points are sufficient. The key is

to drop a clear hint to the patient before needling, namely to clearly communicate to the patient that effects will be achieved as long as certain expected sensations and their propagations are felt.

For those patients with various symptoms, corresponding associate points can be punctured to play an inductive role. For example, select points at the neck such as Fuyin (EX73) to treat hysteric dysphonia; select points around the eye such as Taiyang (EX4) to treat hysteric blindness; select points on the limbs such as Shenmen (HT7) and Taichong (LR3) to treat hysteric palsy, and so on.

【 Case Studies 】

Case 65: Hysteric dysphonia (refer to Section 17.4).

【 Discussion 】

Because the hysteria patients usually do not have organic lesions of the nervous system, the psychological factor of the patients plays a relevant role in the success of such therapies. In most cases, a combination of acupuncture and “hint drop therapy” can recover the patient’s normal consciousness or functions more quickly during onsets. However, hysteria is characterized with frequent recurrences. When treating the patients with frequent relapses, not only the trigger factors should be eliminated, but psychotherapy should also be provided to enhance patient’s mental toughness. Moreover, it is of essence to make sure patients and their relatives are aware that hysteria is actually a disorder, albeit not a serious one if timely and properly treated. Such understandings will help raise patient’s self-confidence level and strengthen the positive mindset.

When applying acupuncture for hysteria, dropping a hint to patients in advance can play a significant role in helping to recover normal functions quickly. Actually, selected stimulation

points are not necessarily limited within either central reflex zones or the meridians as long as the stimulation can induce stronger needling sensations. However, it is optimal that needling sensations can be anticipated and informed the patients in advance no matter whether patients are under a state of false coma or hearing loss. For example, tell the patient in advance that a regional or propagating needling sensation of soreness, distension, or numbness might be felt, and when they do occur, the patient's dysfunctions will be recovered. Once patients have felt such anticipated sensations, patients should be instructed to exercise the corresponding portions of the body immediately, such as speech training for those with dysphonia (refer to Section 17.4) or voluntary movements of the limbs for those with palsy. If above steps are followed properly, then, hysteric symptoms of the patient often are alleviated immediately.

15.4 Depression/Schizophrenia /Psychiatric Disorders

Depression is very widespread in the USA and around the world. In 1998, it was estimated around 18 800 000 American adults suffering from this disease. When it manifests moderate but chronic conditions, it is called dysthymia. Many patients with dysthymia can gradually become worse with more frequent onsets of depression, which is called major depression. Another type of depression called bipolar disorder has alternate occurrences of depression and mania. Depression is also one of the more common symptoms of neurosis, and can coexist with anxiety. The definition of psychosis usually includes bipolar disorder and schizophrenia.

Acupuncture has certain therapeutic effectiveness for depression and other psychiatric disorders.

[Therapy]

Mainly apply body acupuncture at select points within central reflex zones on the head, the midline of the trunk, or the extremities according to clinical manifestations of the psychiatric disorder. Electrical stimulation, auricular acupuncture, and moxibustion also can be combined with needling.

Mania type: Select points within central reflex zones of the extremities, such as Hegu (LI4), Houxi (SI3), Shenmen (HT7), Neiguan (PC6), Zusanli (ST36), and Sanyinjiao (SP6). Stimulate them with an intense manipulation but without retaining needles.

Depression or Delusion type: Apply JNPNM (Jin's nine points needling method) (refer to Section 15.2). For retractable cases, choose associate points on the head and the midline of the trunk, such as Baihui (GV20), Houding (GV19), Qiangjian (GV18), Shuigou (GV26), Shenting (GV24), and Dazhui (GV14), as well as Jueque (CV14) and Tanzhong (CV17). Use weak stimulation and retain needles for 30 min after the generation of slight needling sensations. It is applicable to connect the needles to an electrical stimulator after the generation of needling sensations.

For patients with a longer disease course, combine needling with auricular acupuncture or moxibustion. Ear points of the central micro reflex zones, such as *Subcortex*, *Shenmen*, and *Brainstem*, can be selected. For patients of the mania type, auricular needling is primarily used. It is best to acquire a severe pain without retaining needles. For patients of the depression or delusion type, ANEM or APPM can be applied.

When adopting moxibustion, moxa cones can be applied directly on the selected reflex points with

marked tenderness or increased muscular tone at the midline (Governing Vessel) and the bilateral of the spine (BL meridians), such as the Shenzhu (GV12), Jinsuo (GV8), Tianzhu (BL10), Dazhu (BL11), Fengmen (BL12), and Ganshu (BL18).

Acupuncture therapy can be applied once daily. One course of treatment is composed of 10~20 sessions. If needed, a second course can be followed after an interval of two weeks.

[Case Studies]

Case 66: Patient was a 59-year-old male. He had been diagnosed with depression for 4~5 years and was under an antidepressant (Paxil) with fair results. The patient's main complaint was that he was unable to complete a task once started due to fatigue. The **JNPNM (Jin's nine points needling method)** with a needle-retaining period was applied with the patient in supine position twice weekly. After the initial session of treatment, he felt better instantly, and through six sessions, the patient was less depressed and had more energy.

Case 67: Patient was a 60-year-old male. He had been diagnosed with depression/anxiety for 14 months. The symptoms were worse in the morning and afternoon, and his libido was low. The patient took antidepressants with fair results. The JNPNM (Jin's nine points needling method) with a needle-retaining period was applied twice weekly. Through the first three sessions of treatment, the patient reported feeling better, but still had some listlessness. Through the fourth session, he felt much better with depression but the listlessness still occasionally flares up, mainly better from afternoon to night, but worse in the morning. Through the ninth session, the patient's self-evaluation showed a remarkable improvement in the depression but listlessness symptoms did not subside completely. He ceased the acupuncture treatment after 14 sessions over a

45-day period.

[Discussion]

In a single-blinded, placebo-controlled study, Roschke *et al.* of Germany investigated the efficacy of acupuncture applied in addition to drug treatment in major depression. Acupuncture was applied three times weekly over a period of 4 weeks. The results were that the additionally applied acupuncture improved the course of depression more than pharmacological treatment with drug (Mianserin) alone. However, they could not detect any differences between placebo and verum acupuncture. The verum group received acupuncture at specific points, while the placebo group was treated with acupuncture at non-specific locations ^[367].

Eich *et al.* of Germany observed a significant clinical improvement as well as a remarkable reduction in anxiety symptoms in patients with minor depression or with generalized anxiety disorders after acupuncture treatments. However, the total sum of acupuncture sessions and the specific location of acupuncture needle-insertions might be important factors for bringing about therapeutic success. After completing 10 acupuncture sessions, the verum acupuncture group showed a significantly larger clinical improvement compared to the placebo group. In contrast, no differences in the response rates were evident just after five acupuncture sessions. Acupoints used in the verum acupuncture group were Baihui (GV20), Shenmen (HT7), Neiguan (PC6), and Shenmai (BL62) ^[368].

From the above two studies, we believe the discrepancy of the results can be explained as the relatively lower specificity in actions of acupoints of central reflex zones. It was often observed clinically that as long as there was the generation of needling sensations, stimulation on a random location on the body surface, regardless of acupoints

or non-acupoints, had certain effects for psychosis, but those with stronger needling sensations produced more effective results in less number of sessions.

Shirota Bunshi of Japan observed that most patients with psychosis had rigidity and hypersensitivity of the major pectoral muscles and the abdominal rectus, as well as swelling of the cervical muscles. The familiar tender spots could appear at Qihai (CV6), Zhongwan (CV12), Shangwan (CV13), Tangzhong (CV17) on the chest and abdomen, Baihui (GV20) of the vertex and Tianzhu (BL10) of the neck, Shenzhu (GV12), Jinsuo (GV8), Dazhu (BL11), Fengmen (BL12), and Ganshu (BL18) of the back. Moxibustion at these reflex points had the best effectiveness for depression, but was not suitable for the mania type. Bunshi also realized that patients of psychosis or neurasthenia had mostly tenderness at Shenmen (HT7). Moreover, Quchi (LI11) and Zusanli (ST36) were the key points for psychosis^[88]. From the perspective of acu-reflexology, most of reflex points that lodge within the scope of central reflex zones can be chosen to treat psychosis regardless of moxibustion or needling. We experienced that for acupoints located at the chest and abdomen, due to their hypersensitivity to thermal stimulation and that patients usually are scared of needling these body parts, applying moxibustion instead of needling is more acceptable. For acupoints on the vertex, due to the hairiness, needling is more applicable than moxibustion. For acupoints of the back, either needling or moxibustion is applicable.

Through a comparison of effects of EA and Amitriptyline on patients of depression, Luo *et al.* of Beijing, China found both of them had similar effectiveness, the completely recovered and the remarkable effective rate was 75.2% in 133 cases of using EA, while was 66.7% ($P>0.05$) in 108 cases of using the medication as the control. However, for

the anxiety symptom of somatization and the disturbed cognitive process in the depression patients, EA was more effective ($P<0.05$) than that from the medication, as well as had less side effects ($P<0.001$)^[369,370].

Yang *et al.* reported that totally 20 cases of mental depression were treated by needling extraordinary points with an effective rate of 90%, but it showed no significant difference in effect ($P>0.05$) in comparison of these cases with 21 controls treated with Amitriptyline. Further studies of EEG revealed that after 6 weeks of needling, the power of slow wave delta decreased while that of the fast wave alpha increased, all significantly different as compared with that before and during the treatment ($P<0.05$)^[371]. The results suggested that EA or acupuncture is an effective therapy for depression, especially suitable for patients who cannot take classical antidepressants due to their side effects. Generally, at the initial stage of acupuncture treatment, antidepressants that have been prescribed to the patient can still be taken continuously, but as the symptoms show improvement with each session, the dosage of the antidepressants might be gradually reduced until their complete withdrawal. On the other hand, acupuncture was found to be effective in some patients showing resistance to antidepressants^[372].

There are many successful clinical trials about acupuncture treatment of schizophrenia^[373~377]. According to Shi *et al.* of Shenyang, China in 500 cases of schizophrenia treated by acupuncture, the total effective rate was as high as 88.4%, in which cured and markedly improved was 72%. They realized that therapeutic results were better in cases with acute onset and a short duration (less than one year), but there were 7 cases of duration of diseases longer than 10 years^[374,375]. Zhang treated the hallucination symptom in 296 cases of psychosis mainly by piercing Houding (GV19) into Baihui

(GV20), and achieved the total effective rate of 95.5%. He applied the needle-twisting and vibrating methods for 1~3 min, then retained the needles for 1~3 hours after the generation of needling sensations, once daily, every 10 sessions for one course of treatments ^[377].

According to Zhuge and Chen, 60 schizophrenia patients were treated with EA and Chlorpromazine therapy in comparison with Chlorpromazine therapy alone, 30 patients for each group. The result showed the total curative effects of the two groups were similar. However, the marked effects appeared earlier in combined therapy than that of using Chlorpromazine alone, less chlorpromazine was needed, hence displayed fewer side effects ^[376].

In treating 120 cases of auditory hallucination, Shi found no significant difference in curative effects among the groups of simple auricular acupuncture, auricular plus body acupuncture and auricular acupuncture plus Chlorpromazine. Therefore, he recommended auricular acupuncture for treating auditory hallucination ^[378]. Kurland conducted a

study comparing effects of electroconvulsive therapy (ECT) with EA treatment in functional psychoses. EA was not found to be a panacea and did not enable the discontinuation of antidepressant and neuroleptic medication. Individual EA treatments were often less effective than individual ECT treatments. However, series of EA did assist in producing significant remissions in depressive symptomatology. Because it did not produce the temporary disabling memory defects, which occurred with ECT, EA was more easily adaptable to outpatient treatment ^[379]. Chang agreed with the viewpoint of Dunner *et al.*, namely EA is actually a novel variation of electroconvulsive therapy, and is especially suitable for those who does not respond to antidepressants and has contraindications of electroconvulsive therapy ^[380]. One of the mechanisms of acupuncture in treating psychosis may be related to its regulatory effects on the intracerebral blood pressure and the improvement of the intracerebral blood flow ^[315].

Disorders of Ophthalmology

16.1 Myopia / Ametropia

In China, acupuncture has been widely used and it has accumulated a rich experience for ophthalmological refraction disorders (e.g., myopia or ametropia, hypermetropia and astigmatism) commonly found in adolescents. In addition to general methods of acupuncture, the plum-blossom needle therapy was frequently used for myopia since its birth in 1964. Moreover, electric plum-blossom needle therapy and auricular acupuncture have been developed for disorders of ophthalmology over the years.

【 Therapy 】

Select and directly puncture points within ophthalmologic reflex zones around the orbit (refer to Appendix A), such as Zanzhu (BL2), Yuyao (EX31), Jianming (EX23), Jingming (BL1), Taiyang (EX4), and Sibai (ST2). In addition, it is suitable to select distal points of ophthalmologic reflex zones alone or in combination, such as Hegu (LI4), Waiguan (TE5), Taichong (LR3), and Guangming (GB37). Retain needles for 20 min after the generation of needling sensations, and then massage tender spots around the orbit for few minutes after the removal of needles, in which it is required to make slight tearing to attain the best results. It is also applicable to use

seven-star needles to tap local ophthalmologic reflex zones, 20~30 times per point, at a moderate intensity. Such treatment is administered once daily or once every other day, 10~15 sessions consist of one course of treatment.

If the patient cannot receive the above treatment frequently, it is also suitable to apply ANEM or APPM on appropriate auricular points, such as *Eye*, *Liver*, *Kidney*, *Sight 1*, or *Sight 2*, once every 3~4 days or once weekly, alternately on both ears for each session.

【 Discussion 】

Acupuncture or other above-mentioned therapies have certain effectiveness in treating myopia in adolescents, and the effective rate was around 76%~99% reported by various studies ^[381~384]. However, the spontaneous recovery rate of myopia is generally low. According to an uninterrupted observation which was made in 147 eyes for 2 to 5 years, among them 117 eyes showed continual attenuation of vision (79.6%), and only three eyes (2.1%) recovered to normal ^[384]. This indicated that the effects of acupuncture for myopia should be not disregarded. The complete recovery rate is generally lower for those with a longer disease course or with poorer basic vision, or suffering from moderate and severe myopia. The patients with the true myopia

will be less effective than those with pseudomyopia. Another common phenomenon observed clinically is that many patients only had a temporary vision improvement during acupuncture treatment but results were not stable. Once the treatment was ceased, the vision would quickly retrogress, sometimes even return to the previous state prior to acupuncture. This is particularly common among adolescents who wear glasses to correct their vision, as their results are less effective than those who never wore any glasses before. To raise the curative effect, it is advised that glass-wearing patients should put away the glasses during acupuncture.

There is an abundant experience accumulated in treating myopia in the adolescent with plum-blossom needles or electric plum-blossom needles. According to a report of Mei and Ying, among the cases with remarkable effects, total 953 eyes were followed for three months to five years since the conclusion of treatment course. They found further improvement of vision in 248 eyes (26%), 368 eyes (58.6%) remained at the unchanged status, impairment of vision or retrogression to the original level in 270 eyes (28.4%), and a decline to the pre-treatment level or even worse in 67 eyes (7%). A continual improvement of the vision after the conclusion of the treatment is closely related to the insistence of practicing massage on acupoints by the patient himself ^[384]. Therefore, regardless of the acupuncture method applied, the patients should combine acupressure around the eye during the treatment period.

Other methods that are used to raise the effectiveness of acupuncture are the facilitation of PNSAM (propagation of needling sensations along the meridians), combining needling with traditional visual trainings, as well as laser acupuncture.

Li *et al.* of Fujian, China observed the relationship between PNSAM and the therapeutic effects of

acupuncture on myopia in adolescents. Nine-hundred-ninety-two eyes suffering from various degrees of myopia in 536 adolescents were treated with acupuncture. Bilateral Hegu (LI4), Taichong (LR3), Waiguan (TE5), and Guangming (GB37) were punctured on alternate days. The results showed that after 1~3 courses of treatment, the vision of 868 eyes (87.5%) was improved in various extents. Among them, the vision completely recovered in 131 eyes (13.31%), and the diopter decreased -0.75 to -1.00 D.S. in 13 eyes after acupuncture. Therapeutic effects of acupuncture seemed to be considerably satisfactory and stable in two years of follow-up. There was a close relation between the extent of distinctness of PNSAM and the effectiveness of acupuncture. An exceptional effect was always achieved when PNSAM arrived at the affected eye. Since PNSAM arrived at a large number of eyes in subjects who are younger, better therapeutic effectiveness was also achieved ^[385].

Pasmanik and Nizovtseva of Russia treated 52 children of amblyopia by the methods of acupuncture and traditional pleoptics. This complex of treatment was found more effective as against traditional pleoptics alone (70 children, 118 eyes with amblyopia). The best results were attained in children previously treated by pleoptic methods with special equipment (older children). Of the 17 eyes with amblyopia resistant to common treatment multiple-modality treatment resulted in improvement in 10 (58.8%). The effect of treatment persisted for three months. The results showed that the first course of such treatment was the most effective in the treatment of high amblyopia. Starting from the second course the condition grew resistant to such treatment, and this resistance was gradually augmenting ^[386].

Because laser acupuncture is not painful, the younger patients usually can accept it more easily.

Tsikova of Russia reported that when applying laser acupuncture in treating myopic eyes of pediatric patients, normalization of functional indices (reserves of accommodation, convergence, and divergence) began earlier and stability of the results obtained was higher through comparisons ^[387]. Qiao also reported that laser acupuncture had better effectiveness than that of electrical plum-blossom needle or its combination with pressure on the auricular points, and that it would be especially applicable for treating pediatric patients younger than 10 years ^[381].

Acupuncture treatment has certain effectiveness for hypermetropia (farsightedness) in the adolescent. Zhong reported that plum-blossom needles were applied in treating 162 eyes of 87 cases, 61.1% of the eyes were cured, and 34% of them had remarkable effectiveness, 4.3% with progress, only 0.6% without effectiveness after a course of treatment. It was found that there were better effects for those with a basic vision above 0.4 and had mild or moderate hypermetropia. The effectiveness of the group of simple hyperopic astigmatism was also superior to that of those with hyperopic esotropia or hyperopic exotropia. In 51 eyes that were followed up for 3~10 months since the conclusion of the treatment course, 47 eyes remained improved vision and eyeball location, 4 eyes had a decline of the improved vision but the eyeball's location unchanged, none had retrogression to the pre-treatment level of the vision or as result of a even worse tropia ^[388].

The action of acupuncture in treating ametropia is mainly realized through the reflective adjustment of the eye muscle tensions or the crystalline ligaments. Many patients had instant improvement of the visual acuity after acupuncture. The mechanism is related to the improvement of the central visual acuity through the stimulation at the macular area in addition to the improvement of the crystalline

accommodation-convergence system ^[389].

There are many classical or new points surrounding eyes. Because they surround the orbit almost in entirety, we have divided them into two circles according to the distance between them and the eyeball: the reflex zone of the inner margin of the orbit (EY1) and the reflex zone of the outer margin of the orbit (EY2) (refer to Appendix A). Reflex points or acupoints pertaining to EY1 can be further divided into four subzones: the upper, lower, left, and the right. Among them, the region of the inner canthus is centered at Jingming (BL1) and the region of the external canthus is centered at Tongziliao (GB1). The points of EY2 mainly include Zanzhu (BL2), Yuyao (EX31), Kuangshang (EX30) at the supraorbital foramen, Sizhukong (TE23), Yuwei (EX32), Yangbai (GB14), as well as Sibai (ST2) at the inferior orbit and Taiyang (EX4) ^[73,81].

When puncturing points of EY2, due to the presence of palatine bone walls, apply only the superficial needling methods, namely insert the needle 0.1~0.5 *cun* perpendicularly or opaquely use the point-piercing method (PPM) toward surrounding points. When puncturing points of EY1, either insert the needle superficially until the orbit is reached or deeply at a certain direction into the orbit. To avoid injury to the eyeball, the practitioner must be proficient at anatomical structures of the eye region, especially when choosing to needle deeply.

In light of the relationship between therapeutic effectiveness and stimulation points or methods, when puncturing adjacent or distal points, the effectiveness will not be great unless needling sensations can be propagated to the eye or kept for a longer stimulation duration (such as applying ANEM or APPM on auricular points). In general, it is optimal to select local points of the eye, as it would achieve better therapeutic effectiveness than that of

the adjacent or distal points. In our experience, for most cases of ametropia, superficial needling of reflex zones at the inner margin of the orbit or around the orbit could be sufficient to form an effective stimulation.

As long as the stimulation intensity is proper, remarkable regulatory reflexes of optic muscles will occur. Do not retain the needles after the generation of needling sensations, simply apply acupressure for 1~3 min. Actually, the plum-blossom needling or acupressure on areas surrounding the eye is developed due to their good effects of local stimulation. In order to consolidate the effectiveness, patients are advised to practice self-acupressure on the eye region daily in conjunction with the needling therapy.

For pediatric patients who are scared of the needles, acupuncture can be completely substituted by applying acupressure on the orbit wall or tender spots with the hypersensitivity at the inner margin of the orbit. During acupressure, one do not need to accurately locate points clustered together like that during acupuncture as long as the selected points are hypersensitive and are located on either the inner or the outer margin of the orbit. The surrounding area of Zanzhu (BL2), which is located at the inner and upper wall of the orbit, is one of those sensitive optical reflex zones. When applying acupressure on it, press the local wall of the orbit with the finger upward and inward to attain obvious tenderness, it is ideal to have patients slightly tearing upon stimulation as tearing could often help to show an instant improvement of vision.

16.2 Retinopathy / Optic Atrophy / Glaucoma

Until now, there have been many clinical trials on acupuncture for ophthalmologic disorders besides ametropia, such as various types of retinopathy, optic atrophy, glaucoma, cataract, electric ophthalmia, acute conjunctivitis, and color blindness. Because of the similarity of acupuncture methods in treating these ophthalmologic disorders, they are discussed here together.

[Therapy]

The following four types of point selection can be applied either alone or in combination.

Deeply puncture points at the inner margin of orbit, such as Jingming (BL1) in the region of the inner canthus, Tongziliao (GB1) at the external canthus, Jianming4 (EX27) at the supraorbital margin, as well as Chengqi (ST1) and Qiuhou (EX28) at the infraorbital margin. When puncturing Jingming (BL1) or Qiuhou (EX28), the depth of insertion should be around 1~1.5 *cun*.

Superficially puncture points in the reflex zone surrounding the orbit, such as Zanzhu (BL2), Yuyao (EX31), Sizhukong (TE23), Yangbai (GB14), Sibai (ST2), and Taiyang (EX4). Taiyang (EX4) also can be deeply punctured.

Deep puncture points in adjacent and distal reflex zones, such as Fengchi (GB20), Guangming (GB37), and Hegu (LI4). When needling Fengchi (GB20), the needle tip should be pointed toward the ipsilateral eye and inserted at depth of 1~2 *cun*. It would be best to propagate needling sensations to the eye region. When needling Guangming (GB37), attempt to propagate needling sensations to the proximal as farther as possible, to the eye region.

Superficially puncture the micro reflex zones on the ears, hands, or feet. When stimulating auricular

points, such as *Eye, Liver, Kidney, Sight 1*, and *Sight 2*, choose 3 points from one ear each session, alternately applying ANEM on both ears.

The above body acupuncture techniques can be applied once every other day or twice weekly. The length of the treatment course depends on the individual disease condition.

【 Case Studies 】

Case 68: Patient was a 65-year-old female. She had suffered from macular degeneration for three years with a loss of central visual acuity, especially on the right eye. On examination, standing two feet away from the visual acuity chart, she could clearly see the second line of the chart with the left eye alone, or the third line with the right eye alone, and all letters in the third line with both eyes. Acupuncture was applied twice weekly, totaling 30 sessions during the first course of treatment over a three-month period. Bilateral Zanzhu (BL2), Sibai (ST2), Taiyang (EX4), Fengchi (GB20), and Hegu (LI4) were chosen and needles were retained for 30 min after the generation of needling sensations. Reflex zones at the inner margin and around the orbit were massaged for 3~5 min after needles were removed. The patient's vision was instantly improved after the second session, and had continuous improvement of visual acuity greater than or equal to one line of the chart for each subsequent session. After the tenth session, her visions were much improved, and she could read all letters in the sixth line of the chart with both eyes. By the end of the first course, her left and right visions were in the eighth and the fourth lines, respectively. There was also greater improvement in the left eye, the one that had better pre-treatment vision. At the 6-month-follow-up, there was more progress of her vision, and she could read all letters in the seventh line of the chart with both eyes, although the central visual acuity in the

right eye remains lost.

Case 69: Patient was a 42-year-old female. She had mild rises of intraocular pressure (23 and 24 mmHg for left and right eyes, respectively), and was diagnosed as impending glaucoma. Bilateral Sibai (ST2), Fengchi (GB20), Hegu (LI4) and Yintang (EX2) were punctured, with a 30 min of needle-retaining period after the generation of needling sensations, and with 3~5 min of massage on reflex zones of the inner margin and around the orbit after needles were removed. She took 46 sessions of acupuncture in 11 months, twice weekly for the first ten sessions, then once weekly for subsequent sessions. During the treatment period, she did not take any medications, and had two separate checkups for intraocular pressure, of which both were in the normal range.

【 Discussion 】

In China, acupuncture has been widely applied in treating the following types of retinopathy: chorioretinopathy, central serous retinopathy, angiosplastic retinopathy, pigmentous retinitis, macular degeneration, and retinal detachment. Lu *et al.* of Zhejiang, China treated 600 cases (624 eyes) with idiopathic central serous retinopathy by consecutive courses of acupuncture. They found that 86% of patients had resolution of their subretinal fluid within three months of treatment, a result similar to the natural history of the disease as reported by others in non-Chinese patients^[390]. In treating 600 cases of exudative central chorioretinopathy by needling a new point "Xiangyang", Ye of Zhejiang reported an overall cure or improved results in 586 cases (97.66%) and unsatisfactory in 14 cases (2.34%). As postulated, the mechanism might be that acupuncture can regulate the malfunctioned cervical sympathetic plexes, reduce the permeability of choriocapillaries and promote resolution of swelling and exudation^[391].

Li of China reported that 403 cases (649 eyes) of chronic central angiospastic retinopathy were treated with acupuncture at two new points. The recovery rate and general effective rate were 61% and 97.7% respectively. It was found that the absorption of punctate-exudate was better. Of this group of patients, 167 cases were followed up for one year: 71 cases had stable therapeutic results, 16 cases had slightly fluctuated vision, and 7 cases had reduced vision. 73 cases were followed-up for more than one year: 64 cases had stable therapeutic results and 5 cases had slightly fluctuated vision. Those two newly discovered points were “Front Yifeng” and Meishao (EX36). The former is 16 mm in front and above Yifeng (TE17), close to the center of the skin wrinkle of the earlobe. After piercing through the skin, the needle should be pointed forward and upward at 60° to the surface, about 33 mm deep, reaching the front of incisura intertragica and the hind side of the lower jaw. The latter is 33 mm above the tip of eyebrow and 10 mm outward, the needle should be inserted perpendicularly, 15~18 mm deep. Needle-manipulations for these two points were easy and simple, and had strong needling sensations of distension and electric-shock that could be spread to the eye region ^[393]. Obviously, “Front Yifeng” pertains to an adjacent point of the eye, while Meishao (EX36) is located within reflex zones surrounding the orbit.

Macular degeneration is the most common cause that results in the blindness of elders, and acupuncture has certain curative effects for it. Miller of USA once applied with micro current stimulation to treat 120 patients of this disease. As the results, 83% of cases showed improvement of greater than or equal to two lines of visual acuity in one or both eyes. Of them, 88% of patients with exudative type and 77% of patients with non-exudative types showed an improvement of two lines or greater on

visual acuity testing ^[392]. The above Case 68 is an example that we helped to gain remarkable improvement of vision at least for a short-term. The mechanism of acupuncture in treating this disease may be related to the improvement of the blood supply to the retina. Omura reported that blind patients with macular degeneration and pigmentous retinitis often had severe cephalic hypotension and reduced blood flow. Improvement of blood pressure and blood flow induced by safe and effective electrical stimulation could result in significant improvement in vision ^[315].

For retinal hemorrhage, acupuncture also has good effects. It was reported that 123 cases involving 194 eyes of recurrent hemorrhage into the retina and vitreous humor among adolescents were treated with acupuncture, and the effective rate was found to be 87.62%. Forty-four eyes had a long-term follow-up, among them 32 cases (77.28%) had no recurrence and 10 (22.72%) had the lesion recurred. Therapeutic effect was closely related to the original vision prior to acupuncture. Generally, excellent results were expected in cases with higher visual acuity, and this was true vice versa. Among the 94 eyes with a vision level below 0.1, only 5 eyes claimed cure (5.32%) and 17 (18.00%) were failures. In the 100 eyes with the original vision above 0.1, 47 (47.0%) were cured and no effect in 7 cases (7%). Therapeutic effect was affected by the amount of hemorrhage into the fundus as well as the extent of the disc lesion, and the outcome was promising when both hemorrhage and the disc lesion were not severe ^[394].

There were several recent reports on acupuncture in treating optic atrophy ^[395-397]. Li *et al.* observed that when treating the optic atrophy with acupuncture at points such as Fengchi (GB20), applying the heat and tonification technique of acupuncture to induce needling sensations of the heat and distension sensations and propagate them to the eye regions

could raise the effectiveness markedly^[398]. The point Qiuhou (EX28) is also one of the important and effective points for optic atrophy^[399], but deep needle-insertion technique is generally required for that point.

Applying acupuncture in ophthalmology, Dabov *et al.* treated 50 patients aged 5 to 71 suffering from myopia, glaucoma, retinitis pigmentosa (degenerative retinae pigmentosa), or optic nerve atrophy. One to three courses were conducted, each consisting of 10~15 sessions. All the patients were punctured at bilateral Yintang (EX2), Zanzhu (BL2), Yangbai (GB14), Hanyan (GB4), Yifeng (TE17) and Chengqi (ST1). In cases of optic nerve atrophy, the authors also punctured Tianliao (TE15) and Kunlun (BL60). In all the patients, a subjective improvement of visual acuity was observed. In children with myopia, the relative accommodation was enlarged. In patients with retinitis pigmentosa, an enlargement of the borders of the visual field, investigated by perimetry and isopter perimetry was observed, as well as a light difference sensitivity established by static perimetry. Three of the patients with glaucoma had a decrease in pressure of the eye, measured by Maklakow's tonometer^[400]. Acupuncture treatment has certain action in declining the intraocular pressure for certain simple glaucoma. However, it was also observed that there were no marked changes of the intraocular pressure in treating 18 cases of chronic cases of simple glaucoma using acupuncture^[401].

Litscher *et al.* of Austria applied a new transcranial doppler sonography arrangement to monitor the effect of acupuncture on blood flow in the cranial arteries simultaneously and continuously. In a 25-year-old female with pigmentary retinopathy, they found that stimulation of Zanzhu (BL2) and Yuyao (EX31) led to a marked increase of blood flow velocity in the supratrochlear artery and to a decrease of flow velocity, in the middle cerebral artery. These

acupuncture-induced effects were reproducible even though both arteries originate from the same major vessel^[402]. Because the supratrochlear artery supplies blood to the eye, the increase of its blood flow velocity may also is one of the mechanisms why needling these two acupoints can treat certain eye diseases.

Because of the difficulty in deep puncturing reflex zones at the inner margin of the orbit, it requires the practitioner to be familiar with the anatomical structure of the eye region and to be proficient with the applicable needling techniques. Generally, when treating retinopathy or optic atrophies, first apply the superficial needling method on the optic reflex zones around the orbit, or apply needling at adjacent or distal reflex zones to propagate needling sensations to the eye region. If the attained effect is not ideal, try to apply deep needle-insertion method at reflex zones of the inner margin of orbit.

Eye reflex zones exist not only around the orbit, but also on distal portions of the extremities. Using fMRI (functional MRI) in 12 volunteers, Cho *et al.* of USA found a vision-related acupoint located in the lateral aspect of the foot. When acupuncture was performed there, the activation of occipital lobes was seen by fMRI. They also stimulated non-acupoints 2~5 cm away from the vision-related acupoints on the foot as a control, and the activation in the occipital lobes was not observed^[112]. It provides a possible central mechanism for acupuncture to raise the vision and treat vision-related diseases. Another famed experiential acupoint used for vision-related diseases in the distal reflex zones of the eye is Guangming (GB37). However, in 2002, applying fMRI, Gareus *et al.* of Germany observed that no blood oxygenation level dependent (BOLD)-response correlating with acupuncture on Guangming (GB37) was detected in the visual cortex, while BOLD-signal-changes in response to puncture

twisting were detected in different cortical areas ^[403]. Nevertheless, it is still too early to conclude the effect of Guangming (GB37) negatively because most researchers in the West still have not taken the consideration of the propagation of needling sensations into the study of acupuncture. According to

Master Jiao's experience, to ensure satisfactory effectiveness from puncturing Guangming (GB37) for optic atrophy, it is necessary to propagate needling sensations from the leg to the eye via applying continuous needle-manipulation techniques for about 15 min.

Disorders of Otorinolaringology

17.1 Tinnitus / Neurosensory Deafness

Tinnitus, also known as “ringing in the ears”, can be intermittent or constant, with single or multiple tones, and its perceived volume can range from subtle to shattering. Generally, acupuncture methods for tinnitus and neurosensory deafness are the same.

【 Therapy 】

Select and puncture master points at local reflex zones surrounding the ear, and associate points at adjacent or distal reflex zones of the ear (refer to Appendix A).

Local reflex points surrounding the ear contain Ermen (TE21), Tinggong (SI19), Tinghui (GB2), Shangguan (GB3), and Xiaguan (ST7) at the region before the ear, and Chimai (TE18) at the region behind the ear, Yuntingqu (EX48) at the region above the ear, and Yifeng (TE17) at the region below the ear.

Adjacent reflex points of the ear contain Baihui (GV20) and Fengchi (GB20).

Distal reflex points of the ear contain Sidu (TE9), Sanyangluo (TE8), Waiguan (TE5), Yangchi (TE4), Zhongzhu (TE3), Houxi (SI3), Yangxi (LI5), Hegu (LI4) located at the reflex zone on the upper limb, as

well as a small area with length of three inches extending from Yanglingquan (GB34) downward. This area is located on the lower limb and centered below the capitulum of the fibula, including Feilong (EX153), Lingxia (EX156), Feitouxia (EX158), and Zuyicong (EX159).

When puncturing the above points, it is best to have stronger needling sensations, especially for patients with a longer course of the disease, and to retain needles for 20~30 min. Once everyday for patients with recent occurrence of the disease or once every 3~4 days for those with a longer course of the disease. Apply continuous treatment until it takes effect, and use different groups of points alternately to avoid occurrences of the needling-resistance. Once effectiveness seems to reach a plateau, take a break from the treatment for 1~2 weeks, and then start the subsequent treatment course.

【 Case Studies 】

Case 70: Patient was a 40-year-old male. He had suffered from a bilateral neural tinnitus that occurred suddenly one morning, and it lasted the entire day with a low buzzing sound in the right ear, and slightly higher pitch in the left ear. Examination showed two hard nodules at bilateral Yifeng (TE17), the one in the right was slightly smaller than the one in the left. There was remarkable tenderness in both

nodules. These two nodules were punctured and needles were retained for 10 min. Consequently, the buzzing sound of the right ear subsided first, and then followed by of the left ear after the intensity of needle-twisting was strengthened. The patient was cured through only one session of acupuncture and had no relapse of tinnitus at the 1-week-follow-up.

Case 71: Patient was a 48-year-old male. He had suffered from a sudden and complete deafness in the right ear with tinnitus for two weeks. This was a result from hearing a loud explosion from close, and he was diagnosed as neurosensory deafness. A round hard nodule with remarkable tenderness was found at right Yifeng (TE17). With needling applied on the acupoint, the needling sensations acquired were intense, and the patient immediately experienced heavy perspiration, with warmth across the entire body. Shortly afterwards, the tinnitus subsided and he could even hear whispers. When the needle was removed after 15 min of needle-retaining period, amazingly, the patient completely recovered the hearing. At the 1-month-follow-up, he showed no relapse of the deafness or tinnitus.

【 Discussion 】

In treating the above two cases of tinnitus or deafness, we attained excellent effects by using only one acupoint, namely Yifeng (TE17) ^[74]. According to classical TCM literature, the anatomical location of Yifeng (TE17) is posterior to the lobule of the ear, in the depression between the mandible and the mastoid process. “It should be punctured when the mouth is slightly open.” “When pressed, there might be an auricular pain triggered.” For most patients, some hard round nodules of various sizes could be detected in subcutaneous tissues located at Yifeng (TE17) by careful examination of depression area posterior to the ear lobule. Upon pressing, the patient

could feel sensations of soreness, aching, or heaviness radiated toward the inside of the ear or the throat. Unless the hard nodule is pressed, the patient could not feel those sensations. Thus, we believe that harden nodule is actually the Yifeng (TE17) described by ancient literature. As for the method of needling, first make a nail mark on the center of the nodule surface, then insert a needle perpendicularly 0.3~1 *cun* into the most sensitive spot of the center. Retain the needle for 10~20 min. Common needling responses are sensations of regional soreness, distension, numbness, and ache, which may radiate toward inside the ear or the face, as well as sometimes accompany with facial twitching. Besides, skin redness or a raised skin temperature may emerge at the auricle, face, and areas surrounding the needle. Some patients might experience warmth or heavy perspiration throughout the body, hiccup, or cough. Occasionally, patients might even experience mild fainting (**needle-sickness**) during needling, but they could quickly recover as long as the needle was removed instantly with the patient lying supinely.

We realized that acupuncture has certain effects for tinnitus or neural deafness of a short disease course, but that is not ideal for those with a longer disease course. For the latter, some patients might experience a certain relief period of ear-ringing symptoms, but that might actually be resulted from the improvement of holistic conditions, such as neurasthenia and insomnia. Some hearing loss is closely related to tinnitus, thus its progress may be the result of tinnitus’s improvement.

Currently, tinnitus patients in the West are increasingly turning to acupuncture for help. However, acupuncture efficacy for tinnitus has not yet been demonstrated on the evidence of rigorous randomized controlled trials. According to a systematic review on the efficacy of acupuncture as

a treatment for tinnitus conducted in December 1998 by Park *et al.*, which included six randomized controlled trials, two studies showed a positive result, whereas four blinded studies showed no significant improvement from acupuncture [404~406].

In addition to tinnitus, there are scores of reports on the efficacy of acupuncture for hearing loss in China, as well as related proofs from animal experiments [127], but the effectiveness of acupuncture on hearing loss has yet to be verified in the West [407,408].

17.2 Meniere's disease

Meniere's disease is a disorder of the inner ear. Although the cause is unknown, it is perhaps resulted from an abnormality in the fluids of the inner ear. In most cases, only one ear is involved, but both ears may be affected, and it typically starts between ages of 20~50 years. Men and women are both affected in equal numbers. The symptoms of Meniere's disease include episodic rotational vertigo, tinnitus, and a sensation of fullness in the affected ear, but vertigo is one of most uncomfortable and distressing symptoms that often results in nausea and vomiting. Acupuncture therapy has good effectiveness for symptoms of vertigo and nausea due to disorders of the inner ear.

[Therapy]

For symptoms of vertigo, select and puncture points in local reflex zones around the ear and adjacent reflex zones on the posterior neck, such as Yifeng (TE17), Yuntingqu(EX48), Fengchi (GB20), and Tianzhu (BL10), and associate with points in distal reflex zones on the extremities or central reflex zones, such as Taichong (LR3), Waiguan (TE5), Shenmen

(HT7), and Baihui (GV20). For symptoms of nausea, apply associate points in stomach reflex zones, such as Yintang (EX2), Shangxing (GV23), Neiguan (PC6), and Zusanli (ST36). For vertigo that might be related to excess water retention or the menstrual cycle, apply associate points in the urogenital reflex zones, such as Sanyinjiao (SP6) and Yinlingquan (SP9). Retain needles for 30 min after the generation of needling sensations. Acupuncture is administered once daily for acute cases and once every day or every 3~4 days for chronic cases. ANEM can also be applied on auricular points, such as *Heart*, *Shenmen*, and *Subcortex*. Advise the patient to avoid salty foods during the treatment period.

[Case Studies]

Case 72: Patient was a 31-year-old male. He had suffered from tinnitus in both ears for a number of years and had frequent dizziness in recent years that was diagnosed as Meniere's syndrome. Acupuncture was applied twice weekly on bilateral Yifeng (TE17), Fengchi (GB20), *Balance area* of scalp, and Hegu (LI4). After local soreness and distension were generated, the needles were retained for 30 min. Dizziness was reduced after two sessions, and completely subsided after four sessions. The patient reported complete relaxation in every session during the needle-retaining period.

Case 73: Patient was a 41-year-old female. She had been diagnosed as Meniere's disease for 6~7 years which frequently recurred 2~3 days before the menses and lasting throughout the entire length of menstrual period. She had taken medications such as the diuretic Triamterene and the antiemetic Meclizine in the past. When she came for acupuncture, the recurring vertigo and nausea symptoms had lasted three days along with the menses. Bilateral Yifeng (TE17), Fengchi (GB20), Waiguan (TE5), Hegu (LI4), and Sanyinjiao (SP6),

as well as Yintang (EX2) were punctured. After the generation of needling sensations, needles were retained for 30 min. After the initial treatment, the vertigo subsided but the nausea remained. After the second treatment three days later, the nausea also was gone. Thereafter, the patient received acupuncture once weekly for 12 sessions in three months and did not have any recurrences of vertigo or nausea. At the 10-month-follow-up, the results were sustained without recurrences.

【 Discussion 】

There are many successful trials on applying acupuncture in treating Meniere's disease, though designs of these clinical studies were mostly imperfect, such as a lack of controls, or having controls but not double-blinded. According to Steinberger and Pansini, 34 patients suffering from Meniere's disease were treated by acupuncture. For these patients, vertigo was the most uncomfortable symptom complained. Before acupuncture, most of the patients had been treated by other medical means without satisfactory results. After a few courses of acupuncture treatment, vertigo was gone in all cases. The researchers felt that it is more important to follow up and control the hearing threshold. As long as the hearing threshold remains stable, the other symptoms of Meniere's disease also would not persist. All 34 patients were regularly followed by careful audiometric studies for several years after their initial acupuncture treatments. In most cases, the hearing level had not greatly changed, and other symptoms of Meniere's disease were not present^[409]. Zhang *et al.* reported that in 39 cases with acute onset of this disease were treated by puncturing Fengchi (GB20), Baihui (GV20), Taiyang (EX4), Shangxing (GV23), Zusanli (ST36), and Taichong (LR3). After 15 days, 19 cases were shown to be effective and symptoms of 27 cases were under control, whereas

in the control group of 37 cases who received the medications through the same 15 days, 18 cases were shown to be effective and 16 cases under control. The results showed a significant statistical difference between the two groups ($P < 0.05$)^[410].

From our experience, stiffness of the cervical muscle or hard nodules of the muscles in the posterior neck were often observed in patients who had reduced cervical movements due to chronic vertigo. The cause of vertigo could be either Meniere's disease or cervical spondylosis. Applying acupuncture or massage at the affected region could soften those stiff portions or hard nodules and relieve vertigo. Fengchi (GB20) and Tianzhu (BL10), the two most commonly used points for vertigo, are located at the posterior neck.

17.3 Rhinitis/Sinusitis

A runny, stuffed nose, accompanied with headaches around the eyes, nose, and temples are the common symptoms of rhinitis or sinusitis, and people with allergies are especially susceptible to them. Acupuncture has good effectiveness for both rhinitis and sinusitis, no matter whether they are anaphylactic or non-anaphylactic, acute or chronic. In addition to alleviating nasal obstruction, nose running and sneezing symptoms, acupuncture may also improve the smelling function. It is estimated that up to 40 million American adults and children suffer from rhinitis or sinusitis.

【 Therapy 】

The following seven acupoints within nasal reflex zones of the nasal region, neck, and hand (refer to Appendix A) are preferred as master points: bilateral

Yingxiang (LI20) or Bitong (EX65), Fengchi (GB20), Hegu (LI4), and Yintang (EX2). Sibai (ST2) also can be associated. Acupuncture can be administered once every 2~3 days. Retain needles for 30 min after the generation of needling sensations, and apply acupressure at the points below in order for 3~5 min after needles were removed. First rub the skin besides the nasal bridge from top to bottom, then knead Yingxiang (LI20), Bitong (EX65), Yintang (EX2), and Zanzhu (BL2) (towards the bone wall upward and obliquely to achieve a slight pain), finally press Fengchi (GB20). Instruct the patient to perform self-acupressure, at least once daily.

For the chronic patient, apply ANEM or APPM at auricular points such as *Lungs*, *Nose*, and *Mouth*, once every 3~7 days, alternately on both ears. The pellets could be any one of tiny steel balls, radish seeds, herbal seeds of *Semen Vaccariae*, or other tiny vegetable seeds.

【 Case Studies 】

Case 74: Patient was a 43-year-old female. She had suffered from sinusitis along with severe sore throat, chill, and coughing over one month. The symptoms were intermittent. After the initial session, where acupuncture and acupressure was combined as above, she felt much better. She took seven additional sessions of treatment once weekly to stabilize the results, until all symptoms subsided completely.

Case 75: Patient was a 56-year-old female. She had suffered from chronic sinusitis for 18 years and had frequent onsets. When she first sought acupuncture, she was just within the period of recurrence and had nasal obstruction, running nose, and swollen cheeks and nose, as well as remarkable tenderness at the affected region. After the initial session where acupuncture and acupressure were combined as above, she felt markedly better. Not only were symptoms of nasal obstruction and running nose

alleviated, the swelling also completely eased. Through six more sessions at twice weekly, all of her symptoms subsided and the relapse frequency of sinusitis reduced markedly. She could almost felt instant improvement after each session of the treatment.

【 Discussion 】

There are many successful reports on acupuncture for rhinitis and sinusitis, and certain recognition about its applications and mechanisms. The effect of using Yingxiang (LI20) and Hegu (LI4) as master acupoints to treat rhinitis has been demonstrated, such as increasing the velocity of mucociliary transport in chronic rhinitis patients, but not in normal persons ^[411]. According to Wolkenstein and Horak of Germany, a study of the protective effect of acupuncture therapy against a nasal allergen-provoked rhinitis was undertaken on 24 patients suffering from seasonal allergic rhinitis. However, the objective and subjective results of the allergen-provocation were not able to verify a protective effect of the acupuncture therapy, a definite reduction of subjective complaints in the acupuncture group showed during the second month ^[412]. In a study on effect of acupuncture on nonallergic rhinitis, Davies *et al.* of UK reported that real acupuncture showed an improvement in nasal airways resistance after treatment in 9 of 13 patients, while sham acupuncture in 2 of 9. With the exception of improvement in a minimal cross-sectional area (measured by acoustic rhinometry) in the real acupuncture group following treatment, the outcome was not statistically significant ^[413].

Mikhireva and Portenko of Russia applied EA in combination with surgical intervention in the treatment of 36 patients with polypous rhinosinusitis. Results showed that in most cases the combined treatment led to improvement of olfactory function, mucociliary

transport, and local immunity. During two-year follow-up recurrent polyps were detected in 4 patients ^[414]. Pothman and Yeh compared effects of treatment with antibiotics and acupuncture on chronic maxillary sinusitis in children, and found in 18 cases that took acupuncture, their results and duration of improvement was significantly better than that due to previous treatments with antibiotics. Accordingly, acupuncture was to be applied in chronic and recurrent stages after exclusion of large adenoids in children or bone inhibition of sinus clearance, especially before an invasive surgical procedure ^[415].

In order to raise the curative effectiveness of acupuncture, it is important to stimulate nasal reflex points precisely. Local nasal reflex zones lodge at both sides of the nasal bone, including the area from Yingxiang (LI20) to Bitong (EX65), where finger pulp pressure can be applied to ease the nasal obstruction symptoms. While puncturing Yingxiang (LI20), the needle should be inserted perpendicularly at the depth of approximately 0.3 *cun* until the needle is standing upright. Some patients may feel a twisting sensation at the upper lip. It is necessary to retain the needles for a certain period to ensure the effectiveness though needle-manipulation may not required during that period. After the needle-retaining period, the areas around Yingxiang ^[LI20] may have local skin redness or slight blood pricking followed by removing of the needles. However, those signs usually indicate that the stimulation is appropriate. For those with fore headaches, one can puncture Yintang (EX2), where the needle should be obliquely inserted 0.3~0.5 *cun* toward the nose tip. For those with symptoms of plugged ears, Yifeng (TE17), Xiaguan (ST7) or Ermen (TE21) may be associated.

17.4 Dysphonia

Dysphonia or aphonia can be caused by inflammatory congestion at the region of throat, or the laryngeal nerve pinched or damaged by surgeries or tumors. In addition, it can be functional, such as hysteric or spasmodic dysphonia (SD). SD is a disorder characterized by involuntary movements of one or more muscles of the larynx or voice box. With SD, movement of the vocal cords is forced and strained resulting in a jerky, quivery, hoarse, tight, or groaning voice. SD can affect anyone, but most often becomes evident between 30~50 years of age, affecting more women than men. In general, acupuncture has satisfactory therapeutic effectiveness for dysphonia, especially for those due to functional causes.

[Therapy]

Select and puncture points within the throat reflex zones in anterior part of the throat, neck, and hand. Electrical stimulation can also be combined with needling. Commonly used acupoints are Tiantu (CV22) and Lianquan (CV23) of the anterior part of the throat, Fengchi (GB20), Tianzhu (BL10), and Dazhui (GV14) of the neck, and Fuyin (EX73), which was initially discovered by us, as well as Hegu (LI4) of the hand. Most of them overlap with central reflex zones.

The location of Fuyin (EX73) and its needling method: Through carefully touching or pressing the posterior cervical region, one can find sensitive nodules with a shape of funiculus at 0.3~0.5 *cun* bilateral to the cervical spine, which is Fuyin (EX73). Insert filiform needles of 1 *cun* in length into the center of nodules, and manipulate the needles with the equal tonification and purgation method so that needling sensations are propagated up and down, even reaching the throat. Retain needles for 5~10

min.

While twisting the needle, the patient is instructed to repeat pronunciations. For the patient who speaks Chinese, ask to repeat “Ar”, “Yi” or the numerals “1, 2, 3 ... 10”, while for the patient who speaks English, ask to recite the alphabets. If the SD is functional or hysteric, as long as the first normal sound is coming, other sounds generally can be followed, the patient can instantly recover the normal speech ability.

【 Case Studies 】

Case 65: Patient was a 35-year-old female. Two months ago, due to a psychological stimulation, she lost voice suddenly and only could whisper, though her crying or laughing was still normal. She was diagnosed as hysteric dysphonia. Examination showed that her vocal cord activity was normal. After only one session of acupuncture at bilateral Fuyin (EX73), where needling sensations of soreness and distension propagated to the throat, in conjunction with the speech training, she recovered her voice instantly.

Case 76: Patient was a 47-year-old male. He had suffered with hoarse and sore throat for two years that occurred after six months of severe coughs. He was diagnosed as bilateral vocal cord dysfunction. Bilateral Fuyin (EX73), Fengchi (GB20), and Hegu (LI4), were punctured and connected to an electric stimulator with needles retained for 20 min after the generation of needling sensations. After removing needles, he had speech training for 3 min. He received acupuncture once weekly for six consecutive weeks and felt instant improvement of the sore throat after the initial session. He had a much louder voice as noted by his colleagues through the third session. At the 3-month-follow-up, his voice appeared to be much louder than that before acupuncture, but still showed some hoarseness if talked too much.

【 Discussion 】

For functional dysphonia, it is optimal to combine acupuncture with hypnosis. We once treated 12 female cases of hysteric dysphonia aged 30~50 using acupuncture at Fuyin (EX73) with good results. Among them, the disease course was 2~15 days for 9 cases, and 1~3 months for other 3 cases. They lost their voice suddenly, or could only whisper through coughing. Examination showed that the vocal cord activity was normal and they were diagnosed with functional dysphonia. After only one session of acupuncture, all of them showed instant short-term effects (Case 65). This disease has the tendency of recurrence, but acupuncture still is effective in relieving the recurrences. For examples, 2 of the above 12 cases had 3 recurrences, and were relieved each time ^[416]. In Case 76, which were probably caused by chronic hyperemia of the vocal cord, acupuncture attained certain effects, unfortunately, the patient did not choose to receive additional sessions; otherwise, a further improvement of his condition might be achieved. Crevier-Buchman of France analyzed frequency and duration parameters of voice and speech in two men with adductor spasmodic dysphonia (ASD). One was treated with Botulinum Toxin injection while the other received acupuncture therapy. Improvement of voice and speech parameters after acupuncture therapy was comparable to the results achieved with Botulinum Toxin injection. The results were stable one year after acupuncture therapy ^[417].

Dysphonia due to surgical injury of the cervical nerve would be gradually improved with the recovery of nerve function, but acupuncture has shown the effect to speed up this recovery process. Karpova reported that 14 patients with unilateral paralysis of the recurrent laryngeal nerve underwent a combined therapy, which included acupuncture. The combined treatment yielded good results in all

patients in terms of recovery of their vocal function. In 11 patients the recovery was reached within 2~3 weeks and in 3 remaining patients within 2~3 months. Dysphonia due to a pinched nerve by tumor will not improve unless the tumor is removed or shrunk.

Mechanism of acupuncture in treating dysphonia with the above causes includes two aspects: one is the functional regulation of the vocal cord and its innervations; the other is the rebuilding of the speech reflex. For the former, there might be the specificity

in actions of acupoints, namely optimal effects of eliminating edema, spasm or paralysis of the vocal cord may be induced by stimulation at some specific reflex points of the throat. For the latter, the specificity in actions of acupoints seems not significant. Functional dysphonia often recovers immediately as long as certain sensitive acupoints or non-acupoints are stimulated along with the normal speech training of the patient. In other words, rebuilding the speech reflex mainly depends on the speech training, while acupuncture may only play an inducing role.

Dental Disorders

18.1 Toothache / Dental Pain

Toothache (or odontalgia) is one of most effective indications of acupuncture therapy. Until now, the majority of related clinical trials and case studies indicate that acupuncture is effective for dentistry analgesia ^[419].

【 Therapy 】

Apply acupuncture or acupressure on the following local or distal oral reflex points that can be selected either alone or in combination.

In local reflex points, select ipsilateral Xiaguan (ST7) and Jiache (ST6) as master points, and associate Yifeng (TE17) for complications of otalgia. When puncturing Xiaguan (ST7), the needle can be inserted perpendicularly at depth of 1~1.5 inches. In distal reflex points, select ipsilateral or bilateral Hegu (LI4) and Neiting (ST44).

In addition, if the pain is difficult to be alleviated, apply NTN (nerve trunk needling method, refer to Section 14.5) on the “*infraorbital nerve point*”, i.e., Sibai (ST2) for the upper toothache, the “*mental nerve point*” i.e., Jiachengjiang (EX72) for the lower toothache. Auricular acupuncture can also be applied. *Select Subcortex, Brainstem, Upper jaw or Lower jaw, and Shenmen* of auricular reflex zones.

In all of above methods, retain needles for 20~30

min after the generation of needling sensations. For acute toothache, administer 1~2 times daily. For chronic pain, once every day or once every other day or apply ANEM.

【 Case Studies 】

Case 77: Patient was a 37-year-old female who had right toothache due to pulpitis that had received dental treatment for six days. She had to take Ibuprofen everyday to control the pain. Bilateral Hegu (LI4), right Xiaguan (ST7), Jiache (ST6), Qianzheng (EX63), Ermen (TE21), and Yifeng (TE17) were punctured. After only one session, the toothache was alleviated significantly. It was subsided completely through a follow-up session the next day.

【 Discussion 】

Because acupuncture has dual effects of analgesia and anti-inflammation, it is suitable to for odontalgia caused by inflammation or pain after an exodontia. According to the report of Moroz *et al.* of Russia in the emergency dental care office, the analgesic effect of EA combination with non-narcotic analgesics (Rengasil or Ibuprofen) was the most marked in alveolitis and periodontitis. Less inflammations of the pulp and no effect could be achieved in acute purulent pulpitis. Moroz *et al.* supposed that pain

syndrome alleviation after EA stimulation and after administration of anti-inflammatory medications was explained mainly by changed hemodynamics at the site of inflammation, this resulting in reduction of the edema and in diminished effects of biochemical substances released in the course of inflammation ^[420]. For toothache caused by tooth decay, acupuncture can temporarily relieve pain only. Accordingly, the response of a patient with odontalgia to acupuncture might be used to assume its cause. For instance, a severe odontalgia, which could only be temporarily alleviated by acupuncture might be mostly caused by either tooth decay or purulent inflammation at the affected region. For such cases, a method to raise the curative effect is to shorten the intervals between consecutive acupuncture sessions, such as administering 3~5 sessions daily. This is because acupuncture has the relative low antibiotic actions, only repeated inputs of stimulation would be able to control the infection and subsequent odontalgia effectively.

In addition, it is advised to alleviate nervousness of the patient prior to acupuncture as much as possible, which usually could weaken analgesia effects of acupuncture. Widerstrom-Noga *et al.* observed that the magnitude of analgesia induced by acupuncture might be modified by psychological factors such as anxiety and stress, the higher ratings of stress correlated significantly with a low increase of tooth pain threshold following acupuncture ^[421].

Among acupoints that are effective for dental pain, Hegu (LI4) is the most famed. However, there are arguments on which side (ipsilateral or contralateral) of the stimulation on Hegu (LI4) can achieve better results. Yukizaki *et al.* of Japan observed that the human toothache threshold was elevated by EA on Hegu (LI4) ipsilaterally but was unchanged contralaterally ^[422]. Concerning the difference between local or distal acupoints, for the pure neural

odontalgia, selecting distal acupoints such as Hegu (LI4) usually is sufficient in attaining the desired effects. However, for odontalgia due to significant local infection, selecting local acupoints on the affected cheek, such as Xiaguan (ST7) will attain better results.

As for the stimulation method on acupoints for dentistry analgesia, in general, applying manual acupuncture is sufficient. As long as the precise location of the reflex point is struck, it is easy to acquire intense needling sensations and take effects. Sometimes one can also apply acupressure instead of acupuncture. In an animal experiment with monkeys, Ha and Tan observed that some points such as Hegu (LI4) and Zusanli (ST36) produced more prominent analgesic effects than that of other points. Moreover, an increase of pain threshold was also observed after application of finger pressure on these points. The results indicated that acupuncture and finger pressure applied to certain muscle points exhibited similar analgesic effects ^[423]. When applying EA, an intense stimulation is also required. Schimek *et al.* compared the effects of mild, moderate, and intense levels of EA stimulation on event-related potentials elicited by painful dental stimulation. Acupuncture was performed bilaterally at Hegu (LI4) on the hands. Only the intense level of EA was effective. No dose-response effect was observed. The outcome suggests that the analgesic effect occurred abruptly when stimulation reached an intense level and a subnoxious pounding sensation was elicited ^[424]. After the effect of acupuncture takes place, one can retain the needle for a while. If the toothache is severe and difficult to be relieved, the needle-retaining period can be prolonged to 30~50 min. Repeat the manipulation once every five min to strengthen the stimulation, and each manipulation lasting around 1 min. Bakke observed that the effect of increasing pain threshold of maxillary incisors and

canines was most pronounced after 45 min of acupuncture on Sibai (ST2), Hegu (LI4), or Neiting (ST44) ^[425].

The mechanism of acupuncture for relieving toothache is one of the most representative aspects in exploring mechanisms of acupuncture analgesia (refer to Section 4.3). For this mechanism, the involvement of an endogenous opioid system has been demonstrated by many experiments ^[426,427]. In a double-blinded, randomized study of 40 subjects, Simmons and Oleson of USA demonstrated that auricular electrical stimulation could raise pain threshold 18%~23% significantly. However, the effect was partially blocked by Naloxone, and the pain threshold in the placebo stimulation groups remained unchanged ^[426]. Acupuncture not only can induce analgesia, eliminate inflammation, but also can inhibit stressor reactions due to pain, such as increase of the blood pressure, changes of the level of catecholamine and ACTH in the blood ^[428].

18.2 Dysfunction of Temporomandibular Joint

Dysfunction of temporomandibular joint (TMJ) or temporomandibular dysfunction (TMD) is mainly manifested as the regional pain, limited mouth opening, snapping joint, and other symptoms. It is mostly resulted from an occlusal injury, ligament chالاس, or inflammation of the joint. Acupuncture has remarkable effects in controlling pain of the joint and in recovering occlusal functions.

【 Therapy 】

Select and puncture local reflex points with distinct tenderness on the affected regions and based on the

accurate locations of pain or dysfunction when opening mouth or occluding. Most of them are distributed on Xiaguan (ST7), Tinggong (SI19), Ermen (TE21), Qianzheng (EX63), Yifeng (TE17), and Taiyang (EX4).

Hegu (LI4) on the side with higher sensitivity (most on the healthy side) or both sides can be associated. When punctured, insert the needle along the edge of the second metacarpal bone perpendicularly to strike the sensitive center of the point. Meanwhile, a twisting of the index finger as well as intense soreness, distention or numbness will be generated.

Retain the needles for 30 min. First remove needles on the face, and instruct the patient to open and occlude the mouth for over 10 times with a continuous needle-twisting on Hegu (LI4). It often can immediately improve the joint pain and the width of mouth opening. This effect may sustain for couple of hours or days after the treatment in chronic and intractable cases. For them, the above method can be repeated once every other day or twice weekly until the effectiveness is stabilized.

【 Case Studies 】

Case 78: Patient was a 42-year-old male. He had suffered with pain in the right TMJ for over two months, which restricted movement of the mouth. He once took medications without much effect. He received acupuncture as above method. When puncturing Hegu (LI4) of the contralateral side, he had numbness on the affected face and could open the mouth without any restriction and pain. At the 1-month-follow-up, the patient stated that his TMJ pain did not recur.

Case 79: Patient was a 77-year-old male. He had suffered with pain in bilateral TMJ for 20 years, especially on the left side. His month opening was restricted so it was difficult to take meals. Examination

showed a distinct muscular atrophy at his bilateral Hegu (LI4), which might be a kind of distal reflection of this disease. Acupuncture along with infrared radiation on the face was applied, 1~2 times per week. At each session, atrophy locations of bilateral Hegu (LI4) were punctured. Through 30 sessions, the TMJ pain subsided markedly, and no longer affected the patient's chewing function.

【 Discussion 】

According to a literature search on the use of acupuncture in dentistry by Rosted of UK in 1998, acupuncture in 11 out of 15 studies proved effective in the treatment of TMJ dysfunction and as analgesia^[429]. We treated 50 patients of this disease in early years and found that the effective rate was 96%^[430]. Puncturing Hegu (LI4) was the most effective for controlling the TMJ pain and increasing the amplitude of mouth opening, and the effect usually took place immediately during the needle-retaining period or after the removal of the needles.

Raustia and Pohjola compared the effects of acupuncture and stomatognathic treatment on the mobility of the mandible in patients with TMJ dysfunction. All of the patients were evaluated before treatment, within one week of treatment, and three months after treatment. The results found no significant differences in painful movement of the

mandible except in retrusive movement, wherein stomatognathic treatment was clearly superior immediately afterwards. From this, acupuncture seemed to be an early-stage therapy suitable for patients who belongs to the largely functional and reversible disease type and with evidence of psychophysiologic or neuromuscular disturbances but not of any marked occlusal interference or joint damage^[431]. In 110 patients of TMJ dysfunction, List *et al.* of Sweden compared the effect of acupuncture and occlusal splint therapy. They found that both acupuncture and occlusal splint therapy reduced the symptoms as compared with the control group. Moreover, acupuncture gave better subjective results ($P<0.001$) than the occlusal splint therapy^[432].

In 1998, Wang of Wuhan, China reported that the effective rate was 93.1% in 477 cases of myofascial pain dysfunction using acupuncture at Hegu (LI4) and Minyin point. They found that there were raised temperature of the skin on the TMJ regions, enlarged blood vessels, and increased blood flow of the nail fold capillary loops in the treatment group, with the elimination of pain and increase of mouth opening as compared with the control group^[433]. This hinted that the inhibition of sympathetic constriction of blood vessels resulted from needling such points might be related to its analgesia mechanism.

Disorders of Circulatory System

19.1 Hypertension

Acupuncture has certain therapeutic effects on essential hypertension or parts of secondary hypertension, such as renal hypertension. However, the effects may be more pronounced in treating neurogenic hypertension, or hypertension with a mild rising of BP or with a short disease course, such as borderline hypertension, in which the blood pressure (BP) is around 140~160/90~95 mmHg.

【 Therapy 】

For essential or neurogenic hypertension, generally choose points within central reflex zones and heart reflex zones such as Baihui (GV20), Tianzhu (BL10), Fengfu (GV16) on the head and neck, Quchi (LI11), Shenmen (HT7), Zusanli (ST36), Sanyinjiao (SP6), and Taichong (LR3) on the extremities, which pertain to the central reflex zone, as well as Xinshu (BL15), Ganshu (BL18), Zhiyang (GV9), and Neiguan (PC6) within the heart reflex zone. For renal hypertension, select associate points within urogenital reflex zones, such as Yinlingquan (SP9) and Taixi (KI3). Retain needles for 30 min after the generation of needling sensations. In the initial course composed of 10 sessions, apply needling therapy once daily or once every other day. Then determine the number of required sessions and the interval between the

sessions according to the individual response of the patient. When BP is under control, it is best to continue the treatment (1~2 sessions weekly) for several months to attain stable effects. Moxibustion may be also applied on these points, at least once daily.

For patients without obvious results from body acupuncture, auricular acupuncture may be combined once daily. Choose three most sensitive points each session from *Heart, Sympathetic, Depressor Groove, Shenmen, Subcortex, Kidney* of auricular reflex zones, and insert filiform needles (No. 32) perpendicularly, at a depth where the needle can stand upright. It is optimal to attain a regional pain of the ear when inserting the needle. Retain the needles for 30 min. ANEM or APPM is also applicable, once every 3~4 days, alternately on both ears. Regardless of body acupuncture or auricular acupuncture, the length of treatment course is determined according to the individual response of the patient.

【 Case Studies 】

Case 80: Patient was a 70-year-old male. He had suffered from high BP for three months, and was diagnosed with neuropsychogenic hypertension. He stayed and rested at home and took anti-hypertension medications without obvious effectiveness. When he initially came for acupuncture, his BP was 186/94

mmHg. The above-mentioned body acupuncture method was applied once every other day. His high BP reduced to 155/85 mmHg after the third session of treatment, and recovered to normal (130/80 mmHg) after the fifth session. Meanwhile, he resumed his job, and still received acupuncture once weekly for over two months until discharged. During that period, his BP remained normal (less than 140/90 mmHg).

Case 81: Patient was a 57-year-old female. She had suffered from borderline hypertension for a year. Her systolic pressure was often between 140~160 mmHg while diastolic pressure was maintained within the normal range (less than 90 mmHg). When she was on anti-hypertension medication (Norvasc, 10 mg once daily), her systolic pressure was slightly declined but most of times it was still above 140 mmHg. The above-mentioned acupuncture method was applied, twice weekly for total 22 sessions. Meanwhile, she still took the same dose of Norvasc. Her BP was self-monitored and recorded every morning. Results showed that it recovered to normal (less than 140/90 mmHg) after 14 sessions of acupuncture, and was continuously in the normal scope at the 3-month-follow-up.

[Discussion]

There are numerous clinical reports about acupuncture for hypertension, in which the effect of acupuncture lowering BP has been first verified. In treating 10 subjects with diastolic hypertension using acupuncture at Taichong (LR3), Zusanli (ST36), Quchi (LI11), and the auricular point *Depressor Groove*, Williams *et al.* of USA observed a significant, immediate poststimulation reduction of diastolic BP ^[434]. According to Chiu *et al.* of Taiwan, acupuncture was performed in 50 untreated essential hypertensive patients. Thirty min after acupuncture, there were decreases in systolic pressure from (169 ± 2) mmHg

to (151 ± 2) mmHg, diastolic pressure from (107 ± 1) mmHg to (96 ± 1) mmHg, and heart rate from (77 ± 2) beats/min to (72 ± 2) beats/min ($P < 0.01$). Plasma renin activity decreased from (1.7 ± 0.4) ng/mL/2h to (1.1 ± 0.2) ng/mL/2h ($P < 0.01$), but there were no significant changes in plasma vasopressin or cortisol concentrations. These results suggested the decrease of BP after acupuncture, at least in part, was from a decrease in renin secretion ^[435]. Concerning the mechanism that acupuncture declines BP, now it is also known there are involvements of the pituitary gland, adrenal hormones, endorphins, and so on ^[436]. Because of the close relationship between hypertension and CNS ^[437], the depressor role of acupuncture is mostly realized through stimulation on CNS, which lowers the sympathetic tone and results in a series of endocrinal changes. In 2001, Ku and Chang of Beijing, China reported that effects of specific EA surpassing pressor responses of the nucleus amygdaloideus centralis-emotional circuit was mediated by both β -endorphin-ergic and GABA-ergic neurons ^[438].

In addition, there are some reports that have confirmed the long-term anti-hypertensive effects of acupuncture. Akhmedov *et al.* of Russia treated 360 patients with initial essential hypertension using acupuncture in auricular and corporal zones and observed that 82.1% of the patients had positive response. Moreover, the hypotensive effect in the majority of patients sustained for 12 months ^[439].

However, anti-hypertensive effects of acupuncture mainly appear in hypertensive patients. For various conditions of shock or low BP, acupuncture may have opposite effects, namely increasing BP to a certain degree. According to most reports, BP rises from 4~30 min after needling, and such raised BP was relatively stable with little fluctuation. It was difficult to lower after it had risen. In case BP declined, repeated needling might again increase it.

The pressor effect of acupuncture had a collaborative role with anti-hypotensive medications but without the side effects of the medications. The pressor effect of acupuncture has been applied to treat clinical shocks. Acupoints with stronger pressor effects are Suliao (GV25), Yongquan (KI1), Shuigou (GV26), Shixuan (EX128), Hegu (LI4), Zusanli (ST36), and Baihui (GV20) [29]. Among them, Suliao (GV25) has the strongest action [440]. Interestingly, almost all of the acupoints that have pressor effects lodge within central reflex zones.

The pressor effect of acupuncture may also occur in normal subjects with a lower BP. Baba *et al.* of Japan examined the effect of acupuncture or EA on some circulatory parameters in ten healthy male adult volunteers. They found that acupuncture and EA significantly increased total peripheral resistance, and EA increased systolic BP further. There was no difference in the cardiac output compared with the control. The results suggested that acupuncture or EA has an action of α -stimulation but not of β -stimulation, and that EA has a stronger effect than acupuncture alone [441].

The bi-directional influence of acupuncture on BP (either decrease or increase) is a typical example for regulatory functions of acupuncture, i.e., impacts of acupuncture on the body are dependant on the preexisting state of the body prior to acupuncture. If the original BP is high, acupuncture can lower it, and vice versa (refer to Section 4.2).

Because of the chronic features of hypertension, among various stimulation methods, either ANEM or APPM is preferred [442]. Moreover, in general, the depressor effect of auricular acupuncture is more satisfactory in comparison with body acupuncture, but the key factor to increase its effectiveness is to carefully locate auricular reflex points and seek optimal needling sensations. In treating 30 patients with hypertension using auricular needling, Huang

and Liang found that there was remarkable hypotensive effect by stimulation of “Heart”, whose hypotensive rate of short-term was 100%, while there was inefficacy for hypotensive by Stomach point [443]. In addition, puncturing Cardiovascular point (i.e., Thoracic area) of scalp acupuncture [444] or other acupoints of the head also had distinct hypotensive effects.

Because there is a pronounced circadian fluctuation of BP [445], chronoacupuncture is also applicable to treat hypertension. Selection of an optimal time to administer acupuncture may increase the depressor effect. The optimal time may be determined by rhythmic patterns of individual BP. For example, for most patients with a higher BP in the afternoon, their acupuncture session may be scheduled in the afternoon as well.

Many patients of hypertension have a high level of blood lipids simultaneously. There have been controversial reports on acupuncture effects for blood lipids. Yu *et al.* of Harbin, China treated 291 cases of essential hypertension with auricular acupressure and found that not only BP but also the level of blood lipids significantly dropped ($P < 0.01$) [446]. Yan *et al.* of Hunan, China studied changes of blood lipids before and after acupuncture on Neiguan (PC6), Zusanli (ST36), Taichong (LR3), and Sanyinjiao (SP6). They found that after two courses of treatment, the glycerin level descended (1.16 ± 1.84)mmol/L at average ($P < 0.01$) in 26 patients of glycerin lipemia, while the cholesterol level descended (0.26 ± 0.41)mmol/L ($P < 0.01$) in 45 patients with high level of cholesterol [447]. However, Kraft *et al.* of Germany applied acupuncture with a standardized combination of acupoints to treat 10 postmenopausal cases with mild hypertension, and found no changes of serum lipids and BP though the excretion of normetanephrine was reduced [448].

19.2 Angina Pectoris/ Coronary Artery Diseases

As a kind of adjunct therapy, acupuncture can be used either to control acute onset of angina pectoris or to improve myocardial ischemia after the stabilization of symptoms in conjunction with medications. It has been demonstrated in animal experiments and clinic trials that acupuncture has significantly positive influence to the cardiovascular system, which may help to relieve common symptoms of coronary artery diseases, angina pectoris, arrhythmia, or left ventricle dysfunction.

【 Therapy 】

Mainly select and puncture reflex points with tenderness or hard nodules within heart reflex zones at anterior chest, upper back, or upper and medial limbs (refer to Appendix A). Commonly used are Tanzhong (CV17), Jueque (CV14), Shencang (KI25), Yuzhong (KI26), and Qihu (ST13) of the anterior chest, Xinshu (BL15) and Jueyinshu (BL14) of the upper back, Neiguan (PC6), Shaohai (HT3), Ximen (PC4), and Shenmen (HT7) of upper and medial limbs. Needling is applied once daily or once every other day. Retain the needles for 30 min after the generation of needling sensations.

In addition, auricular reflex points, such as *Heart*, *Small intestine*, *Large intestine*, and *Sympathetic* can be stimulated through general needling, ANEM or APPM that is applied once every three to four days, alternately on both ears.

Besides, moxibustion or herbal patch can also be applied on the heart reflex zones once daily. Due to the chronic features of coronary artery disease, a long-term course of acupuncture treatment is recommended. Set an appropriate interval (one or two weeks) between two consecutive treatment courses.

【 Discussion 】

There are many clinical studies on anti-anginal effects of acupuncture^[449-453]. Acupuncture can decrease the anginal attack rate, nitroglycerin consumption, and slightly increase exercise tolerance^[452]. In 21 patients with severe and intensively treated angina pectoris, Richter *et al.* of Sweden compared effects of traditional Chinese acupuncture or placebo tablet treatment. Acupuncture was given three times weekly for four weeks at master acupoints Neiguan (PC6), Tongli (HT5), Xinshu (BL15), Pishu (BL20), and Zusanli (ST36). Previous anti-anginal treatment remained unchanged during the whole study. During the acupuncture period, the number of anginal attacks weekly was reduced from 10.6 to 6.1 compared with placebo ($P<0.01$). Accordingly, the performance before onset of pain during exercise test increased from 82 W to 94 W ($P<0.05$). However, maximal performance did not increase after acupuncture. Intensity of pain at maximal workload decreased from 1.4 to 0.8 (scale 0~4, $P<0.01$). Further, ST-segment depressions at maximal comparable load decreased from 1.03 mm to 0.71 mm after acupuncture ($P<0.01$). A life quality questionnaire confirmed an improved feeling of well-being^[453].

Concerning the mechanism of acupuncture in treating angina pectoris or coronary artery disease, there have been many advanced studies through animal experiments. For example, it has been demonstrated that acupuncture or EA could decrease oxygen consumptions of the ischemic myocardium, prevent the descent of pH value in the blood of coronary sinus, thus prevent the acidosis of myocardial cells, and enhance myocardial contractility^[454]. It could also decrease the sugar intake of ischemic myocardium and increase the intake of fatty acids^[455], as well as improve the blood supply to the myocardium so that electrical activities of the ischemic myocardium were normalized^[456].

Cao *et al.* of Xian, China observed that acupuncture at Neiguan (PC6) could prolong the left ventricular ejection time and decrease the ratio of pre-ejection time/ejection time of the left ventricle in 50 patients with coronary artery disease. It hinted an increased cardiac output and improved left ventricular function ^[457]. Ho *et al.* of Taiwan also found that acupuncture at Neiguan (PC6) could temporarily improve the left ventricular function in patients with coronary artery disease. The mean values of left ventricular ejection fraction in the initial 15 min of acupuncture significantly increased from baseline, and the increase persisted through the next 15 min of acupuncture and 15 min after acupuncture, but became insignificant at one week. In contrast, in normal subjects, the mean values of left ventricular ejection fraction did not change significantly during or after acupuncture ^[458].

Neiguan (PC6) is the most commonly used acupoint in treating cardiac disease, its effectiveness has been widely acknowledged in ample clinical trials and laboratory experiments. Moreover, stimulation on the median nerve located within this acupoint also has similar effects. In 2001, Abad-Alegria *et al.* of Spain conducted an objective assessment of the sympatholytic action of Neiguan (PC6). The experiments were performed in 29 healthy volunteers. They found that acupuncture at Neiguan (PC6) could strongly inhibit sympathetic tone, with reduction of heart rate, systolic BP, and an important reduction of the amplitude of the sympathetic electrical response; the latency of the electrical response was also prolonged. Some weak effects on BP and heart rate were observed, as non-specific effects of electrical stimulation of the median nerve at Neiguan (PC6) level in the wrist ^[459].

Actually, other acupoints located at the heart reflex zone of the flexive forearm, such as Shaohai (HT3), Quze (PC3), Ximen (PC4), Jianshi (PC5), Shenmen

(HT7), and Lingdao (HT4), have effects similar to Neiguan (PC6). In addition, Tanzhong (CV17), Juque (CV14), Shencang (KI25), Yuzhong (KI26), Kufang (ST14) and Qihu (ST13) of the anterior chest, Xinshu (BL15) and Jueyinshu (BL14) of the back often show reflective tenderness, and can be used as master acupoints of regional reflex zones for stimulation. Forms of stimulation can be needling, moxibustion, or herbal patch ^[449]. ANEM or APPM with steel balls or herbal seeds of *Semen Vaccariae* ^[450] is also a simple and effective method.

In our experience, there are at least the following two methods in stimulation of acupoints or reflex points at the medial side of forearms. First is to puncture the points more superficially to attain needling sensations of soreness or distension, and propagate them toward the upper arm or chest. Second is to puncture the points more deeply to make precise stimulation on the median nerve trunk, which can obtain an electric-shock sensation propagated toward the fingertips. Generally, it is more important to stimulate the left arm than the right. As for needling local reflex points located at the anterior chest and the back, special attention should be paid to the needling angles and depths. Do not merely pursue needling sensations that may lead to an overly deep needle-insertion that may result in an injury to the internal organs. In addition, it is recommended to apply moxibustion or external herbal plasters on these reflex points. Of course, due to the chronic features of this disease, more courses of acupuncture treatment may be needed. Even after some results are attained, continuous sessions of treatment for at least 6 months are suggested in order to stabilize the results.

19.3 Arrhythmias

There are various types of arrhythmia with different causes. Generally, acupuncture has good effects for supraventricular tachycardia and certain effects for ventricular or atrial extrasystoles due to coronary cardiac disease.

[Therapy]

The treatment method of arrhythmias is the same as that of angina pectoris or coronary cardiac disease (refer to Section 19.2).

[Case Studies]

Case 82: Patient was a 50-year-old male. He had suffered from ventricular extrasystoles for eighteen months. Self-recorded extrasystoles were over 100 beats daily. He had several onsets of atrial fibrillation that spontaneously disappeared. He never took any anti-arrhythmic medications. Needling therapy was applied at nine acupoints of the heart reflex zone: bilateral Xinshu (BL15), Yixi (BL45), and Geshu (BL17), as well as Shenzhu (GV12), Lingtai (GV10), and, Zhiyang (GV9). Needles were retained for 30 min after the generation of needling sensations. Through two sessions of acupuncture weekly, he began to feel better, and within one month after the treatment, his ventricular extrasystoles descended to about 20~50 beats daily. In the following three months, when he received continuous 16 sessions of treatments with the same method once weekly, he had almost no any onsets of ventricular extrasystoles.

[Discussion]

In treating 33 patients with constant ventricular extrasystoles using EA, Liptak *et al.* of Germany found that there was no difference in heart rate between the treatment-conditions and the

non-treatment-conditions. However, during EA the total sum of ventricular extrasystoles and the number of subjects with ventricular extrasystoles was lowered significantly in relation to the non-treatment-condition^[460]. Ying *et al.* reported that 52 cases of arrhythmia were treated by acupuncture with the total effective rate of 58%. There was better effectiveness for the ventricular and atrial extrasystole than the atrial fibrillation and the heart-block. Gao *et al.* reported that 220 cases of arrhythmia were treated by acupuncture with effectiveness of 86% and 18% for those with disorders of the abnormal excitation source or conduction respectively. They found that those under 50 years of age had better results than those over 51^[461].

While applying moxibustion to treat neurogenic tachycardia, Shiota Bunshi of Japan often selected hypersensitive spots lodged at the left upper back, such as the lateral area to Xinshu (BL15) and around Gaohuangshu (BL43), as well as those tender spots located on Shaohai (HT3), Shenmen (HT7), Ximen (PC4), Neiguan (PC6), Jueque (CV14), and Tanzhong (CV17). Puncturing Ximen (PC4) and Neiguan (PC6) was rather effective in treating onsets of neurogenic tachycardia. Moxibustion on Ximen (PC4) (about 20 moxa cones each session) was also applicable. When tender spots of the left back disappeared, tachycardia would also recover consequently^[88].

There have been ample animal experiments in studying mechanisms of acupuncture for arrhythmia, which is generally thought to be resulted from the reduction of sympathetic activity or the enhancement of vagus tone. However, Shinohara of Japan observed significant elongation in R-R and shortening in R-P intervals by application of EA (1Hz) on Shenmen (HT7) and Ximen (PC4) in 30 cases (18 physically healthy volunteers and 12 patients). It was assumed that the decrease in heart rate by acupuncture was due to relative superiority

of the vagal tone and the shortened R-P intervals was due to sympathetic nerve activities stimulated by acupuncture. Thus, increased activities of both sympathetic and vagal nerves could coexist simultaneously during acupuncture [462].

In treating arrhythmia, stimulation of auricular reflex points can generate conspicuous effects, which may be due to the distribution of vagus nerves on the ear and that their fibers can be directly punctured. For supraventricular tachycardia, auricular points *Heart*, *Shenmen*, and *Sympathetic* can be selected, or apply body acupuncture or acupressure on Zanzhu (BL2) of the orbit, which may play an inhibitory role similar to pressing the supraorbital foramen, a more familiar way for doctors.

19.4 Raynaud's Syndrome

Raynaud's syndrome is manifested as regional ischemia due to spastic or functional occlusion of arterioles on the extremities. The primary type is called Raynaud's disease, of which the patient has intermittent changes of the skin color, such as pale and cyanosis on the extremities, accompanying the digital pain if exposed to cold air or due to emotional disturbance. Younger females are more susceptible to this disease. The cause is still unclear, but it might result from raised sympathetic activity or sensitivity of the regional artery to cold stimulation. The secondary type is called Raynaud's phenomena, such as the thromboangiitis obliterans that mostly occurs on the lower limb asymmetrically, showing feeble or unremarkable arterial pulsation of the dorsum of the foot, with symptoms similar to Raynaud's disease.

[Therapy]

There are four types of point selection and needling methods as below.

(1) Select acupoints along the meridians on the affected extremity, where needling sensations can be generated and propagated to the distal area of the affected limb.

(2) Select corresponding nerve points, which innervate the affected portion of the body. For example, when the middle finger is affected, puncture Neiguan (PC6) or the *median nerve point*, making numbness or electric-shock sensation propagated to the middle finger.

(3) Select local points on the muscles corresponded to the affected portion. For example, when the thumb or index finger is affected, puncture Hegu (LI4) with different needling directions towards the radial or ulnar side of the thumb respectively. Once there is a twitching of the thumb or the index finger, it will indicate that the corresponding muscle of the finger has been stimulated respectively.

(4) Select points on the contralateral side of the affected portion and apply ONM (opposite needling method).

No matter what point selection method is applied, retain the needles, and connect them to an electric stimulator for 30 min after the generation of satisfactory needling sensations. Besides, a blood vessel stimulation method can be combined. For symptoms of arterial occlusion in the upper or lower extremities, apply finger pressure on Jiquan (HT1), Qichong (ST30) or Jimai (LR12) to temporarily block the blood circulation of axillary artery or femoral artery for 1~2 min. Then immediately release the pressure to recover the blood perfusion (refer to Section 12.6). Moreover, one may incorporate acupuncture with other adjunct therapies, such as cold and hot hydrotherapy alternately, infrared radiation, direct electrical stimulation, as

well as acupressure.

【 Case Studies 】

Case 83: Patient was a 67-year-old male. He had suffered from severe pain, cold skin, and cyanosis of the left foot due to poor blood circulation for 2 years. His sleeping and walking were severely affected. Zusanli (ST36), Qiuxu (GB40), Taichong (LR3), Yinlingquan (SP9), Sanyinjiao (SP6), Taixi (KI3), and Rangu (KI2) were punctured. Needles were retained for 30 min. Infrared radiation was combined with needling. After the initial session, he felt an immediate improvement. He first took 10 consecutive sessions of treatment at once weekly, and then took treatment once monthly for another 10 months. In the end, his pain was entirely under control. Although the patient had occasional onsets later on, they were resolved instantly with one or two more acupuncture sessions. At the 4-year-follow-up, the patient indicated there was no pain at all when walking.

Case 84: Patient was a 33-year-old female. She had suffered with intermittent pain, cold skin, and cyanosis of the right thumb for several years. She was diagnosed with occlusion of digital artery of thumb, and the pain worsens in the colder weather. Meanwhile, she also had scleroderma of the digestive tract. Hegu (LI4), Shaoshang (LU11), Yangxi (LI5), and Lieque (LU7) of the affected side were punctured. Needles were retained for 20 min after the generation of needling sensations, while infrared radiation, electrical stimulation were combined with needling. While puncturing Hegu (LI4), the needle was oblique inserted toward the side of thumb, making twitching of thumb as the indicator of desired needling responses. She felt remarkable relief of the pain through each session of treatment, but the effect was not sustained. After receiving consecutive treatments of 6 months at twice weekly, she

continuously took the treatment for another 6 months at once weekly. By that time, her thumb pain was completely under control and she no longer felt cold skin like that before the treatment.

【 Discussion 】

Acupuncture has certain short-term curative effects in treating this disease. It often can recover normothermia of the affected extremities and relieve pain quickly, but its long-term outcome remains unknown and needs further studies.

Appiah *et al.* of Germany recently conducted a controlled, randomized study in which 32 patients with primary Raynaud's syndrome were divided into one acupuncture treatment group (17 cases) and one control group (16 cases). The patients of the treatment group were given seven acupuncture treatments during the weeks 10 and 11 of the observation period. The results were that treated patients showed a significant decrease in the frequency of attacks, the overall reduction of attacks was 63% (control 27%, $P=0.03$). They concluded that acupuncture therapy is a reasonable alternative in treating patients of the primary Raynaud's syndrome^[463]. There were similar results from other reports. It was found that mechanisms of acupuncture might include releasing the arterial spasm and especially in increasing the circulation in collateral vessels^[464]. However, there was a report in which angiograms were obtained before and after acupuncture in a small series of patients with Raynaud's disease. It did not give positive evidence of therapeutic effect, though a marked vasodilatory action was noted^[465].

Effects of ONM (opposite needling method) on obliterative arteritis have been supported by studies. Li of China studied 38 patients of this disease with rheograph of the extremities. These cases were divided into two groups: one group with ONM on the healthy side, while the other group with

non-ONM (direct needling on the affected side). Both groups applied methods of equal tonification and purgation on Yanglingquan (GB34) and Zusanli (ST36). After the generation of needling sensations, needles were retained for 10 min. The rheograph of the bilateral big toe was recorded at 15 min before and after needling, respectively. The results showed that the amplitude of rheograph in the ONM group was obviously raised on the affected side and had

significant difference ($P < 0.01$) comparing with that prior to needling, whereas that on the healthy side was also raised but did not show the difference ($P > 0.05$). The amplitude of rheograph in the non-ONM group was not raised on the affected side, but was raised on the healthy side ($P < 0.05$). These results indicated that the instant improvement of blood circulation on the affected extremities using ONM is better than that of non-ONM ^[175].

Disorders of Respiratory System

20.1 Common Cold/Tonsillitis

Acupuncture has certain effects for fever and sore throat caused by common cold, influenza, or acute tonsillitis.

【 Therapy 】

Select and puncture Dazhui (GV14), Fengchi (GB20), Quchi (LI11), and Hegu (LI4) with an intense stimulation to facilitate perspiration. It is not required to retain needles. Alternatively, prick blood on Shaoshang (LU11) or Shixuan (EX128) with a thick filiform needle or a three-edged needle.

Auricular acupuncture can be applied alone, such as pricking blood on the auricular apex, one side or both sides.

【 Discussion 】

Tan of Beijing, China applied rapid needling technique to treat fever due to exopathic wind-cold in 57 cases of common cold, influenza, acute tonsillitis, and acute bronchitis. Dazhui (CV14), Fengchi (GB20), and Quchi (LI11) were used and the total effective rate was 80.7%. After the treatment, the axillary temperature drop was over 1.0 °C in 19 cases and 0.5~1.0 °C in 27 cases. Even though their peripheral blood leukocyte and lymphocyte counts differed insignificantly after needling, while the

body temperature, respiration rate, pulse, BP, and temperature of the acupoint all dropped, with a simultaneous increase in the percentage of T-lymphocytes. The author noticed the immediate effects were especially marked in fevers due to exopathic wind and cold ^[466].

In treating fever due to exopathic wind-cold, a key principle of acupuncture is to apply a strong stimulation making the whole body, particularly the upper portion, and the head perspire. Thus, commonly used acupoints are those sensitive points located on the upper limbs or the head with stronger needling sensations, such as Hegu (LI4), Quchi (LI11), and Fengchi (GB20). After the generation of needling sensations and perspiration, remove the needles immediately. If the perspiration and pain relief still cannot be attained by the general acupuncture, one can also combine the method of pricking blood, such as that on Shaoshang (LU11) to help perspiration and relieve sore throat. The essence of pricking blood is directly stimulate the free endings of sensory nerves and sympathetic nerves distributed on the blood vessel walls, so it is required to “acquire a intense pain” and to “have a certain amount of bleeding” (refer to Section 12.6). That can explain why applying the three-edged needles, a thicker kind of needle than the filiform needle, can achieve better effectiveness. According

to Prof. Fang, Youan's experience, when pricking blood on Shaoshang (LU11) with a three-edged needle, the needling should be quick, accurate, and not overly light, with 2~3 drops of blood to reach the purpose of treatment ^[196].

In addition to Shaoshang (LU11), other points of the fingertips such as Shangyang (LI1), Guanchong (TE1), or Shixuan (EX128) also can be selected to achieve similar effects of perspiration and to relieve sore throat. Shixuan (EX128) points located on the fingertip and Shaoshang (LU11) are often the most sensitive points of the body, and pertain to central reflex zones. They are also within an overlapping area between the otorhinolaryngologic reflex zone and the central reflex zone. When they are stimulated, the patient may feel an intense regional pain, and induce instant reactions of perspiration and pain-relief of the throat through CNS.

In summary, the effects of acupuncture for symptoms of fever, headache, and pharyngalgia caused by common cold or acute tonsillitis often are superior to that from medicated fever reducers and pain relievers. However, when supportive tonsillitis occurs, or when the upper respiratory tract has been severely infected, applying acupuncture alone may be insufficient to control such conditions, antibiotics, or effective Chinese herbs should be timely prescribed.

20.2 Asthma/Bronchitis

It has been demonstrated by a large number of studies that acupuncture, as an adjunct therapy, can be safely used in treating respiratory disorders such as asthma and bronchitis. For example, it can improve conditions of bronchial asthma, chronic

bronchitis, and chronic disabling breathlessness to varying degrees ^[467]. Acupuncture treatments for these respiratory disorders are similar, thus they are discussed altogether in this section.

【 Therapy 】

Select and puncture reflex points of tenderness or hard nodules within lung reflex zones of the back, chest, and the palmar side of upper limbs, such as Dazhui (GV14), Dazhu (BL11), Fengmen (BL12), Shenzhu (GV12), Feishu (BL13), Jueyinshu (BL14), Xinshu (BL15), Geshu (BL17), Pishu (BL20), and Shenshu (BL23) on the back, Tanzhong (CV17), Zhongfu (LU1) and Yunmen (LU2) on the chest, Chize (LU5), Kongzui (LU6), Taiyuan (LU9), and Yuji (LU10) on the upper limb. Select 5~7 points each session, retain needles for 20~30 min after the generation of needling sensations. Combine with moxibustion after needling or via a ball of argyi moxa fixed on the needle handle during the needle-retaining period if necessary. In addition, infrared radiation instead of moxibustion can be applied on the chest and back during the needle-retaining period. Administer acupuncture once daily or even two to three times daily for those with acute onsets and serious symptoms. Once acute symptoms are under control or for chronic patients, administer acupuncture once every 3~4 days.

ANEM or APPM on auricular points can be applied in conjunction with body acupuncture. Select three reflex points, such as *Lungs*, *Pingchuan*, *Kidney*, *Adrenal gland*, *Sympathetic*, *Subcortex* on one side of the ear each session, and alternately stimulate both ears every 3~4 days.

Besides, herbal patch or ointments, cupping or laser stimulation on points can be incorporated. A kind of Chinese herbal plasters called *Shang-Shi-Zhi-Tong-Gao* (analgesia plasters for damp pain) has an action of skin irritation like thermal stimulation. It

can be externally applied on selected sensitive reflex points of lung reflex zones in the chest or back, once daily.

【 Case Studies 】

Case 85: Patient was a 41-year-old female. She had suffered from asthma since age 16. She often had onsets and needed medications (Ventolin and Albuterol) to control them, but the effectiveness was not ideal. She came to acupuncture for the latest onset because she did not like to take medications any more. Bilateral Feishu (BL13), Dazhui (GV14), Chize (LU5), and Kongzui (LU6) were punctured and needles were retained for 30 min after the generation of needling sensations while infrared radiation was applied on her back. She instantly felt better after the initial session but still had some shortness of breath. Through the second session three days later, she showed a remarkable improvement. After the third session, her symptoms were almost under control. Later on, she took another two sessions of treatment to stabilize the results.

Case 86: Patient was a 45-year-old female. She had suffered from chronic asthma for many years. In the winter of 1972, she had a severe asthma attack triggered by a common cold and could not be controlled even with medications. The patient was afraid of the needles so only Chinese herbal patches called *Shang-Shi-Zhi-Tong-Gao* were applied on her bilateral Feishu (BL13), where marked tenderness was detected. Her asthma was alleviated after just one night, and was under complete control after several consecutive days of patch applications. Since that winter, she no longer had onsets of asthma.

【 Discussion 】

Today, it has been widely recognized that acupuncture is effective in treating bronchial asthma or chronic bronchitis, particularly in changing the

patient's subjective feeling. The effectiveness also could be manifested as reducing medication dosage of bronchial dilators or amount of steroids taken by the patient at the time. Acupuncture not only has instant results for acute onsets of this disorder, but also has good long-term effectiveness for many chronic patients. However, for those with severe asthma or acute bronchitis, be cautious and do not immediately withdraw medications without the consent of the doctor who originally prescribed the medications.

Hu of Beijing, China reported 25 cases of hormone dependent bronchial asthma treated by acupuncture, yielding a remarkable effective rate of 56% with a total effective rate of 96%. He found that asthmatic symptoms in most of the patients began to show improvement after several acupuncture treatments with the dosage of the drugs gradually reduced. Generally, the dose of cortisone was decreased by 2 mg every 10 days, while the symptoms in most of the patients were markedly improved after 15 treatments, but the treatment was continued for another 10 times to stabilize the curative effect. Thus, each asthmatic patient needed to receive approximately 30 sessions of acupuncture treatment over 3 months. Thereafter, in order to prevent relapses, the treatment should be applied 10 sessions each year in the summer season. For those with poor results, or acupuncture were difficult to apply, APPM may be combined with cupping instead ^[468]. In a retrospective study of 17 patients with long-standing history of asthma bronchiale treated with acupuncture, Zwolfer *et al.* of Austria found that over 70% of the patients reported a significant improvement of their ailments after 10 weeks of treatment as well as 6 months after starting acupuncture ^[469].

Sliwinski *et al* of Poland applied acupuncture to treat 51 patients suffering from chronic spastic bronchitis. Out of the 51 patients, 36 completed 3

years of acupuncture treatment. Acupuncture sessions were applied twice weekly. Therapy program consisted of 2 or 3 months of acupuncture treatment in alternation with an equal period (2 or 3 months) of recess during which no treatment was applied. Before acupuncture, patients had taken corticosteroids either orally and/or intramuscularly for a period of 2 to 24 years. It was found that 63.8% of the patients were able to eliminate corticosteroids for the last part of this study period, i.e., from 3 to 26 months (average period 10.2 months). In 13.9% of the patients, the dose of intramuscularly injection of corticosteroids was reduced over 60% during acupuncture treatment. In 16.7% of the patients, the oral intake of corticosteroids was only during lung infections with dyspnea. In 7 patients (i.e., in 19.5% of the 36 patients), application of all previously required drugs (i.e., corticosteroids, mucolytic drugs, appropriate antibiotics, sympathomimetic β -agonists, and so on.) during the last 3 to 15 months of this study period were no longer required [472]. Sliwinski *et al.* further observed that those patients suffering from chronic spastic bronchitis had leukocyte migration defect before acupuncture. This defect increased in patients who had taken corticosteroids. After 42 acupuncture sessions, the amount of leukocytes in the tissue pool came close to the value found in healthy persons during leukocyte migration [473].

Yu *et al.* of Harbin, China treated 72 infant acute bronchitis cases with Chinese herb pastes on acupoints and showed a high curative rate. The curative rate of the infantile group is higher than that of the childhood one. All indices of humoral immune substances (IgA, IgM, IgG, Complement C3), especially IgA, were increased after treatment [474]. In addition to acupuncture and external application of Chinese herbs on acupoints, a laser stimulation applied on acupoints is also effective in treating bronchitis [475, 476].

As for mechanisms of acupuncture in treating

asthma and bronchitis, there have been many clinical studies. In addition to those mentioned above, Aleksandrova *et al.* of Russia investigated the development of nonspecific bronchial hypersensitivity and hyper-reaction in bronchial asthma and effectiveness of its correction with acupuncture in 152 patients with asthma and preasthma. They found that the regulatory role of acupuncture consisted in the reduction of nonspecific bronchial hyper-reaction, normalization of blood acetylcholine, desensitization of cell β -adrenergic sensory receptors, elevation of mean concentrations of 11-OCS and T-lymphocytes [477]. In treating 50 patients with chronic obstructive bronchitis and 61 patients with bronchial asthma using laser puncture, Zamotaev *et al.* of Russia observed a positive response to 10 sessions of infra-red laser acupuncture evident from improved bronchial potency, enhanced bronchial sensitivity to sympathomimetics, reduced systolic pressure in the pulmonary artery. Accordingly, they thought that the promise of the laser puncture was attributed to its separate broncholytic effect and the ability to lower pulmonary vascular resistance [478].

In the West, there are some research reports indicating the specificity of action of acupoints was not seen in treating asthma using acupuncture or laser acupuncture [467, 470, 471]. In a review on the effects of acupuncture in treating pulmonary disease, Jobst of UK pointed out that though most sham points were believed to be inactive according to TCM principles, many are actually active in treating pulmonary diseases [467]. This may explain why the results of real and sham acupuncture in those reports were not significantly different.

Biernacki and Peake of UK conducted a randomized, double-blinded study on acupuncture effects in 23 cases of stable asthma. Apparently, there was no improvement in any aspects of respiratory function

measured after real or sham acupuncture. Despite this, there was a significant improvement in Asthma Quality Life Questionnaire and parallel reduction in the usage of bronchodilators. They concluded that acupuncture could be useful in improving quality of life in some patients and reducing the need for using bronchodilators. However, they thought it was either a placebo effect or that precise sites of puncturing on the chest are unimportant ^[470].

However, based on most clinical reports until now,

the specificity in actions of acupoints during the treatment of asthma or bronchitis does exist. Acupoints or reflex points distributed on lung reflex zones of the front chest, back, and medial and upper limbs are such examples. Some points of sham acupuncture used in West are actually points used for asthma in TCM ^[479], so such conclusion of “no specificity in actions of acupoints” should also be carefully analyzed.

Disorders of Digestive System

21.1 Nausea/Emesis/Hiccups

Nausea, emesis (vomit), and hiccups (the diaphragm spasm) are all familiar indications of acupuncture. There are various causes for nausea and emesis. A great deal of clinical studies have demonstrated that acupuncture has good results for nausea and emesis including dry retching, which may be caused by surgeries or chemotherapies, or nausea due to pregnancy. Regardless of nausea, emesis, or hiccups, acupuncture treatments for them are similar.

【 Therapy 】

Select points within any one of the five stomach reflex zones (refer to Appendix A), or select one point per zone and associate together. For example, the combination of Neiguan (PC6), Zusanli (ST36), and Zhongwan (CV12) is commonly used. These three points can be stimulated simultaneously as long as the patient is in a supine posture. If points on abdominal reflex zones are selected to associate with that of the back, then they must be stimulated separately. Stimulation methods can be acupuncture, moxibustion, or acupressure. Because forehead pain or dizziness often correlates with nausea, puncturing or pinching Yingtan (EX2) with fingers is effective to relieve nausea. In addition, apply finger pressing

at Zanzhu (BL2) and Tiantu (CV22) for severe emesis or hiccups, and puncture Shenmen (HT7) and Baihui (GV20) for central reflective emesis, as well as combine with Yingxiang (LI20) and Hegu (LI4) for hyperosmia, which could be related to emesis of many gravida in the earlier term of pregnancy. Retain needles for 30 min after the generation of needling sensations. For acute patients, acupuncture can be applied at least once daily.

Auricular points of *Stomach*, *Diaphragm*, *Shenmen*, *Mouth*, and *Subcortex* of auricular reflex zones can also be stimulated with needling, ANEM, or APPM. The latter is particularly applicable to chronic and persistent symptoms, such as pregnancy emesis.

【 Case Studies 】

Case 87: Patient was a 55-year-old female. She had suffered from multiple cancers (ovary cancer, breast cancer, metastatic melanocytoma), and was undergoing chemotherapy with intravenous injection of Taxol and Carboplatin once every three weeks for six rounds. She had side effects of nausea, fatigue, numbness of hands and feet, headache, sleeping disturbance after the first three rounds of chemotherapy, especially during the first three days. These symptoms lasted for about three weeks. She first came to acupuncture one day before her scheduled fourth round of chemotherapy, and later

she had a follow-up acupuncture session three days after the chemo. For acupuncture, seven points of Yintang (EX2), bilateral Neiguan (PC6), Zusanli (ST36), and Shangyanling (EX15) were punctured with the retaining of needles for 30 min after the generation of local needling sensations, including soreness and heaviness. She immediately felt better after removing needles in her follow-up visit. On the following day, she came in for third session of acupuncture, and reported that her nausea symptoms had eased markedly and sleep was plentiful. Later on, she took another three sessions of acupuncture in two weeks, and gradually felt more energized and less fatigue all over the body. Soon afterwards, she started her fifth round of chemotherapy and received the same acupuncture treatment as before, only that time, all of her symptoms of nausea, headache, and fatigue were gone completely after acupuncture. After another 20 days, she was feeling good and seemed all but insomnia had been relieved by acupuncture. She took the same acupuncture treatment after the sixth round of chemotherapy so that it could be completed more smoothly. In the end, her self-evaluation showed that the side effects of the three latter rounds of chemotherapy during acupuncture were much less than that of the first three rounds.

Case 88: Patient was a 17-year-old female. She had suffered from anorexia nervosa for over three months and was worsening in the recent two weeks. She felt nauseous and vomit whenever seeing the food, making it impossible to take any meals. When bilateral Neiguan (PC6) was punctured, she felt an electric-shock sensation radiating toward the middle finger. The needles were retained for 30 min, during which, a gruel meal was fed to her using a spoon, without any vomiting. Since then, her appetite recovered and she could take meals by herself without any loss of appetite.

Case 89: Patient was an 82-year-old male. He had suffered from frequent hiccups since he had apoplexy for two years. Lately, he had hiccups for five consecutive days that affected his sleep and made him unwell. Bilateral Neiguan (PC6), Zusanli (ST36), Yifeng (TE17), as well as Yintang (EX2) and Baihui (GV20) were selected and punctured. Needles were retained for 30 min after the generation of needling sensations. After the treatment, his hiccups instantly ceased, and he received a good night of sleep. Later in the week, he had several more acupuncture sessions once daily to stabilize the effectiveness. His hiccups did reoccur one week later but subsided again after one session of the same treatment. He still had occasional hiccups since then, so he took acupuncture continuously once every other day for another seven sessions over three weeks. Combining with ANEM each time on auricular points *Diaphragm*, *Stomach*, *Subcortex*, and *Brainstem*, he had only one relapse of hiccups for one day during that period.

[Discussion]

There are numerous clinical trials about antiemetic effects of acupuncture worldwide, with the most applied point being Neiguan (PC6). Although most researchers believed its effectiveness, some researchers could not directly see the results or detect significant differences between the treatment group and the control group. The first reason behind their disputes is that there are various causes of vomit, and it is impossible to be relieved with a single point of Neiguan (PC6) completely. For example, puncturing Neiguan (PC6) did not diminish emesis in children following tonsillectomy or strabismus surgery ^[480, 481]. For vomiting caused by reflective stimuli of the pharynx or eye, one may choose other related points for treatment, such as Tianzhu (BL10), Dazhu (BL11), and Yanglingquan (GB34), which

could also significantly reduce vomiting due to strabismus correction in children ^[481]. Another reason is the differences of stimulation methods on Neiguan (PC6) or the differences in needling sensations attained, which are important factors affecting curative effects for all indications of acupuncture.

Generally, stimulation of Neiguan (PC6) is more suitable for emesis due to the irritation of internal organs, such as gynecological surgeries ^[482~484], or due to central causes, such as chemotherapy or morphine applied ^[485, 486]. According to Dundee of North Ireland, EA (10 Hz applied for 5 min) was applied on Neiguan (PC6) as an antiemetic in 130 patients who had a history of distressing sickness after previous chemotherapy. Results showed that sickness was either completely absent or reduced considerably in 97% of patients and no side effects were encountered ^[485]. Dibble of USA applied finger acupressure bilaterally at Neiguan (PC6) and Zusanli (ST36) in 17 patients with breast cancer, and found this therapy could significantly reduce intensity and experience of nausea during the first 10 days of the chemotherapy cycle ^[487].

In a randomized controlled trial to assess the antiemetic effect of acupuncture, which was performed by Shen *et al.* of USA, 34 women undergoing stem cell transplant for breast cancer were randomly assigned to groups. In the acupuncture group, patients took 4 Hz of EA at classical antiemetic acupoints of Neiguan (PC6) and Zusanli (ST36) for 20 min daily for 5 days. They found that the number of emesis episodes during the 5 days was lower for subjects receiving specific acupuncture than subjects receiving non-specific acupuncture or no acupuncture. Nausea severity was lower for subjects receiving specific acupuncture than subjects with non-specific acupuncture, and both groups were lower than subjects that received no intervention. The global quality of life reported by subjects

receiving both specific and non-specific acupuncture was higher than reported by subjects receiving no intervention. These data suggested that antiemesis acupuncture might reduce high dose chemotherapy induced nausea and vomiting ^[488]. The above Case 87 is an example that had successful results of acupuncture for the side effects of radiotherapy.

Generally, most clinical trials of acupuncture in the West overlooked the impacts of different needling sensations upon antiemetic effectiveness, and applied various stimulation methods on Neiguan (PC6). Some studies demonstrated that acupuncture had better effectiveness than acupressure in relieving emesis, also EA better than TENS ^[489]. However, acupressure or the method using an elasticized wristband with a plastic stud is simple and easy to be practiced, and can prolong the antiemetic actions. Dundee and Yang observed that antiemetic efficacy of TENS on Neiguan (PC6) was limited to 6~8 hours, while application of the elasticized wristband with a stud placed over Neiguan (PC6) would prolong the antiemetic action for 24 hours ^[490]. When puncturing Neiguan (PC6), needling sensations generally are required to be propagated to the fingers. If needling sensations can be propagated to the proximal portion of the body through certain particular manipulations, such as the elbow, the effects will be much better.

There have been many successful cases on the effect of acupuncture, EA or acupressure on Neiguan (PC6) inhibiting nausea, dry retching or emesis due to pregnancy ^[491~493, 495, 496]. Acupuncture or acupressure in general has better effects for nausea and dry retching, but not as ideal for emesis. Belluomini *et al.* of USA reported that acupressure at Neiguan (PC6) was effective in reducing symptoms of nausea but not the frequency of vomiting in pregnant women ^[491]. A single-blinded, randomized controlled trial was undertaken by Smith *et al.* of Australia in

which 593 women less than 14 weeks' pregnant with symptoms of nausea or vomiting were treated by acupuncture. They found that acupuncture was an effective treatment for nausea and dry retching experienced in early pregnancy, but had no effect on vomiting ^[495].

The antiemetic action of acupuncture is thought to be related to the inhibition of stomach movement ^[490], but the mechanism of acupuncture for reducing or preventing nausea occurrence is still unclear. In the above Case 88, the emesis was caused by anorexia nervosa, where the effects were attained just via puncturing Neiguan (PC6). Of course, psychologically dropping a hint also played a role in this remarkable case.

According to distribution rules of visceral reflex zones on the limbs, reflex zones of the stomach, which is passing through the diaphragm (small portion above the diaphragm, large portion below the diaphragm), may lodge at the upper and lower limbs simultaneously (refer to Section 3.7). Neiguan (PC6) and Zusanli (ST36) are primary points of stomach reflex zones at the upper and the lower limbs, respectively. Zhongwang (CV12) resides around the center of upper abdomen, while Yintang (EX2) is located on the stomach reflex zone of the forehead. Thus, selection of these four acupoints is the optimal combination in treating nausea, emesis, or gastric disorders. Moreover, their stimulation can be administered simultaneously through the same supine posture. Of course, some points of the back may be associated with abdominal points or other points at different postures sequentially. When Master Jiao treated hiccups, he preferred Dazhui (GV14), Shenzhu (GV12), Zhiyang (GV9), Geshu (BL17), and Weishu (BL21) of the back, then Tanzhong (CV17), Zhongwan (CV12), and Qihai (CV6), as well as Zusanli (ST36) and Yanglingquan (GB34) of the lower limb.

Occasional hiccups (singultus) may subside spontaneously, but if they persist for a long time then they need to be treated. Acupuncture and acupressure are often effective in ceasing hiccups. In 2002, Schiff *et al.* reported two patients with persistent hiccups, refractory to conventional treatments, were treated successfully using acupuncture ^[497]. Persistent hiccups are a rare but severely disabling disorder. The causes are miscellaneous.

In our clinic practice, we have treated many intractable hiccup cases successfully. In the above Case 89, persistent hiccups occurred after a cerebrovascular accident, its cause obviously is in the central, so we combined Baihui (GV20) of central reflex zones in treating this case. Moreover, due to its refractory future, ANEM was applied at *Subcortex* and *Brainstem* of auricular reflex zones. We experienced that in hiccup patients whose phrenic nerve was pinched by causes difficult to be released with conservative interventions, such as the pressure of tumor or ascites, acupuncture was difficult to take effects, especially to stabilize the effects. Auricular acupuncture applied in conjunction with the body acupuncture may be one way to raise effectiveness. In addition, choosing reflex points within reflex zones of the diaphragm is relevant. The reflex zone of the diaphragm on the ear is easily distinguishable, namely on the helix root (refer to Section 3.10). As for reflex zones of the diaphragm at the whole body surface, we think that it overlaps partially with reflex zones of the stomach, so in treating refractory hiccups, points within the stomach zone are also applicable. In addition, when treating refractory hiccups, it is better to change associate points slightly for each session to avoid occurrence of the needling-resistance that might result in the decline of effectiveness.

21.2 Gastritis/Peptic Ulcer/Reflux Esophagitis

Acute or chronic gastritis including superficial gastritis and atrophic gastritis, as well as peptic ulcer and reflux esophagitis are indications of acupuncture treatment. Patients with gastric disorders who come for acupuncture are mostly chronic. In spite of hyperacidity or hypoacidity of the stomach, acupuncture has good effects, and their treatment methods are similar.

【 Therapy 】

Select points within stomach reflex zones at the upper abdomen, back, and medial sides of the extremities. Zhongwan (CV12) and Liangmen (ST21) of the abdomen, Weishu (BL21) and Pishu (BL20) can be used as master points for local stimulation because these locations often have reflections of gastric disorders, such as tenderness and hard nodules. Neiguan (PC6) and Zusanli (ST36) are master points for distal stimulation. The local and distal reflex points may be combined and both needling and moxibustion can be employed. Besides, select Zusanli (ST36) and Diji (SP8) for the inhibition of gastric acid, Neiguan (PC6), Quze (PC3), and Yintang (EX2) for nausea and vomiting, Tanzhong (CV17) and Tiantu (CV22) for esophagitis or cardiospasm. During the acute period or for patients with severe symptoms, acupuncture is applied at least once daily and at least twice weekly for chronic patients. When puncturing distal points, it is preferred to generate needling sensations and propagate them to the affected region. Retain needles for 30 min.

For chronic patients or those who cannot receive frequent treatments, ANEM or APPM may be applied on auricular reflex points, such as *Stomach*, *Small intestine*, *Shenmen*, and *Subcortex*.

【 Case Studies 】

Case 90: Patient was a 33-year-old male. He had suffered from stomachache and hyperacidity for six months and was diagnosed as superficial gastritis. ANEM was applied on auricular points with tenderness such as *Stomach*, *Small intestine*, *Shenmen*, and *Subcortex*, three points each session, once every 3~4 days, alternately on both ears. The patient was advised to take meals on time everyday. Through ten sessions of treatment, his stomachache and hyperacidity subsided completely. At the 10-year-follow-up, he indicated there was no recurrence of this disorder.

Case 91: Patient was a 32-year-old male. He dealt with an uncomfortable upper abdomen for two months. His symptoms include hyperacidity, tenseness and pain of the upper abdomen after meal, flatulence, and so on. X ray exams of the gastrointestinal tract were negative. He was diagnosed as suspicious reflux esophagitis or hiatal hernias. Body acupuncture and ANEM were applied, at once weekly. Bilateral Zusanli (ST36), Sanyinjiao (SP6), Neiguan (PC6), and Yintang (EX2) of stomach reflex zones, as well as auricular reflex zones *Stomach*, *Esophagus*, *Small intestine*, *Subcortex*, and *Shenmen* were selected and punctured, three points per session. After the initial session, he felt marked improvement for several days. After nine consecutive sessions of treatment, his symptoms subsided almost completely. Four months after discharging from the treatment, he came back for another session as a preventive tune-up. At the 8-month-follow-up, he stated that the results were stable.

Case 92: Patient was a 60-year-old female. She was diagnosed as duodenal ulcer and reflux esophagitis five years ago but was recovered after taking peptobismol. Recently she had some recurrence of the pain in the upper abdomen and hyperacidity. The pain was especially worse on an empty stomach. Her

tongue coating was thick, white, and greasy. For acupuncture, Zusanli (ST36), Neiguan (PC6), Tanzhong (CV17), and Yintang (EX2) were selected with 30 min of needle-retaining period after the generation of needling sensations. Following the removal of needles, stomach reflex zones of her back were massaged for three min. The patient received 10 sessions of acupuncture at once or twice weekly. She felt much better after the initial session of acupuncture, and no longer had hyperacidity after the third session. Her tongue appeared normal through the fifth session, but still had occasional abdominal tenseness until the end of the treatment course.

【 Discussion 】

The whole body reflex zones of the stomach can be divided into four main parts: the anterior chest and the upper abdomen, back, forearm and the palmary side of hand, as well as the medial side of leg and foot (Color Figure 15 at the end of the book). Among them, one of most famous acupoints is Zusanli (ST36), which has been verified to have a link with innervations of the stomach in addition to having numerous reports on its clinical applications. In a 1983 study, Zhang *et al.* demonstrated that the afferent neurons from Zusanli (ST36) area and the nerve dominating the stomach converge or overlap in some segment of the spinal cord ^[66]. In 2001, Lee *et al.* of Korea found a commonality of cell groups in the central autonomic center of the rat brain controlling the stomach and Zusanli (ST36) ^[498]. When puncturing Zusanli (ST36), needling sensations generated usually are propagated to the dorsum of foot. At that time, if one could apply specific manipulations, such as blocking the distal portion of Zusanli (ST36) with a finger pressure and alternating the needling direction upward, needling sensations might be propagated to the thigh or even the

abdomen, the effect would be much better. Another important acupoint in reflex zones of the stomach is Neiguan (PC6), of which the needling method has been analyzed in the preceding section.

The mechanisms of acupuncture in treating gastritis, peptic ulcer, or reflux esophagitis are mostly related to the regulatory action on the secretion of gastric acid and the function of digestive tract. Qian and Lin of Changsha, China observed that EA on Zusanli (ST36) might have dual effect on the regulation of the pyloric peristaltic function, which expressed itself as enhancing hypofunction and weakening hyperfunction ^[499]. In treating 31 chronic superficial gastritis patients, Zhou of Beijing, China observed that the content of hydrochloric acid tended to fall after acupuncture while in hypoacidity patients the content tended to rise after acupuncture. They also found that some changes of the gastric juice volume in one group: the low volume rose and the high volume fell after acupuncture ^[500]. Reported by Liu *et al.* of Beijing, China, after needling Zhongwan (CV12), Neiguan (PC6), and Zusanli (ST36), the amount of fluorescent G cells and the fluorescent intensity of gastrin in the G cells were obviously decreased in patients with duodenal ulcer, as compared with that before acupuncture treatment. However, the amount of G cells was increased by acupuncture treatment in patients with chronic atrophic gastritis ^[501]. Cheng and Yang of Chengdu, however, observed that the decrease of gastric acid output in patients with peptic ulcer disease after acupuncture was not caused by the change of plasma gastrin. The plasma prostaglandin E1 might be involved in this process because both the plasma gastrin and prostaglandin E1 were increased after acupuncture ^[502].

Shirota Bunshi of Japan accumulated an abundant experience on the application of tender spots in treating stomach diseases using acupuncture ^[88]. He

found that particular tender spots for duodenal ulcer were mostly located on Liangmen (ST21), Hua-roumen (ST24), Pishu (BL20), Weicang (BL50), Baohuang (BL53), and Daqie (EX139) of the right side. Baohuang (BL53) is namely **buttock point** named by Onodera of Japan. According to the theory proposed by Onodera, when this spot showed moderate or intense tenderness, it meant that the stomach or duodenum definitely was suffering from ulcer. When pressed forcefully, it could induce sensations propagated to the lower back, abdomen, even the entire lower limb, and tenderness degree was in a direct proportion with the severity of disorder. Once it became negative, it indicated the disorder was cured. His teacher, Sawada often applied Liangqiu (ST34) for stopping bleeding of digestive hemorrhage. Liangqiu (ST34), Weicang (BL50), and Pigen (EX109) were thought to be especially effective points for stomach spasm, while the point 0.5 *cun* away from GV at the T7 level and Zhiyang (GV9) were the specific reflex points for hyperacidity.

Note that Liangqiu (ST34), a *xi* (cleft) point of ST meridian, is also a master point that may treat gastric disorders according to ancient TCM literature. However, there is no other acupoints at its surroundings that could be used to treat gastric disorders. Moreover, there is a knee joint between it and Zusanli (ST36). Thus, in this book, Liangqiu (ST34) is excluded from the stomach reflex zone centered at Zusanli (ST36), located on the anterior and upper portions of the leg (refer to Appendix A).

Through comparison, it was reported that puncturing acupoints of ST and SP meridians had better effectiveness of inhibiting gastric acid than that of other meridians. For chronic atrophic gastritis or peptic ulcers, in addition to above-mentioned body and auricular acupuncture, acupressure, injection or external application of Chinese herbs on acupoints

may be alternative means that have been successfully applied in the clinic ^[503–505].

21.3 Ulcerative Colitis/Irritable Bowel Syndrome/Crohn's Disease

Acupuncture has certain therapeutic effectiveness for functional intestinal diseases, such as irritable bowel syndrome (IBS), non-ulcerative indigestion, and inflammatory intestinal diseases, such as ulcerative colitis and Crohn's disease.

【 Therapy 】

Detect reflex points within following three regions of intestinal reflex zones (refer to Appendix A): Dachangshu (BL25), Guanyuanshu (BL26), and Xiaochangshu (BL27) at the lumbosacral region; Tianshu (ST25), Qihai (CV6), and Guanyuan (CV4) at the lower abdomen; Yinlingquan (SP9), Diji (SP8), and Zusanli (ST36) at the medial side of the lower limb. Select 2~4 points each region and associate either abdominal or lumbosacral points with those on the lower limb. Retain needles for 30 min after the generation of needling sensations. Moxibustion also may be applied on abdominal points alone or after needling, while acupressure also can be applied on lumbosacral points alone or after needling. Administer acupuncture once every other day or every 3~4 days, moxibustion once everyday. For chronic patients, it generally needs several courses of treatment in a few months to achieve a better outcome.

In addition, one may select corresponding auricular reflex points, such as *Large intestine*, *Small intestine*, *Subcortex*, and *Shenmen*, applying ANEM or APPM,

1~2 times weekly, alternately on both ears.

【 Case Studies 】

Case 93: Patient was a 26-year-old male and was diagnosed as ulcerative colitis from 1993 to 1998. Since then, he had suffered from irritable bowel syndrome for the past 4 years. When he first came to acupuncture, main symptoms were constant pain around the umbilicus and in lower abdomen, as well as constipation without hematochezia. His daily activities were impacted greatly. Needling therapy was applied twice weekly on Zusanli (ST36), Diji (SP8), Yinlingquan (SP9), Sanyinjiao (SP6), Tianshu (ST25) and Wailing (ST26) of the intestinal reflex zones on the lower limbs and of the lower abdomen. It was found that there was slight swelling or prominence at Tianshu (ST25) and Wailing (ST26) regions on the right abdomen. Needles were retained for 30 min after the generation of needling sensations. After two sessions of treatment, he felt better but still had some abdominal tenderness. Through ten sessions of treatment, the abdominal pain was 90% gone. Through 12 sessions of treatment, Tianshu (ST25) and Wailing (ST26) no longer swelled or bulged. After 23 sessions of treatment, abdominal pain was almost eliminated, although occasionally he still had constipation. In the end, the patient was very satisfied with the results.

Case 94: Patient was a 51-year-old female. She had suffered from ulcerative colitis for 20 years. She had frequent loose bowel movement everyday, particularly right after meals or during early mornings, with abdominal gas and hematochezia, and so on. She felt fatigue throughout the whole body after each onset. She took some oral steroids but without marked results. For acupuncture, the above needling method was applied twice weekly for the first two weeks. She almost recovered through four sessions of treatment, but then took several more sessions

once weekly or twice monthly to stabilize the effectiveness. She received 30 sessions in 18 months. During treatment, she always felt energized without taking any related medications. These needling effects even sustained 18 months after she discharged from acupuncture.

【 Discussion 】

Acupuncture in treating either ulcerative or non-ulcerative colitis has satisfactory effectiveness^[506-509]. Chan *et al.* of England reported a significant improvement both in general well-being and in symptoms of bloating using acupuncture in treating seven cases of irritable bowel syndrome^[510]. Through a comparison among five therapy methods, Kunze *et al.* of Germany found that acupuncture with 31% long-term success was significantly superior to the sham acupuncture (17.2%)^[511].

Irritable bowel syndrome (IBS) is one of the most common gastrointestinal disorders in Western society, affecting about 15% of the population, especially young adults. Its causes and effective treatments have remained elusive. In a double-blinded controlled study on acupuncture treatment for IBS, Fireman *et al.* of Israel assigned 25 cases to one of the two groups randomly. True acupuncture was performed at Hegu (LI4) (needling only) and sham acupuncture at Kunlun (BL60) (needling only). They found that though the true acupuncture results were consistently better, such as the effect of the initial session on overall symptoms and abdominal pain was a clear and significant improvement ($P=0.05$), no difference was found between the two groups in the overall statistical analysis. Accordingly, they concluded that it could not show a therapeutic benefit of acupuncture in IBS^[512]. We think that needling Kunlun (BL60) actually still pertains to the true acupuncture. Thus, the results of this study should indicate that the effectiveness of needling

Hegu (LI4) of LI meridian was better than needling Kunlun (BL60) of the BL meridian, but no significant difference was found between the two points of different meridians.

Because distal reflex zones of the intestinal diseases are located on the anterior and medial sides of lower limbs instead of the upper limbs, we do not feel that choosing acupoints of LI and SI meridians located on the upper limbs is necessary in treating intestinal diseases. Reflex zones of the intestine located in lumbosacral area are the locations where clinical positive reactions of intestinal diseases appear on the body surface most easily. Stimulation of this region usually has better therapeutic effects to regulate intestinal functions, in spite of either diarrhea or constipation. As for the method of stimulation, in addition to acupuncture, we found that acupressure or some forms of electrical vibration on acupoints could also generate good effectiveness, such method could also be taught to patients so that they could perform self-acupressure. The abdominal reflex zone of intestine is sensitive to temperature stimuli, so it is better to provide moxibustion than needling, or combine with infrared radiation while retaining the needles. Alternatively, patients may apply hot/warm water bag or external application of Chinese herbs on the navel or Shenque (CV8) to attain certain relief.

In treating intestinal diseases, a commonly used combination of reflex points is to first stimulate reflex zones of the abdomen and lower limb simultaneously, and then stimulate reflex zones of the lumbosacral area. Master Jiao used to apply this combination to treat intestinal disorders (including the bacillary dysentery). He first punctured Xiawang (CV10), Qihai (CV6), Tianshu (ST25), Zusanli (ST36), and Yanglingquan (GB34) using the purgation method, retained the needles for 15 min, then punctured Dachangshu (BL25) and Zhonglushu (BL29) also

using the purgation method. The needles were inserted slight obliquely downwards and propagating needling sensations to the tailbone or Chengfu (BL36). Master Jiao also often applied Chinese herbs to assist the acupuncture treatment.

21.4 Cholelithiasis

In the treatment and prevention of cholelithiasis, acupuncture therapy has already accumulated an abundant experience. It not only could alleviate biliary colic and expel gallstones effectively, but also could prevent the formation of calculus.

[Therapy]

Seek reflex points in the liver and gallbladder reflex zones (refer to Appendix A) of the right upper abdomen, which are mainly distributed at Riyue (GB24), Qimen (LR14) or the area from Juque (CV14) to Fuai (SP16). The criterion to determine reflex points is the regional tenderness. Generally, needles are inserted obliquely with the tip of needle reached beneath the external oblique muscle. After the generation of needling sensations, connect needles to an electric stimulator for 30~40 min with sparse-dense waves at a tolerable intensity. In cases of severe pain, Yanglingquan (GB34), “Gallbladder point” (EX152) on the lower limb, as well as Danshu (BL19) and Tianzong (SI11) on the right back can be associated. General needling methods, EA, and/or water acupuncture are all applicable.

In addition, remarkable changes of the skin electric resistance can be detected on auricular reflex points, such as *Sympathetic*, *Pancreas*, *Gallbladder*, *Stomach*, *Liver*, *Sanjiao*, *Endocrine*, and *Vagus*. Choose three points each session, and apply needling, EA, ANEM

or APPM.

When biliary colic occurs, the above-mentioned treatment should be administered at least once daily, continuously until disappearance of colic or excretion of gallstones. If results of expelling stones are not satisfactory, fatty meals and magnesium sulfate may be applied simultaneously to promote the excretion of stones. For the purpose of prevention, acupuncture can be applied once weekly or monthly.

【 Discussion 】

From 1975 to 1978, a cholelithiasis-treating research group at Wending Central Hospital applied EA on acupoints in treating 522 cases of cholelithiasis. Patients were divided into three types: stable type, acute type, and shock type. Stone excretion rate is 35% in the stable type, 89.7% in the acute type, and 50% in the shock type. The total stone excretion rate is 78.4%. Other 73 cases of the acute onset type with same diagnostic criteria as before were selected as control group, 40 mL of 50% magnesium sulfate were taken orally immediately after admission, then same dose was taken every morning at 9 o'clock. The stone excretion rate was 27.4% in this group that is markedly lower than that in the EA group with the acute type ($P<0.01$). 360 cases out of 522 patients (69%) in the EA group excreted gallstone within 1 to 5 days, while only 15 cases out of 73 cases (20.5%) in the control group excreted gallstones within the same period. The results of both groups were greatly different from each other ($P<0.001$). Since 1978, 61 consecutive cases that had received EA and excreted stones were examined cholangiographically. Results were satisfactory. 23 cases (37.7%) were free from gallstones. As for the relationship between the stone-excretion and the disease course, the researchers found that stone-excretion rate was higher in cases of the shorter disease course than that in cases of the

longer disease course. It was also higher in younger patients than in elders. Statistics showed a marked difference ($P<0.01$). For cases of acute attack and shock patients, anti-shock managements such as antibiotic application and fluid infusion should not be omitted in the course of EA. If there was no improvement after 6 to 8 hours of first-aid treatment, it might be the case of stricture of bile duct complicating severe infection and shock, surgical intervention then should be considered. They experienced that those cases who failed to excrete stones after EA treatment were related to swelling and thickening of the bile duct, pyocele of the bile duct, peripheral fibrosis, stricture, scars, or diverticula of lower segment of the common bile duct, as well as large stones^[513].

Since 1985, Zhang *et al.* of Dantong, China began to use electric-shock on auricular points in treating 1291 cases of cholelithiasis. The total effective rate was 99.69%, the rate of calculus excretion was 91.32%. The composition of the calculi was cholesterol crystals (31.25%), bilirubin crystals (28.17%), and mixed crystals (40.58%). In 100 random cases, the biliary system was shown to manifest vigorous dilations and constrictions under ultrasonic B-scan when relevant auricular points were stimulated with electric shock. Among 78 control cases, no cholecystic stones were excreted, in spite of magnesium sulfate, Folium Cassiae and fatty meals applied to many cases with constipation^[514].

Acupuncture not only could expel stones but also could prevent bile lithogenesis^[515]. However, there is still a lack of clinical experiments on how apply acupuncture to prevent cholelithiasis in patients susceptible to fall ill to this disease. Generally, the easily practicable ANEM or APPM should be the first choice. Presently, the mechanisms of acupuncture for expelling of stones or preventing bile lithogenesis are mostly clear. According to a study of Yun *et al.*

of Nanjing, China, puncturing Juque (CV14), Burong (ST19), Yanglingquan (GB34), and Zusanli (ST36) on the right side had remarkable effect on relieving spasm of the Oddi's sphincter and promoting contraction of the common bile duct. The effect was strong during manipulation of needles, weakened during retaining needles and faded away after withdrawal of needles. In addition, needling above acupoints could promote bile secretion and yield a good effect of relieving pain, thus helping expelling stones. It was suggested that therapeutic effectiveness would be further raised if stimulation given by needling was further intensified and needles were manipulated more frequently or for a longer duration ^[516]. Ma and Yang of Nanjing, China observed that EA could reduce the contents of cholesterol in plasma and bile, and increase the volumes of secretion of cholic acid, thus inhibit the crystallization of cholesterol from bile. At the same time, the electrotherapy could cause rhythmic contractions of Oddi's sphincter and increase secretion of bile, so gallstones were discharged on patient's own initiative ^[515]. Zhang *et al.* of Shanghai, China observed that EA of Ganshu (BL18) and Qimen (LR14) could obviously promote secretion of hepatic bile, and inhibit bile pigment lithogenesis in guinea pigs effectively ^[517].

21.5 Hepatitis

Acupuncture is widely used to raise the immunity and achieve certain effectiveness for various types of hepatitis, especially in treating chronic hepatitis or hepatitis B virus surface antigen (HBsAg) carriers.

【 Therapy 】

Seek reflex points with tenderness or hard nodule in the three reflex zones of liver and gallbladder on the back, right abdomen, and the lower limb (refer to Appendix A). They often emerge at Zhiyang (GV9), Jinsuo (GV8), Zhongshu (GV7), Jizhong (GV6), Ganshu (BL18), Danshu (BL19), Pishu (BL20), Weishu (BL21), Sanjiaoshu (BL22), Hunmen (BL47), Yanggang (BL48), Yishe (BL49), Weicang (BL50), Huangmen (BL51), and Pigen (EX109) in the three longitudinal zones of the back; Qimen (LR14), Chengman (ST20), Riyue (GB24), Fuai (SP16) and Zhangmen (LR13) of the right upper abdomen; Ququan (LR8), Yinlingquan (SP9), Diji (SP8), Zhongdu (LR6), Ligou (LR5), Lougu (SP7), Sanyinjiao (SP6) and Taichong (LR3) at the medial side of the lower limb; Yanglingquan (GB34), Waiqiu (GB36), Xuanzhong (GB39), Qiuxu (GB40) at the lateral side of the lower limb. Choose 5~7 points as master points for needling or moxibustion each session.

Besides, select associate points on the distal portions of the body according to the symptoms: Hegu (LI4) and Quchi (LI11) for fever, Dazhui (GV14) and Taichong (LR3) for jaundice, Diji (SP8) and Gongsun (SP4) for abdominal pain, diarrhea, and abdominal tenseness, Zusanli (ST36) and Neiguan (PC6) for nausea, vomit, or a poor appetite, Yanglingquan (GB34) and Qiuxu (GB40) for pain of the costal or liver region.

Needling alone or moxibustion after needling can be applied while retaining the needles for 30 min, once daily for the initial treatments, then twice weekly until all symptoms are under control.

【 Discussion 】

Before the invention of single-use and disposable needles, acupuncture needles were once considered as one of the distribution channels of hepatitis B virus

as the needles without strict sterilization guidelines may be contagious and infect the patient with hepatitis B virus ^[518]. However, as the modern technology developed, the single-use and disposable needles have eliminated that channel. According to a recent survey, the positive rate of HBsAg was 2.5% in 1502 cases who had received acupuncture treatment, and 8.0% in 2567 cases who never had acupuncture treatment, there were very remarkable difference in both groups ($P < 0.01$). This indicated that acupuncture itself also could reduce the positive rate of HBsAg ^[519]. Its interpretation is that acupuncture can increase the immunity of the body.

Tao *et al.* of Nanjing, China applied acupuncture in treating 32 cases of HBsAg carriers without symptoms, selecting Zusanli (ST36) (combining with moxibustion after needling), Qihai (CV6) (only moxibustion), Dazhui (GV14) (only needling). They found that the short-term effective rate was 70%, the negative turnover rate of HBsAg was 25%, while in 30 cases of control (only took the Chinese herb "Xiangyun Pills" orally) the effective rate was 30%, and the negative turnover rate of HBsAg was 3.33%. Other indices, such as the negative turnover rates of HBcAg, anti-HBc, and HBV-DNA, as well as the positive turnover rate of anti-HBe were higher in the acupuncture group than that in the control group. In 24 cases with the one-year-follow-up, the effective rate was 72.73%, the negative turnover rate of HBsAg was 45.45% in the acupuncture group, while the effective rate was 23.08% and the negative turnover rate was zero in the control group. This indicated that acupuncture has certain effects on indices of HBV serology, and has steady long-term effectiveness. The results of HBsAg skin test in the 62 cases showed that before the treatment, the majority of the virus carriers had low cellular immunity function, but that were turned to the positive from the negative or weak positive after the treatment in 59.9% of patients

in the acupuncture group and 50% of patients in the control group, respectively. It indicated that acupuncture has the same action of increasing the specific cellular immunity function of the body as that in control group ^[520]. In 60 cases of chronic hepatitis B carriers, Chen *et al.* of Hunan, China proved that manual acupuncture and EA could markedly regulate the immunological functions, both cellular and humoral as evidenced by the negative turnover rates of HBsAg, HBeAg, anti-HBc, and HBcAg, as well as the positive turnover rate of anti-HBe ^[521].

There are many reports about clinical trials of acupuncture in treating acute hepatitis. A research group of liver disease of Hebei College of TCM, China, compared results using acupuncture therapy and conventional medicine in treating 212 cases of acute icteric hepatitis. 129 cases were treated with manual acupuncture on Taichong (LR3), Yongquan (KI1), and Zusanli (ST36) (retaining needles for 30 min), 83 cases were treated with an EA on the same acupoints (a G6005 type of pulsating stimulator was used), and 50 cases were treated with conventional medications (glucuronic acid, glucose, and Vitamin B & C) as control. It was found that symptoms improved faster and the curative rate was higher in the two acupuncture groups than the control group. The icteric indices of the two groups of manual and EA therapy took an average period of 14.2 days for recovery among adults and 8.1 days for recovery among children. The SGPT (serum glutamic pyruvic transaminase) returned to normal within 8.1 days among adults and 21.3 days among children. However, the icteric indices of the control group took an average of 27.8 days for recovery. The SGPT returned to normal with an average period of 33 days. Through a follow-up period of 3 months to 2 years, the clinical cure rate was 94.2% in the acupuncture groups and 68% in the control group.

Moreover, it was observed in 12 cases who had a choledochostomy, acupuncture resulted in an increase of bile flow at 43 of 58 times, no change at 10 times, and a decrease at 5 times. When the bile flow was increased, it occurred in 15 min after acupuncture stimulation, the climax being reached in 30 min or so. In addition, in 32 cases of acute or chronic hepatitis, infection of the biliary tract, or toxic hepatitis, a contraction of the gallbladder was observed upon acupuncture stimulation, as shown by ultrasonic scanning. Accordingly, it was thought that improvement of icterus might be due to a choleretic effect of acupuncture through the parasympathetic stimulation ^[522].

In treating 68 cases with acute infectious icterohepatitis by puncturing Ganshu (BL18), Danshu (BL19), Zusanli (ST36), and Taichong (LR3), Wang *et al.* of the Infectious Diseases Hospital of Chengdu, China obtained satisfactory results: The jaundice lasted on average 11 days, the hepatic function recovered to normal on average 17.6 days, and the clinical cure rate is 88.1% ^[523]. There was another report that applying needling only or a combination of needling with injection of Vitamin B₁ into acupoints for acute icterohepatitis had the curative rate of 91.7% above, and it took effect quickly, the symptom and physical signs of the patient were improved gradually in one week or so. Some patients immediately had obvious improvement after only 3

days of treatment ^[524].

The optimal acupoints should be located within reflex zones of liver. Applying HRP technology, Tao *et al.* of Beijing, China observed that the afferent of Taichong (LR3), Qimen (LR14) and the liver are reciprocally intersected and overlapped at 2~4 segments. The reciprocal intersection and overlapping were probably the morphological foundation of the treatment of liver disease by needling Taichong (LR3) and Qimen (LR14) ^[525], and may also elucidate the underlying mechanism of correlation between these acupoints of liver reflex zones and the liver. In addition, certain abnormal reactions on Ququan (LR8) on liver reflex zone of the lower limbs have been paid attentions by investigators ^[526].

Interestingly, we discovered that Shangyinling (EX155), which is nearby the front of Ququan (LR8), is also an area with frequent positive reactions of urogenital disorders. It could be used to treat prostatitis or prostate cancer, ovary cancer, endometriosis, infertility, and fibroid tumor of the uterus (refer to Sections 22.4, 22.6, 22.8 and 22.10). Furthermore, the area of the medial side of knee connecting Ququan (LR8) to Shangyinling (EX155) might pertain to the same visceral reflex zones. In other words, it is another overlapping area of liver reflex zones and urogenital reflex zones besides the area of Sanyinjiao (SP6).

Disorders of Urogenital System

22.1 Urinary Retention

The causes of urinary retention (urochesis) may vary. It can either be functional, such as chhalasis of bladder detrusor, tonic contraction of urethra exterior sphincter due to gynecological operation (e.g., parturition), or postoperative anal pain. It can also be caused by obstructions of the lower urethra, such as oppression from enlarged prostate. Until now, there are many clinical reports on acupuncture for various uroschesis or dysuria, which have shown marked effectiveness for those with non-obstructive or functional causes ^[527~531].

【 Therapy 】

Select reflex points with tenderness or soreness upon pressing urogenital reflex zones at the medial side of lower limb, lower abdomen, and the sacral or buttock regions (refer to Appendix A), such as Shuidao (ST28), Zhibian (BL54), Yinlingquan (SP9), and Sanyinjiao (SP6). While puncturing points on the lower abdomen, propagate needling sensations to the perineum. While puncturing the sacral portion, propagate needling sensations to the lower abdomen. While puncturing the lower limb, propagate needling sensations upward to the knee or the medial side of the thigh. During the 30 min needle-retaining period, repeat needle-manipulations

once every 5 min to strengthen the stimulation. After removing the needles, apply sparrow-pecking moxibustion on points for 5~10 min, until the regional skin color turns rosy. Apply needling once and moxibustion 2~3 times daily until all symptoms are eliminated.

In addition, acupressure or self-acupressure can be incorporated. Apply finger pressing or an electric massager to stimulate the perineum and sensitive points near Siliao (BL31~34) on the lumbosacral region, 1~2 times daily. This method may be particularly suitable to obstructive urinary retention.

【 Case Studies 】

Case 95: Patient was a 25-year-old female. She had suffered from postpartum uroschesis for three days and received thermal application at the lower abdomen to facilitate the self-micturition, but without success. It was found there were reflex points at Shuidao (ST28), Zhibian (BL54), and Sanyinjiao (SP6) that showed abnormal soreness upon pressed. First, puncturing these points was applied, and then moxibustion was followed. Two hours later, her self-micturition ability was recovered.

Case 96: Dysuria due to prostate hypertrophy (refer to Section 22.4).

【 Discussion 】

Acupuncture is one of the most effective methods in treating functional uroschesis, such as postpartum uroschesis that is commonly seen in the parturient with dystocia or extended labor. In 1974, we reported the above therapy to treat five cases of postpartum uroschesis, yielding satisfactory results. Among them, three cases of self-micturition recovered after only one session of acupuncture, while the other two cases, who had heat application in the lower abdomen and many times of urinary catheterization without effects, gradually recovered through two sessions of needling and four sessions of moxibustion^[531]. The mechanism of acupuncture for urinary retention is obviously related to the reduction of bladder-neck pressure and urethral closure pressure, etc^[528].

Acupuncture also has certain effects for urinary retention due to organic obstruction. It is mainly because there is chhalasis of the bladder sphincter along with lasting uroschesis that may further aggravate uroschesis resulting in a vicious cycle. Acupuncture can raise the tension of the bladder sphincter, thus alleviating the symptoms of uroschesis. Of course, acupuncture may also have direct effects on some causes of urethral obstruction, such as prostate hypertrophy (refer to Case 96), but usually it needs a certain number of treatment sessions in order to show marked improvement.

22.2 Nocturnal Enuresis/ Nocturia/Bedwetting

As estimated, currently there are about 15%~30% of school-aged children suffering from nocturnal enuresis (nocturia or bedwetting) worldwide. In

85% of affected children, bedwetting is monosymptomatic, namely without other disorders or daytime incontinence. For monosymptomatic children, acupuncture is often effective.

【 Therapy 】

Choose 5~9 points within urogenital reflex zones and central reflex zones, such as Sanyinjiao (SP6), Yinlingquan (SP9), Xuehai (SP10), and Taixi (KI3) at the medial side of the lower limb; Guanyuan (CV4), Qihai (CV6), and Zhongji (CV3) in the abdomen; Shenshu (BL23), Pangguangshu (BL28), and Ciliao (BL32) on the lumbosacral region; Baihui (GV20) and Yintang (EX2) on the head. Apply needling alone or in conjunction with moxibustion once daily or once every other day, ten sessions for one course of treatment.

ANEM or APPM also can be applied on auricular reflex points, such as *Kidney, Bladder, Subcortex, Endocrine, Shenmen, and Heart*. Select 3~4 most sensitive points, the stronger the sensations felt by the patient, such as a sharpening pain and warmth on the auricle, the better the result of the treatment. If only slight sensations felt, move the needle tip a little bit into nearby spots to attain stronger sensations. Alternately stimulate both ears every 3~5 days. It is advised for patients to press the areas with embedded needles or pellets before sleep to attain a moderate pain, warmth, and the skin redness of the ear.

【 Case Studies 】

Case 97: Patient was a 15-year-old male. He had suffered from nocturia almost every night since childhood and he was difficult to awaken during sleep. Even after awakened, he often was in a state of apparent daze. ANEM was applied on four sensitive auricular points: *Shenmen, Kidney, Bladder, and Endocrine* in the right ear. His nocturia was fully

recovered after only one session of treatment, and it did not relapse until the 3-month-follow-up.

Case 98: Patient was a 14-year-old female. She had suffered from frequent nocturia since childhood. Sometimes, nocturia emission occurred once every few nights, while at the other times, it might be several emissions per night. In applying auricular acupuncture, four tack needles were embedded at those sensitive points of *Shenmen*, *Kidney*, *Bladder*, and *Subcortex* in the right ear. The night when needles were first embedded, her nocturia symptoms actually worsened, however, it never occurred again for subsequent nights. After the second treatment one week later, she was fully recovered and did not relapse until the 3-month-follow-up.

【 Discussion 】

To date, there are numerous clinical proofs and reports for the effectiveness of acupuncture on nocturia from all over the world. In a survey by Tuzuner *et al.* of Turkey, 162 subjects with nocturia were treated with EA therapy. Specially chosen points were punctured once daily over a ten-day period. After the therapy term, the success rate was evaluated as 98.2% ^[532]. By applying EA in the treatment of 25 children with monosymptomatic nocturia, treated earlier without success, Bjorkstrom *et al.* of Sweden observed that there were more dry nights in 65% of the children ($P<0.001$) and 5 out of 23 children were responders (>90% reduction of the numbers of wet nights) at the 6 months' follow-up. According to the parents, the sleep arousal threshold had decreased in about 50% of the children ^[533]. Caione *et al.* of Italia found that acupuncture gave good results in 55% of treated patients of nocturia. Its long-term success rate was 40% that was compatible to that (50%) of pharmacological therapy (tricyclic antidepressants, anticholinergics, 1-Desamino-8-D-Arginine Vasopressin or called

DDAVP) ^[534]. The combined treatment of DDAVP and acupuncture appeared to be the most efficacious both in terms of the percentage of dry nights at the end of treatment and in relation to the stability of results, even after ending the study ^[535].

When using body acupuncture to treat this disease, it is recommended to have treatment done once daily or at least once every other day. However, this kind of plan is often not suitable for pediatric patients as they either are scared of the needles, or have no time for treatment due to regular schooling. For that reason, either ANEM or APPM can be applied. In 1974, we reported that 13 pediatric patients between ages of 10~17 with bedwetting were cured by ANEM. For those cases with bedwetting during sound sleep, after the treatment, most of them could be awakened easily. In some cases, the enuresis actually became worse during first few days of treatment, but eventually the symptoms reduced. ANEM has several advantages in treating pediatric patients. It can be applied even once weekly due to its persistent action of stimulation, thus not interfere with the regular schooling of the pediatric patients. In addition, ANEM generates much less needling sensations than body acupuncture, thus is acceptable for pediatric patients who are afraid of needling ^[536].

In addition to body and auricular acupuncture, scalp acupuncture ^[537], wrist-ankle acupuncture ^[538] or acupressure is also applicable for nocturia. Bartocci and Lucentini of Italia compared effects of acupuncture and micro massage in treatment of idiopathic nocturnal enuresis. Acupuncture was applied alternately once every other day at two groups of acupoints: a) Shenmen (HT7), Zusanli (ST36), Sanyinjiao (SP6), and Zhongji (CV3); b) Shenshu (BL23), Pangguangshu (BL28), and Ciliao (BL32). The average number of sessions was 10 per patient. Micro massage was given on the points

“Nocturia” in creases of the fifth finger, between the first and second phalanges, as well as between the second and phalanges. The initial session was administered in the presence of parents, the subsequent treatments then were repeated by the parents at home every night for ten min, for an average of 20 days. They observed that in ten cases with acupuncture, seven cases had complete recoveries, two cases partial recoveries, and one case with no results; and in five cases with micro massage, two cases complete recovery, one case partial recovery, two with no results. Acupuncture produced better results in percentages; however, the micro massage stood out with its simplicity, which was a suitable alternative mostly in younger children who reject needling^[539].

For intractable nocturia patients, one should carefully seek the causes and administer integrative solutions. Pathogenesis of such nocturia might be psychological, or due to cerebral aplasia or local irritations, such as redundant prepuce, cystitis, spina bifida occulta. For the patients due to local irritations, the only way to cure them is to eliminate the irritating focus, such as removal of the redundant prepuce.

Many children patients had sound sleep at night and are difficult to be awakened. For those who might be due to being extreme naughty during the day, it is suggested to start limiting their activities from afternoon and on, such as not letting the child play too much after school. For those whose sound sleep is not related to the activities during the day, may consider how to adjust their sleeping phases. Because nocturia occurs mostly during the rapid eye movement (REM) phase of sleeping, if a nap is taken during the daytime, then the time of REM phase may decrease. Therefore, it is recommended that nocturia patients may take a half hour nap daily if possible. Even a short nap often is beneficial to the conditions.

In addition, many nocturia patients have large urinary amount generated at night, hinting that their antidiuretic hormone (ADH) may be lower than normal. For them, acupuncture is often effective. Meantime, instruct nocturia patients to hold the bladder during the daytime intentionally. Such trainings might help raise their threshold of the bladder holding capacity, so that when the bladder due become filled at night, it might lessen the chances of triggering strong desires to micturate.

In short, the mechanism of acupuncture for nocturia currently is still unclear. Common perception is that it may be related to regulation of awakening function in the brain, the raised threshold of bladder to urine volume irritation, and the increase of ADH production by acupuncture.

22.3 Urinary Incontinence

Urinary incontinence, urgent and frequent micturition are familiar symptoms for elderly women. Although these symptoms are not serious, they indeed cause much inconvenience to our already busy lifestyles. Moreover, due to a lack of effective conventional therapies, many patients with such symptoms often seek help from acupuncture. Of course, urinary incontinence can also result from specific causes, such as injuries of the spinal cord.

[Therapy]

Detect reflex points with tenderness or prominence within urogenital reflex zones, which may be around Ciliao (BL32), Zhongliao (BL33), Shangyinling (EX155), Sanyinjiao (SP6), Guanyuan (CV4), and Qihai (CV6). Choose 3~5 points each session, apply bilateral needling once daily or moxibustion at least

once daily until get effectiveness, then 1~2 time weekly to stabilize the effects for a few months.

ANEM is also applicable. Select the most sensitive auricular points, such as *Bladder*, *Kidney*, and *Brainstem*, alternately stimulate both ears every 3~4 days.

【 Case Studies 】

Case 99: Patient was a 63-year-old female. She had suffered from urinary incontinence for 15 years since menopause. Symptoms of urgent urination were worse during the daytime. It was often too late for her to go to the restroom, though the urine volume was not much. She had colic pain during urination. Examination found that she had a lower sensitivity of acupoints on the lower limbs, thus for her it was difficult to generate *deqi* via needling as most needling locations or acupoints did not show any tenderness. Through a careful detection, bilateral Shangyinling (EX155) was found to be the most sensitive point with some local swelling and soreness, ands were chosen as master points. At each session of treatment, two needles were inserted on each point together to strengthen the stimulation. Associated points were Sanyinjiao (SP6) and Xuehai (SP10). She received this treatment twice weekly and symptoms began to ease after eight sessions. She significantly alleviated after ten sessions when she no longer had urgency feeling and abdominal colic with urination. Through totally 46 sessions in 6 months, she was near full recovery.

【 Discussion 】

In a study including 15 elderly women who suffered from urge-or mixed-type incontinence and were treated with manual acupuncture 12 times, Bergstrom *et al.* of Sweden observed that almost all outcome measurements were significantly improved even at the 3-month-follow-up after the last treatment.

Global scorings showed that 12 of 15 women considered themselves to have been improved ^[540]. Honjo *et al.* of Japan treated urinary incontinence with acupuncture in 8 male patients with chronic spinal cord injury. Detrusor hyper-reflexia with uninhibited bladder contraction was confirmed by urodynamic studies in all of them. Acupuncture was performed using disposable stainless needles (0.3 mm in diameter, 60 mm in length), which were inserted into bilateral Zhongliao (BL33) and twisted manually for 10 min. The treatment was conducted every week for 4 weeks. They found that among 8 patients, incontinence was controlled completely in 3 (38%) and partially in 3 (38%). The average maximum cystometric bladder capacity increased significantly, from (42.3 ± 37.9) mL to (148.1 ± 101.2) mL with treatment ($P < 0.05$), while the average maximum bladder pressure was not changed ^[541]. Kitakoji *et al.* of Japan applied the same method as the above to treat 11 elderly patients (9 males and 2 females) with overactive bladder. Uninhibited contraction was observed in all patients before acupuncture. Urge incontinence was controlled completely in 5 and partially in 2 of 9 patients who complained of urge incontinence. In 2 patients who complained urgency, complete response was obtained after treatment. Uninhibited contraction subsided in 6 patients after treatment ^[542]. Philp *et al.* of London treated 20 patients with lower urinary tract symptoms attributable to bladder instability or sensory urgency by traditional Chinese acupuncture. They observed that 77% of the patients with idiopathic detrusor instability were symptomatically cured ^[543].

Sanyinjiao (SP6) has traditionally been used for urinary problems. According to Chang PL of Taiwan, China, clinically symptomatic improvement was noted in 22 of the 26 patients who presented with frequency, urgency, and dysuria and were

treated by acupuncture at Sanyinjiao (SP6). During acupuncture at Sanyinjiao (SP6), there were periodic increases in intraurethral pressure at distal urethra, which were measured with a microtip transducer, while after acupuncture there was a significant increase in the maximum cystometric capacity and a decrease in peak urinary flow rate ^[544]. From our experience, Shangyinling (EX155) also has an important action in treating urinary diseases (refer to Case 99). However, its mechanism needs further studies. Concerning the mechanism of acupuncture for this disease, it has known that it includes acupuncture-induced detrusor inhibition and external sphincteric contractions ^[544], as well as increase of closing pressure, and so on. On 20 patients with stress incontinence, Kubista *et al.* of Germany found that after 30 min of electrical stimulation through acupuncture needles that were placed into the skin of lower legs and the lower abdomen, there was a significant increase in “closing pressure”. 17 patients even showed positive pressure. In a control group of another 20 patients who, however, did not undergo acupuncture, there were only 2 cases of slight increase in closing pressure. In addition, a second control group of 20 patients was given a placebo suppository in order to eliminate any psychic factor as much as possible. Significant change of the closing pressure could not be found in any of these cases ^[545].

22.4 Prostatitis/Prostate Cancer

Applying TCM, including acupuncture for prostatitis, especially prostate cancer has received some attention in the West ^[546]. Acupuncture has certain therapeutic effects for prostatitis as well as the

accompanying symptoms, such as dysuria and regional heaviness or pain. Besides, acupuncture, as an adjunctive therapy for prostate carcinoma, has been used to alleviate side effects of chemotherapy.

【 Therapy 】

When suffering from prostate diseases, there are reflex points with regional swelling, heaviness, or tenderness emerging on three main territories within urogenital reflex zones. The first is an inversed triangle zone located at lumbosacral region that contains acupoints Dachangshu (BL25), Guanyuanshu (BL26), Pangguangshu (BL28), Zhibian (BL54), Ciliao (BL32), Shiqizhuixia (EX111), and Yaoyangguan (GV3). The second is the medial area of the knee that contains Ququan (LR8) and Shangyinling (EX155) (refer to Section 21.5). The third is the anterolateral side of the thigh containing Futu (ST32), Qianfengshi (EX143), Shangfengshi (EX142), and Zhongdu (GB32). Besides, the reflex points may reside in the lower abdomen, such as Guanyuan (CV4), Zhongji (CV3), and Qihai (CV6). These points can be selected for prostate diseases using needling alone, moxibustion after needling, or moxibustion alone. Once daily for acute symptoms, once every other day or every 3~4 days for chronic patients. While puncturing reflex points on the lower limb, attempt to propagate needling sensations towards the perineum as far as possible.

Acupressure also can be applied on the above reflex points, especially at the perineum region with fingers or massager, at least once daily.

【 Case Studies 】

Case 96: Patient was a 43-year-old male. He had suffered from dysuria due to prostate hypertrophy for many days. The region between Ququan (LR8) and Shangyinling (EX155) on the medial area of knees were punctured with two needles at each

point. The needle tips were obliquely pointed at the proximal portions of the body or the medial side of thigh, at depth of 0.5~1 *cun* to generate intense needling sensation of heaviness. The needles were retained for 20 min. He was treated once daily with such treatment and through four sessions, his dysuria subsided completely.

Case 39: Patient was a 64-year-old male. A year ago, he was diagnosed with prostate cancer. Through seven rounds of radiation therapy, his high PSA (prostate-specific antigen) (4.0) was completely back to normal. However, he gradually suffered from skin numbness with tingling on the lateral and middle portion of the thigh on both sides, which was worse on the right side. His PSA was 1.01 one week prior to his acupuncture treatment. Four pairs of tender spots: bilateral Fengshi (GB31), Qianfengshi (EX143), Shangfengshi (EX142), and Xuehai (SP10) were selected and punctured. At the first two points, there were some swollen hard nodules in funiculus forms as well. The needles were inserted perpendicularly into the centers of these reflex points, and were being manipulated to generate intense needling sensations. During the 30 min of needle-retaining period, needles were connected to an electric stimulator set at continuing waves and a medium intensity, which induced a slight muscle twitching. The patient was treated with such way once every 3~4 days. After the initial session, his pain eased immediately. After ten sessions, all of the pain and numbness on both thighs were eliminated. In the following 2 months, he had another 12 sessions to stabilize results, and consequently his PSA was down to 0.015.

[Discussion]

Ikeuchi and Iguchi of Japan reported that 17 patients with prostatodynia (chronic prostatitis-like syndrome) were treated with EA at a low-wave frequency. Clinical efficacy of long-term treatment

was considered excellent in 30% and moderate in 70% of patients, with an overall efficacy rate of 100%. All of them had a complicated clinical course and pelvic hypertonicity, and were refractory to conventional medical treatment. This therapy was applied to mitigate congestion of pelvic circulation, especially around prostate. The authors examined whether efficacy of EA was related to induction of cytokines, but no significant elevation of either of the serum levels of INF- γ , IL-1 β and IL-6 was detected [547]. Jin of China reported that applying point-piercing method from Zhibian (BL54) into Shuidao (ST28) for chronic prostatitis with results of 54.9% cured and total effective rate being 90.2% [548]. He and Li of China applied combination of scalp and body acupuncture to treat prostatic hyperplasia, and reported that after 5 treatment courses, of the 36 cases in acupuncture group, 20 cases responded with remarkable effect, 13 cases were effective, 3 cases failed in treatment. Of the 32 cases in the control group, 8 cases were treated with remarkable effect, 15 cases were effective, 9 cases failed in treatment. According to the statistical analysis on therapeutic effectiveness of the two groups, there was a significant difference [549].

Reflex zones of prostate diseases also can be distributed on the perineum or the area surrounding the anus beside that on the distal and medial areas of lower limbs, as well as the lumbosacral area. Thus, while treating prostate diseases, pay attention to detect reflex points on these regions to enhance effectiveness. Changqiang (GV1) is one of master acupoints within these areas, and it can be used for the heaviness and sinking feeling of the perineum [196]. In fact, the effect of directly stimulating Huiyin (CV1) may be even much better, but puncturing it may be difficult to be accepted by patients. An alternative way is to let the patient to perform self-acupressure at Huiyin (CV1), 1~2 times daily, 3~5 min each session.

In addition, the patients with this disease might have muscular tension or pain on the anteriolateral area of the thigh, such as that in Case 39. It might be that the enlarged prostate in the pelvic cavity pinches some branches of sciatic nerve or femoral nerves. Of course, it might be caused by injury of local or surrounded nerves due to radiotherapy on the prostate region. Considering the fact that symptoms of a pinched nerve (pain or skin numbness) also often appear on the anteriolateral thigh of gravis (refer to Section 14.2). We believe the anteriolateral area of thigh also should pertain to urogenital reflex zones. While treating various urogenital diseases, if the patient has irritated symptoms on the lateral thigh, Fengshi (GB31) and other nearby reflex points must be punctured instead. In Case 39, after acupuncture, not only the pain of lateral thigh subsided, the PSA value also further decreased.

22.5 Impotence/Prospermia

Impotence is one of principal male sexual dysfunctions. Its causes could be organic (e.g., neurological, biochemical, and vascular) or psychogenic (social). Prospermia (premature ejaculation) is also another common male sexual dysfunction. Acupuncture treatments for them are similar.

【 Therapy 】

Select reflex points with tenderness or soreness in urogenital reflex zones at the medial side of lower limbs as master points, such as Shangyinling (EX155), Fuli (KI7), Sanyinjiao (SP6), Zhaohai (KI6), and Rangu (KI2). The associate points can be Guanyuan (CV4), Zhongji (CV3), Qugu (CV2), Ciliao (BL32), Shenshu (BL23), and Mingmen (GV4) located

on the regional reflex zones of lower abdomen or lumbosacral regions. Apply needling alone or combine with moxibustion. While puncturing acupoints at the medial side of lower limbs, after the generation of needling sensations, point the needle tip at the abdomen and propagate needling sensations towards the proximal portion of the body as far as possible. While puncturing acupoints in the lower abdomen, after the generation of needling sensations, point the needle tip at the perineum and propagate needling sensations at the genitals. Such treatment is administered 2~3 times weekly, 10~20 times as one course of treatment.

For patients who are complicated with anxiety, insomnia, or other psychogenic reasons, select reflex points in central reflex zones of head, such as Yintang (EX2), Baihui (GV20), Naohu (GV17), and Fengchi (GB20) as associate points. ANEM on auricular points can also be incorporated.

In addition to acupuncture, massage or acupressure can be applied to stimulate the regional reflex zones at the lumbosacral region once every morning and evening, 5~10 min each time.

【 Discussion 】

There are numerous clinical reports from China and the West showing acupuncture treatment has certain curative effects for various male sexual dysfunctions including impotence and erectile deficiency (ED) ^[550, 551], and it was especially ideal for those with psychogenic causes.

In 29 patients with psychogenic impotence treated by acupuncture, Yaman *et al.* of Turkey observed that 20 patients demonstrated successful erections following a varying number of sessions. In light of their findings, they concluded that acupuncture might be an effective alternative in the management of purely psychogenic impotence ^[552]. Aydin *et al.* of Turkey examined the effects of acupuncture and

hypnotic suggestions, and compared them with placebo in the treatment of male sexual dysfunction with no detectable organic cause. They found that the success rates in 15 men who received acupuncture treatment and in 16 men who underwent hypnosis was 60% and 75% respectively, while 29 men who served controls had a 43%~47% improvement in sexual function. Although the improvement was not statistically significant, the authors thought acupuncture could be used as an adjunct therapy in non-organic male sexual dysfunction ^[553].

In 1999, Kho *et al.* of Netherlands evaluated the efficacy of acupuncture as a mono-therapy on 16 patients suffering from erectile dysfunction (ED). In nine patients, no organic co-morbidity was encountered. In a period of four weeks, acupuncture treatment was performed twice weekly for eight sessions. Each treatment session consisted of puncture of the same eight acupoints, four of which were connected to a Swiss made constant current Doltron ESA 600 stimulator. Low frequency electrical stimulation (5 Hz and 10 mA) was applied to these four acupoints, whereas no stimulation was applied to the other four points. After 30 min, the electrical stimulation was terminated and all needles withdrawn. Blood samples were drawn according to a fixed time schedule, to study the profile of a number of stress hormones, for example, adrenocorticotrophic hormone (ACTH), antidiuretic hormone (ADH) and cortisol, the gonadotrophins follicle stimulating hormone (GFSH) and leutinizing hormone (LH), as well as the sex steroid testosterone and its binding globulin, within the treatment period. Based on a diary of both patient and partner, and an interview one month after the end of treatment, the changes of sexual activity were

evaluated over a period of 12 weeks, starting from four weeks prior to the treatment, four weeks during the treatment period, and four weeks after the treatment. An improvement of the quality of erection was experienced by 15% of patients, while 31% reported an increase in their sexual activity. No changes in the profiles of hormones were detected. The overall effect was 39%. However, no definite conclusions could be drawn from this pilot study because a controlled and blinded study including more patients would be needed ^[554].

In order to raise the curative effect of acupuncture for this disorder, acupuncture precursors in China mostly put forth effort in controlling the types and propagation of needling sensations. Because this disease mostly pertains to the deficiency syndrome, when puncturing, apply the tonification technique of acupuncture to acquire warm needling sensations and spread it to the area of perineum or the external genitals. For example, Master Jiao took Zhongji (CV3), Qihai (CV6), and Guanyuan (CV4) as master points to treat impotency or prostermia, using the tonification technique of acupuncture after inserting the needle first. He twisted the needle frequently to make needling sensations reach the perineum, and then at 1~2 acupoints change to the heat-producing needling technique slightly, making the penis and testis have the hot feeling, retain needles for 15 min. For the patients with kidney deficiency syndrome including lumbago, he took additional needling on Shenshu (BL23) and Zhishi (BL52). However, because the muscles on the wall of lower abdomen are generally thin, conducting the heat-producing needling is challenging. Thus, during needling, do not just focus on attaining warmth. It is also desired if needling sensations are propagated downward to the genitals.

22.6 Dysmenorrhea/ Endometriosis

Dysmenorrhea can be either primary or secondary. Primary dysmenorrhea refers to the colic in the lower abdomen before or during menses but without other pathological causes. Up to 90% women had primary dysmenorrhea. The most common cause for secondary dysmenorrhea is endometriosis. Acupuncture has satisfactory results of relieving dysmenorrhea, especially the primary type.

【 Therapy 】

Select reflex points with tenderness or hard nodules emerging at the following locations:

Lumbosacral zone: Xiaochangshu (BL27), Qihaishu (BL24), Ciliao (BL32), and Shenshu (BL23).

Lower abdomen zone: Zhongji (CV3), Guanyuan (CV4), Qihai (CV6), Daju (ST27), and Guilai (ST29).

Medial zone of lower limb: Xuehai (SP10), Shangyinling (EX155), Dijì (SP8), and Sanyinjiao (SP6).

Needling therapy or moxibustion can be applied on these reflex points. For primary dysmenorrhea, administer treatment once daily or once every other day one week before menses and once everyday during menses to enhance the stimulation for consecutive several months. For endometriosis, administer treatment once every other day or twice weekly. For severe abdominal colic, an intense stimulation on Hegu (LI4), the analgesic point with non-specificity, can be associated. Besides, acupressure at the lumbosacral region or on the lower limb can be adopted during menses, 1~2 time daily, 5~10 min each time. ANEM or APPM on bilateral auricular points of *Uterus*, *Kidney*, and *Endocrine* may also be incorporated, stimulating both ears alternately twice weekly.

【 Case Studies 】

Case 100: Patient was a 45-year-old female. She had suffered from irregular menses and endometriosis for 25 years. She had a surgery for the endometriosis 23 years ago, and after the surgery, she had two children through normal pregnancies. Currently, she had multiple fibroid tumors detected in the exterior layer of the uterus, of which the diameter of the largest one was 2.5 cm. She complained about severe abdominal colic during menses, and the pain was getting worse in recent years, even occurs at other days besides menses. The ultrasound test three days before her first acupuncture visit (the 10th day of her menstrual cycle) showed an ovary augmentation (4.8cm × 3.8cm) on the left side, hinting there was ectopic tissue growth. During examination, remarkable subcutaneous lumps could be felt at bilateral Shangyinling (EX155), especially at the left one, which seemed to be in accordance with the severer abdominal colic on the left side. In addition, there was a hard bean-sized nodule at 1 *cun* above the left Sanyinjiao (SP6), to which when a needle was inserted, she had intense needling sensations. When applying a massager to stimulate these reflex points, the sensations were propagated to the entire lower limb up and down. After two sessions of such treatment, her lower abdominal colic markedly eased, and the size of the left ovary was reduced (3.4cm × 2.8cm). The latter was verified by another ultrasound test on the 20 days of the menstrual cycle, which suggested the ectopic tissue had already subsided. The patient took several additional acupuncture sessions at an interval of 3~4 days until discharged from treatment. There were no follow-ups to this case.

【 Discussion 】

Acupuncture for primary dysmenorrhea has quick effects and satisfactory long-term outcomes. In a

study by Tsenov of Bulgarian, 48 women in reproductive age were divided into two groups: 24 women with primary dysmenorrhea in the first group, 24 women with secondary dysmenorrhea in the second group. Acupuncture was applied at Hegu (LI4), Sanyinjiao (SP6), Xuehai (SP10), Qichong (ST30), Zusanli (ST36), Qugu (CV2), Zhongji (CV3), Pishu (BL20), and Shenshu (BL23) via torment method for 30 min. The results were that in the first group effect was very good after one course of 2~4 acupuncture sessions before menstruation. In the second group, effect was satisfactory in 50% of the cases after two courses of acupuncture treatment ^[567]. Lewers *et al.* of USA applied acupuncture-like transcutaneous electrical nerve stimulation (TENS) in treating 21 cases of primary dysmenorrhea, and found an average pain relief of at least 50% immediately post-treatment ^[568]. Helms investigated the effectiveness of acupuncture in managing the pain of primary dysmenorrhea in a randomized and controlled study. Forty-three women were followed for one year in one of four groups. The real acupuncture group was given random point acupuncture on weekly basis for three menstrual cycles. He observed that in the real acupuncture group, 10 of 11 (90.9%) women showed improvement that is much higher than that in the placebo acupuncture group or in other two control groups. There was a 41% reduction of analgesic medication used by the women in the real acupuncture group after their treatment series, and no change or increased use of medication seen in the other groups ^[569]. According to Maric of Romania, acupuncture was applied in the treatment of 32 patients with primary dysmenorrhea. A relief of dysmenorrheic pain was already evidenced after the first menstruation. Moreover, one year after the completed therapy there was a full disappearance of dysmenorrheic pain in 93% and a partial one in 7% of cases ^[570].

For endometriosis and secondary dysmenorrhea or irregular menses, one can combine acupuncture and Chinese herbs to raise the curative effect. Recently, Wang of China reported that 37 cases of mild and severe endometriosis were treated with point-injection of *Fu-Fang-Danshen* (a kind of Chinese herbal compound, where the main ingredient is *Radix Salviae Miltiorrhizae*) solution and moxibustion with herbal cake for 3~5 courses of treatment. The effective rate for dysmenorrhea was 85.91%, for irregular menstruation was 90.90%, and for infertility was 37.50%. The total effective rate was 81.08% ^[571]. According to our experience, a common reflex point for this disease is Shangyinling (EX155), so it could serve as a master point, such as in Case 100.

22.7 Menopause/Hot Flush

Menopause (climacteric syndrome) of the female mainly manifests as hot flush, emotion fluctuation, sleep disturbance, of which the most common hot flush mostly takes place during nighttime and can result in sweats and disturbances of sleep. Some patients may also have accompanying hypertension. Acupuncture treatment may control these symptoms effectively.

【 Therapy 】

Select and puncture reflex points in urogenital reflex zones at the medial side of lower limbs and in central reflex zones according to various symptoms as below.

Master points: Sanyinjiao (SP6) and Xuehai (SP10).

Associate points: Yifeng (TE17) and Hegu (LI4) for complexion flush; Shenmen (HT7) and Yintang (EX2) for emotional stability; Fengchi (GB20) and

Baihui (GV20) for sleep disturbance; Zusanli (ST36) and Quchi (LI11) for hypertension.

If effects of body acupuncture are not remarkable, apply ANEM or APPM on auricular reflex points, such as *Uterus*, *Heart*, *Kidney*, and *Endocrine*, alternately stimulating both ears every 3~4 days.

【 Case Studies 】

Case 101: Patient was a 49-year-old female. She had suffered from menopause for about six months and had symptoms of hot flush, headache, fatigue, and so on. She took two months of contraceptives to decrease the level of estrogen, but it made symptoms worse, so she stopped the medication and came to acupuncture. Xuehai (SP10), Sanyinjiao (SP6), Hegu (LI4), Taiyang (EX4), Fengchi (GB20) and Yintang (EX2) were punctured twice weekly. After the second session, she felt much better as all symptoms but fatigue subsided. Through ten sessions, she was very satisfied with the results as indicated by self-evaluation. At the 5-month-follow-up, she stated that the results sustained except there was occasional fatigue due to stress.

【 Discussion 】

Menopause of female is a spontaneous physiological phenomenon and resulted from a loss of function of ovarian follicle. Symptoms of climacteric syndrome may occur before menopause, and last for 6~8 years. Because menopause is mainly caused by a decrease of estrogen level, in Western medicine, hormone substitutes are often used to control its symptoms and play other important roles in the body. There are already many clinical reports on acupuncture treatment for climacteric syndrome ^[572-574].

Hot flush, as one kind of vasomotor symptoms, is a sudden and brief sensation of heat, often over the face and even the entire body, caused by a transient dilation of the blood vessels of the skin. Hot flush

might be elicited from a decrease of opioid activity in hypothalamic thermoregulatory center due to low estrogen concentrations. Acupuncture treatment can stimulate hypothalamic opioid activity, so alleviate vasomotor symptoms. According to Wyon *et al.* of Sweden, 24 healthy women with natural menopause, suffering from hot flushes, were included in the study, and randomly assigned to either of two groups: one group received treatment with EA, the other with superficial needling. Through treatment of totally eight weeks, as recorded in logbooks kept by the participants, frequency of hot flushes decreased significantly by more than 50% in both groups, and remained decreased in the EA group over three months after treatment ^[573]. Popivanov of Bulgaria treated ten female patients of climacteric syndrome with acupuncture on Neiguan (PC6), Gongsun (SP4), Hegu (LI4), and Zusanli (ST36), and observed favorable clinical results ^[574].

Hot flush may also appear in men who undergo castration therapy for prostatic carcinoma, and usually persist for years. Acupuncture has similar effectiveness for them. Hammar *et al.* of Sweden reported that seven men with vasomotor symptoms due to castration therapy received acupuncture treatment 30 min twice weekly for two weeks and once weekly for ten weeks. Of the seven men, six completed at least ten weeks of acupuncture therapy and all had a substantial decrease in hot flushes (average 70% after ten weeks). Three months after the last treatment, the number of hot flushes was 50% lower than that before therapy ^[575].

22.8 Infertility

Infertility can be due to either male or female side.

Low vitality or low sperm count may be the main cause of infertility in a man, while causes of female infertility are more complex, such as obstruction of the fallopian tube, irregular or absence of ovulation, and imbalanced reproductive hormones, as well as an incompatibility of female's mucous membranes with acidity or alkalinity of spermatozoa. As reported by a number of recent studies, acupuncture alone or in conjunction with Chinese herbs may dramatically improve sperm quantity and quality, reduce stress of men, as well as nourish the uterus and balance female hormone levels.

【 Therapy 】

Point selections and acupuncture methods for female or male infertility are the same as that for dysmenorrhea (refer to Section 22.6) or for prostatitis (refer to Section 22.4), respectively.

When puncturing points on the lower limb, it is necessary to generate and propagate needling sensations toward the abdomen or to the proximal as far as possible. If sensations are not strong, connect needle to an electric stimulator and retain needles for 30 min, once every other day for a few months continuously. For female infertility, it is also advised to stimulate points of husband once every other day for the week before ovulation of the wife. This principle is also called **treating the husband and the wife together**.

【 Case Studies 】

Case 102: Patient was a 37-year-old female. Since being married five years ago, she was not able to get pregnant. Her menstrual cycle was regular, and results from various gynecological exams including hormone level were all normal. Acupuncture results were dramatic: after only 6 sessions using the above method in addition to taking certain formula of Chinese herbs, she finally succeeded in a pregnancy.

Case 103: Patient was a 47-year-old female. She had a 21-year-old son, and attempted to have another child three years ago, but without success. For the last five years, though she had regular menses, she had dysmenorrhea almost every cycle. Ultrasound exam showed one fibroid tumor of 6 cm × 10 cm size, which was close to the perimetrium. Through 27 sessions of acupuncture as the above method, she finally succeeded in pregnancy once more, and had her second child, a daughter, shortly before her 48th birthday.

【 Discussion 】

Acupuncture can improve sperm quality of males suffering from subfertility related to sperm impairment that has received affirmation of certain studies [555, 556]. According to the report of Siterman et al of Israel, semen samples of 16 acupuncture-treated subfertile patients were analyzed before and one month after treatment (twice weekly for five weeks). In parallel, semen samples of 16 control untreated subfertile males were examined. Two specimens were taken from the control group at an interval of 2~8 months. Expanded semen analysis included routine and ultramorphological observations. Fertility indices increased significantly ($P \leq 0.05$) following improvement in total functional sperm fraction, percentage of viability, total motile spermatozoa per ejaculate, and integrity of the axonema ($P \leq 0.05$), which occurred upon treatment. Because the intactness of axonema and sperm motility was highly correlated, patients exhibiting a low fertility potential due to reduced sperm activity may benefit from acupuncture treatment [556]. Riegler, Fischl *et al.* of Germany treated 28 males of subfertility by acupuncture and investigated the correlation between the effect of acupuncture on fertility and psychological effects. Each patient received ten treatments for a period of three weeks. They observed that there was a significant increase

in sperm quality in all parameters (concentration, volume, and motility in spermiogram) but volume after acupuncture. The psychological test showed no change caused by acupuncture. Hence, they believed that the effect of acupuncture on sperm quality was not caused by placebo-mechanisms [557].

Globally, there are many reports about the effectiveness of using acupuncture, EA or auricular acupuncture to treat female infertility, which mainly due to the luteal inadequacy, irregular menses, or obstruction of fallopian tube [558–560].

Gerhard and Postneek of Germany treated 45 infertile women suffering from oligomenorrhea (27 cases) or luteal insufficiency (18 cases) with auricular acupuncture. Results were compared to those of 45 women who received hormone treatment. Both groups were matched for age, duration of infertility, body mass index, previous pregnancies, menstrual cycle, and tubal patency. Women treated with acupuncture had 22 pregnancies, 11 after acupuncture, 4 spontaneously, and 7 after appropriate medication. Women treated with hormones had 20 pregnancies, 5 spontaneously, and 15 in response to therapy. In addition, various disorders of the autonomic nervous system normalized during acupuncture. Based on these data, auricular acupuncture seemed to offer a valuable alternative therapy for female infertility due to hormone disorders [561].

Mechanisms of acupuncture for female infertility may be multiple. The first is that acupuncture can promote ovulation and recover normal menstrual cycle. Inability of ovulation is a familiar reason of the female infertility. It was seen in the clinic, for some patients of secondary menostasis (no ovulation chronically), acupuncture, or EA could recover their normal ovulation and menstrual cycles, and alter their serum levels of FSH, LH, and the size of ovarian follicle. These actions are realized obviously through the regulation of the axial function of the

hypothalamus-pituitary gland-ovary [558, 559, 562], and the recovery of imbalanced hormones, which has been verified in animal experiments. For example, through EA, leuteinization of interstitial cells and membrane cells of ovarian follicle in the domestic rabbit ovary could appear [563]. The second is that acupuncture may recover normal menses by improving the blood circulation of uterus. Stener-Victorin *et al.* of Sweden observed a significant reduction of blood flow impedance in uterine arteries of infertile women with EA that might be due to a central inhibition of sympathetic activity [564]. The third is that acupuncture can improve the obstruction of fallopian tube. Recently, Wang and Yue of China reported a combination of acupuncture and Chinese herbs in treating 26 cases of sterility due to tubal obstruction. After being treated 1–3 courses of treatment (20 days for one course of treatment), 21 of them recovered, the total effective rate was 81 % [565].

Regardless of male or female infertility, the optimal acupoints are located within urogenital reflex zones. Master Jiao had excellent results using acupuncture for menostasis. He often punctured the master acupoint Guilai (ST29) of the lower abdomen, propagated needling sensation of soreness to the groin, and associated points of Xuehai (SP10), Sanyinjiao (SP6), Zhongji (CV3), and Qihai (CV6). When needling Xuehai (SP10), the tip of needle should be upwards so that needling sensations can be propagated to the perineum region. We often use reflex points on the medial side of lower limbs and lumbosacral reflex zones. Until now, at least several dozens patients have recovered their fertility after receiving treatment from our clinic.

Because acupuncture can raise the quantity and enhance the quality of the sperm, when treating the female infertility, even if the male sperm may be normal, applying acupuncture for the male, especially just a few days before the ovulation may

raise the chance of conceiving. The treatment sessions for the male need not to be frequent, usually once weekly or once every two weeks, but it is recommended to have a continuous 2~3 sessions the week before female ovulation. Liu and Zhang of China recently reported their results in treating infertility using acupuncture, vertebral manipulation, Chinese herbs, as well as the method of treating the husband and wife together. 32 out of 36 infertility patients successfully conceived after a period of acupuncture treatment, and the total effective rate was 88% ^[566].

22.9 Malposition of the Fetus

Malposition of the fetus (in breech or acromion presentation) is a cause of dystocia. Applying needling and/or moxibustion to correct the fetal position can be a simple, economical, safe, and effective method that has been widely applied in China.

[Therapy]

Apply moxibustion at bilateral Zhiyin (BL67), 15~30 min each session, once daily or once every other day. Generally, it requires five sessions or so to take effects. Needling or EA is also applicable at Zhiyin (BL67) and Sanyinjiao (SP6), 15~30 min each session, once daily or once every other day.

[Discussion]

According to a study from China, 2 069 patients with various abnormalities in fetal position and 29 to 40 weeks pregnant were treated by moxibustion at Zhiyin (BL67), 15 min everyday. The total correction rate was 90.3% and 86% of these cases were corrected

after one to four applications. The remaining 14% were corrected after five to ten applications. In the same 2 069 patients, 2 041 fetuses were in breech presentation (1 841 corrected), and 28 were in acromion presentation (all corrected). The researchers found that the correction rate was higher in patients with an average tension of the abdominal wall than in those with high or low tension. The correction rate in patients 30 to 34 weeks pregnant was higher than in those with gestation above 34 weeks. Nevertheless, in 880 cases of the latter category, the correction rate still approached 84.6%. In 1 794 of 1 869 cases with abnormal fetal positions, when moxibustion was applied, corrected fetal movement could be felt, however, out of them, the fetus malposition was not corrected in 200 cases ^[576].

Another randomized controlled trial conducted in Jiangxi Province, China by Cardini and Weixin showed that among primigravidas with breech presentation during the 33rd week of gestation, moxibustion for one to two weeks increased fetal activity during treatment period and cephalic presentation after treatment period and at delivery. There were significant differences emerged between the intervention group and the untreated control group at same stage of pregnancy. During the 35th week of gestation, 98 (75.4%) of 130 fetuses in the intervention group were cephalic vs. 62 (47.7%) of 130 fetuses in the control group ($P<0.001$). Despite the fact that 24 subjects in the control group and one subject in the intervention group underwent external cephalic version, 98 (75.4%) of the 130 fetuses in the intervention group were cephalic at birth vs. 81 (62.3%) of the 130 fetuses in the control group ($P=0.02$) ^[577].

According to Li and Wang of China, EA at Zhiyin (BL67) for correcting malposition of the fetus has similar effectiveness to that of moxibustion. Thirty-nine cases were corrected by EA with a rate of 81.3%,

the average session of treatment being 1.41. The sessions of EA were less than that of moxibustion, and the difference was statistically significant, but there was no significant difference of efficacy between the two groups with EA or with moxibustion ^[578]. In addition, applying fresh ginger paste at Zhiyin (BL67), Cai *et al.* of Jiangxi, China treated 133 pregnant women (28 to 38 weeks gestation) with breech position. One-hundred-and-thirteen out of the treated pregnant women had normal fetal position after treatment with 77.4% of correction rate. 48 out of the 113 pregnant women whose fetal position corrected by treatment only received therapy once, Spontaneous correction of fetal position occurred in 123 pregnant women of the control group with 51.6% of correction rate. There was a significant difference in the correction rate between the study and control groups ($P<0.01$) ^[579].

Correction of needling and moxibustion for fetal malposition is mainly realized by promotion of uterine activity and fetal movement. It has been demonstrated that moxibustion applied to Zhiyin (BL67) enhanced uterine activity by means of stimulating the secretion of adrenal cortical hormone. At the same time, fetal movement increased in strength, and consequently the heart rate of fetus increased. These factors favored the automatic correction of fetal position ^[576].

To raise the correction rate of fetal malposition, gravidas should be asked to loosen the cloth around the waist during treatment to allow the full relaxation of the whole body, especially the abdominal muscle. Moreover, they may practice *qigong* breathing exercise for relaxation in conjunction with acupuncture simultaneously. As for the point selection, in addition to classical Zhiyin (BL67), may also apply other points in urogenital reflex zones of the medial side of lower limbs, such as Sanyinjiao (SP6), Yinbai (SP1), Taibai (SP3) or auricular reflex

points.

“Could acupuncture induce preterm labor?” This is the question of a widespread concern when using acupuncture to treat other diseases or rectifying malpositions of fetus in pregnant women. In general, acupuncture do not induce preterm labor, instead, it can often be used for prevention because the impact of acupuncture on uterus contraction is a kind of regulatory action, namely its action direction is dependant on previous state of the uterus prior to acupuncture. Tsuei *et al.* reported uterine response to EA stimulation of specific sites of the extremities in 60 pregnant women: 48 cases for labor induction and 12 cases for inhibition of premature labor. In 34 cases, term or post-term, and 7 intrauterine fetal death cases, induction of labor was attempted. In 32 cases, delivery was achieved, resulting in a success rate of 78%. Of 12 cases of premature labor, with exception of one case, all carried pregnancy to term, resulting in a success rate of 91.6%. In 7 cases of midterm abortion attempts, all failed to respond. These clinical observations indicated that EA might become a useful tool in controlling labor ^[580]. According to Pak *et al.* of South Korea, Oxytocin-induced uterine contractions in pregnant rats were significantly suppressed by acupuncture on Hegu (LI4) ($P<0.05$), but not by Sanyinjiao (SP6). Stimulation of Guanyuan (CV4) by moxibustion had no significant ($P>0.05$) tocolytic effect ^[581]. This suggests that the acupuncture action of inhibiting the contraction of pregnancy uterus has specificity of acupoints, and puncturing Hegu (LI4), which usually has strong needling sensations, may have the action of preventing miscarriages rather than inducing preterm labor.

On the other hand, for gravidas at term but without labor, acupuncture may promote induction of labor sooner. In a randomized controlled trial of 2001, Rabl *et al.* of Austria verified that acupuncture

at points Hegu (LI4) and Sanyinjiao (SP6) supported cervical ripening at term and could shorten the time interval between the estimated date of confinement and the actual time of delivery ^[582]. However, through a series of reviews of methods for cervical ripening and labor induction using standardized methodology, Smith and Crowther of Australia concluded that there is a need for a well-designed randomized controlled trial to evaluate the role of acupuncture in inducing labor ^[583].

22.10 Hysteromyoma

Hysteromyoma (fibroid tumor of the uterus) is a common disease of women. Its growth and sizes may be closely related to the estrogen level as it may stop growth and even shrink gradually along with menopause. Usually its conservative therapies are recommended unless it grows too quick and/or induces heavy metrorrhagia, when it has to be surgically removed. Presently, many patients of hysteromyoma are seeking acupuncture as one alternative therapy.

【 Therapy 】

Methods of acupuncture, auricular acupuncture, and acupressure for hysteromyoma are similar to that for dysmenorrhea or infertility (refer to Section 22.6). Optimal stimulation points may be within urogenital reflex zones of lower abdomen as well as at the medial side of lower limbs, such as Guanyuan (CV4),

Zhongji (CV3), Daju (ST27), Qihai (CV6), Guilai (ST29), Xuehai (SP10), Shangyinling (EX155), Diji (SP8), and Sanyinjiao (SP6). Once there are swelling or hard nodules (mass) discovered at nearby Shangyinling (EX155) or Sanyinjiao (SP6), their stimulation will become especially important. EA is preferred, once every other day or twice weekly for a few months continuously.

【 Discussion 】

Because of regulatory effects of acupuncture on the hypothalamus-pituitary body-ovary axon, it is possible to use acupuncture to reduce the size of hysteromyoma through its actions on female hormones, especially estrogen. Yan and Wang of China reported that the total effective rate of acupuncture for hysteromyoma is 98% and cure rate is 73%, and acupuncture treatment is better than conventional medication treatments ^[584].

However, in general, it is difficult to cure this disease with acupuncture alone in a short course of treatment, especially for those with a longer course of disease and larger sizes of fibroid tumors. It is advised to combine acupuncture with Chinese herbs or other conservative methods simultaneously. Shiota Bunshi of Japan experienced that only fibroid tumors up to the fist size could be cured by moxibustion, but for those tumors exceeding the fist size or making the bottom of uterus extend to umbilicus, moxibustion could hardly yield much results ^[88]. To date, in the West, there is a lack of reports with a large sample statistics on acupuncture treatment for hysteromyoma.

Disorders of the Skin

23.1 Herpes Zoster

Herpes zoster (shingles) is caused by a latent chickenpox-herpes virus, which can infringe upon the nervous system, and mostly occurs in the elderly or those with the immune-inhibition. In addition to the skin lesion of herpes zoster, intercostal neuralgia or trigeminal neuralgia is often accompanied. Its acute process is generally benign, but the neuralgia, particularly post herpetic neuralgia (PHN) is a primary chronic complication.

【 Therapy 】

There are mainly four kinds of point selections and needling methods.

The first is ENM (encircling needling method). Insert 6~8 needles into the subcutaneous portion along the edge of skin lesion with the needle tips pointed to center of the herpes aggregation. Retain needles for 20~30 min and connect them to an electric stimulator at a low frequency and a medium intensity.

The second is selecting and puncturing reflex points at GV of the back, corresponded to the skin lesion and based on segmental domination rule of spinal nerves. When applying EA, at first 15 min, use a low frequency (2~10 Hz) and the continuous wave, at the following 15 min, change the continuous

wave to the loose-dense wave with a high frequency. For pain occurring along the trigeminal nerve, select local acupoints, and their needling methods are the same as that for trigeminal neuralgia (refer to Section 14.5).

The third is selecting points within distant reflex zones. Puncture central reflex zones on the extremities, or distant portions of somatic reflex zones that are consistent with the skin lesion.

The above three methods can be applied once daily or once every other day. Meanwhile, infrared radiation onto the skin lesion or pain areas is applicable.

The fourth is ANEM or APPM. Stimulate auricular reflex points corresponded to the lesion location, as well as *Spine point*, *Brain point*, and *Subcortex* on both ears alternately every 3~4 days.

At the acute stage of herpes, the above-mentioned methods can be used alone or in combination. For PHN, only apply the latter three methods.

【 Case Studies 】

Case 104: Patient was a 68-year-old male. He had suffered from herpes zoster for one week. Herpes were distributed on a region with the size of a palm on right upper back and ribs. There was severe regional pain on the skin and thus greatly affecting sleep. The treatment plan was to combine EA with

infrared radiation, three times weekly, once every 1~2 days. Meanwhile, the patient took herbal beverage of *Isatidis Radix*. After the initial session of acupuncture, his pain was greatly reduced, and after two sessions, the pain was further reduced with the improved skin lesion. After the fifth session, herpes scabbed and there were almost no pain. After nine sessions, herpes completely recovered, and no any sequelae remained.

Case 105: Patient was a 78-year-old male. He suffered from herpes zoster, which occurred repeatedly over the past ten months. During each onset, there were severe pain and itching in the regional skin that persisted almost all day long. Since the occurrence of herpes, he had tried many medications, vitamins, and external applications of liniment (*Caladryl* lotion) without obvious effects. When he came to acupuncture, sparse papules were distributed on the left side of chest, the anterior neck and in the area behind the ear. For acupuncture, Waiguan (TE5), Hegu (LI4), Yifeng (TE17), Fengchi (GB20), and Chenjiang (CV24) were selected and needles were retained for 30 min after the generation of needling sensations. Combining with application of infrared radiation on the region of herpes, Acupuncture was applied twice weekly, once every 3~4 days. After two sessions of treatment, the papule and pain had a little bit improvement; at the fifth session, ANEM were applied to bilateral auricular points alternately. The papule and pain did not disappear completely until the 13th session, but there was a recurrence three day later, so he came back to get another four sessions with the above method until the 17th session, when symptoms got better once again. Symptoms subsided completely after 20 sessions while the patient was satisfied with the results and thus discharged. However, because a new papule reoccurred one month later, he came back to acupuncture for a “tune-up”. Through another six

sessions, his symptoms went away again.

[Discussion]

Ample clinical trials have verified acupuncture can generate effects more easily for herpes zoster and PHN at their acute stage, and has better results than medications. In the above-mentioned Case 104 and Case 105, although their disease courses had different lengths, the desired effects were still attained during the treatment. However, once PHN becomes chronic, it usually is intractable, and needs a longer course of treatment to be kept under control. Therefore, for this disease, it is advised to begin acupuncture treatment as early as possible. Even if acupuncture at early stage of herpes zoster could not prevent the occurrence of PHN completely, it may still reduce the incidence and severity of PHN to a certain extent ^[585].

Currently, there are many reports on the successful treatment of acupuncture or EA for herpes zoster and PHN ^[586~588]. Through a review of literature on the current treatment of PHN from 1988 – 1998 on Medline database, Hui *et al.* found that although many medications had been used to reduce pain of PHN, no treatments had been completely successful in decreasing pain. In a study, combining an alternative medical therapy (including acupuncture) with selected medications showed an average pain reduction of 72.1%. There was a 77% average pain reduction in patients with herpes zoster onset of more than one year and a 68% reduction in patients with herpes zoster onset between one month and one year. Almost two-thirds of the 56 patients reported pain reductions of between 75% and 100%. These data suggested the combination of alternative therapy and selected conventional medications provided good pain relief for most patients presenting with PHN. However, randomized trials with appropriate control groups were needed to

validate effectiveness of this therapy in treatment of PHN ^[587].

It has been known that stimulation on acupoints at the region with skin lesion and adjacent areas can effectively control herpes zoster and its pain. According to a study by Guo, combining needling with electrical stimulation mainly on selected acupoints of GV located in the same segment as the area of skin lesion, was applied to 29 cases with herpes zoster related neuralgia. Their disease course lasted from 7 days to 6 months. After 5~10 treatments, 7 cases were cured (the pain subsided but the patient had slightly allergic reaction on the skin). The total effective rate was 93.1%. Among those patients who had a disease course under 2 months, 26 cases were completely cured, while of the 3 cases with the disease course above 2 months, only one case was effective ^[588].

23.2 Urticaria/Pruritus/ Neurodermatitis/Psoriasis

Urticaria is a common allergic disease. Acupuncture has good effectiveness for urticaria ^[589] as well as certain results for other dermatoses, such as pruritus, neurodermatitis, and even psoriasis ^[590, 591]. Their acupuncture treatments are similar.

【 Therapy 】

Select master points within somatic reflex zones, and associate points within central reflex zones. Mainly apply body acupuncture and auricular acupuncture, and combine with pricking blood and cupping methods. While puncturing local points, focus the stimulation on superficial layers of the points through superficial needling methods.

For urticaria or pruritus located throughout the entire body or over a large area, select distal points within corresponding somatic reflex zones on the extremities. For example, select Neiguan (PC6) and Chize (LU5) for lesions of the ventral and upper half of the body, Xuehai (SP10), Sanyinjiao (SP6) or Zusanli (ST36) for lesions of the ventral and lower half of the body. For skin lesions accompanying severe itching or nervousness, select points of central reflex zones, such as Daizhui (GV14), Shenzhu (GV12), Shenque (CV8), Quchi (LI11), Hegu (LI4), and Houxi (SI3). Puncture the selected points once daily, and combine with pricking blood at Houxi (SI3) and Xuehai (SP10), or cupping Daizhui (GV14), Shenque (CV8), and Xuehai (SP10).

For rashes with limited distribution range, ENM (encircling needling method) and puncturing on reflex points at GV may be applied, and both methods can also be applied for herpes zoster (refer to Section 23.1).

For acute rashes or itching, auricular needling can be applied on ear reflex points, such as *Lungs*, *Endocrine*, *Adrenal gland*, and *Shenmen*. It is advised to obtain slight pain and warmth, and retain needles for 30 min, once daily. For chronic patients, it is suitable to apply ANEM or APPM alternately on both ears.

【 Case Studies 】

Case 106: Patient was a 39-year-old female. She had suffered from rashes on the lateral portions below the elbow and the knee for four months. The cause was assumed allergy but it was unclear as the rashes could only be temporarily controlled by cortisone (oral and external application). She sought acupuncture after another onset of rashes when medications were stopped. After two acupuncture sessions, the rashes on the upper limb subsided. After five more sessions, all rashes subsided. At the 2-month-follow-up, the

rashes did not recur.

Case 107: Patient was a 45-year-old male. He had suffered from psoriasis at a small area of both palms and the posterior neck for three years. He had taken many medications for the problem in the past, without good results. Acupuncture was administered twice weekly at Hegu (LI4), Neiguan (PC6), Fengchi (GB20), and Jianjing (GB21) within the corresponding somatic reflex zones. After five sessions of treatment, the skin lesion at the left palm was progressively mended, and after 20 sessions, the rashes on both palms and posterior neck were completely alleviated. Although there were occasional relapses of the rashes, they could be controlled instantly through acupuncture. In the end, the patient had 38 sessions of acupuncture over six months and was satisfied with the results.

Case 108: Patient was a 41-year-old male. He had suffered from psoriasis at a large anterior and lateral area on the both limbs for six years. The area was gradually extended as the time passed, with itching difficult to tolerate, especially at night and during the morning. He had sought other treatment besides acupuncture, but unable to receive any help. Acupuncture methods as the above was applied twice weekly. At the initial session, EA was applied at bilateral Zusanli (ST36), Sanyinjiao (SP6), and Xuehai (SP10). Since the second session, the EA was changed to ENM. That day, he felt his itching eased dramatically. After the fourth session, the area of rashes became a little bit smaller accompanying the reduction of the skin thickness feeling. Through 25 sessions over three months, the itching was completely alleviated but skin lesions remained. There were no remarkable changes comparing the extent of skin lesion with that before acupuncture, though its area was smaller.

【 Discussion 】

In a review by Chen and Yu of Taiwan, China, acute urticaria could be easily treated with acupuncture. Quchi (LI11), Xuehai (SP10), Sanyinjiao (SP6), and Zusanli (ST36) were the four acupoints commonly prescribed for acute urticaria. For chronic urticaria, however, it was more challenging, and to overcome it, at least six kinds of novel acupuncture methods had been developed. The combination of ordinary acupuncture and auricular acupuncture had been observed to be a highly effective cure of chronic urticaria. Acupoint injection with thiamine hydrochloride (Vitamin B₁) was also an effective treatment. Although results of these clinical observations had not been systematically confirmed due to a lack of a control group, with the need for a standard classification of urticaria, the study did offer insight into using an alternative therapy instead of conventional treatment for patients with urticaria, particularly those refractory to medication therapy ^[592].

In addition to acupuncture therapy, cupping on acupoints has been recommended for urticaria. Sun et al applied cupping to treat 66 urticaria patients, including three acute patients and 63 chronic patients. Their disease course was mostly between 6~12 months. The master acupoint chosen was Shenque (CV8), with associating acupoints of Quchi (LI11) for urticaria of the upper limb, Xuehai (SP10) for urticaria of the lower limb, and Dazhui (GV14), Feishu (BL13), and Pishu (BL20) for the intractable ones, once daily. Results showed that 23 cases (34.8%) were cured, and the total effective rate was 98.3% ^[593].

Belgrade *et al.* evaluated the effect of acupuncture on histamine-induced itch and flare in 25 healthy volunteers. They compared it with the effect of a pseudo-acupuncture procedure and of nointervention in a single-blinded, randomized crossover study. Duration of itching was shorter and maximal flare

area was decreased significantly with acupuncture than with either pseudo-acupuncture or with no-intervention. However, acupuncture had little or no effect on itch onset time or on maximal itch intensity after intradermal injection of histamine. In this study, acupuncture appeared to be an effective inhibitor of histamine-induced itch and flare. Moreover, acupoints displayed specificity in that needling nearby; non-acupuncture sites resulted in poorer results ^[594]. Lundeberg *et al.* of Sweden also studied the effect of acupuncture on experimentally induced itch in ten healthy volunteers. Itching was induced by intradermal injections of histamine on upper arm. Placebo-acupuncture, acupuncture, and EA at 2 Hz or 80 Hz were applied over the injection site, proximal to injection site (in the same dermatome) or extrasegmentally (ipsilateral to the injected arm) for a period of 5 min following induction of itch. Results showed that acupuncture and EA significantly reduced subjective itch intensity when applied intrasegmentally, while no significant effects were obtained when stimulation was applied extrasegmentally. The results suggest that acupuncture or EA could be tried in clinical conditions associated with pruritus ^[595].

Duo of Belgium with EA treated six patients with intractable uremic pruritus. Results were encouraging: pruritus was drastically improved during or after EA in several patients, while a control treatment with superficial electrical stimulation was ineffective ^[596]. For treatment of neurodermatitis, EA (with needles inserted around diseased areas) ^[597], plum-blossom needle ^[598], or laser reflexotherapy ^[599] had good effectiveness.

Acupuncture is also an effective treatment for psoriasis. Liao and Liao of New York Univ. Dental College, USA, treated 61 cases of psoriasis with acupuncture, including 25 patients with complications of joint involvement and two cases with scleroderma

additionally. All patients had failed to respond to their previous conventional medical management. Average of disease course was over 16 years. They received an average of about nine sessions of acupuncture treatment. With acupuncture treatment, about one-half (30) of the 61 patients had complete or almost complete clearance of skin lesions. Nine patients had minimal or no improvement. Their experience indicated that acupuncture is indeed an effective therapeutic modality for psoriasis, particularly when Western medical management is unsuccessful. They speculated about possible involvement of cutaneous reticuloendothelial system in clearance of the skin lesions ^[600]. Zhang *et al.* of Dalian, China combined needling with cupping to treat 662 cases of psoriasis with total effective rate of 88.37% including 282 cases completely recovered. After an average of 44 sessions, master acupoints of choice were Dazhui (GV14) and Taodao (GV13) for psoriasis throughout the entire body; Tianzong (SI11) for psoriasis at the upper back and upper limbs; Jianyu (LI15) for psoriasis on the upper limbs. Associate points were selected based on distribution of skin lesions and regression circumstances, sequentially, from top to bottom. They did not select those points below the waist as the skin lesions had not yet subsided. For few remain skin lesions, they took sparrow-pecking needling along the border and center of lesions then cupping ^[601]. However, in a controlled trial of 56 patients who were suffering from long-standing plaque psoriasis and were randomized to receive either active treatment (electrical stimulation by needles placed intramuscularly, plus auricular acupuncture) or sham acupuncture, Jerner *et al.* of Sweden found that classical acupuncture was not superior to sham acupuncture in the treatment of psoriasis ^[602].

According to the ten-year experience of Rosted of England, acupuncture had long-lasting results in the

treatment of acne, psoriasis, atopic dermatitis, eczema, rosacea, and pruritus. Results normally occurred after two or three treatment sessions, and, on average, 14 sessions would usually be necessary. If the patient had not responded after six sessions, it was unlikely that he will respond, and the treatment should be ceased. The author felt that precise diagnosis was of less importance in treating skin diseases, which usually responded to a simple program ^[590].

From our experience, the effectiveness of acupuncture for dermatoses is directly linked to their pathogenesis, , disease course length, and scope of the skin lesion. Generally, patients with a longer disease course and broader scope of skin lesions are more difficult to be cured, and vice-versa. The patients with psoriasis, rosacea or acne are more difficult to be cured than those with urticaria, pruritus, or neurodermatitis. Moreover, those with causes that are closely related to CNS or allergies are easier to be cured than those with unidentified causes.

23.3 Acne

Acne is one kind of chronic infection of the hair follicle and the sebaceous gland, which commonly occurs on the face, neck, chest, and the back. It is frequently seen among young people due to their prosperous sebaceous secretion. There have been many successful experiences of acupuncture for acne ^[590, 603].

[Therapy]

Select reflex points of regional somatic reflex zones as master points, and reflex points within central

reflex zones or auricular reflex zones corresponded to endocrine as associate points. When stimulate regional reflex zones, apply superficial needling to stimulate superficial points or superficial layer of points at the affected or adjacent region (the same segment) with an intense stimulation. Combination of pricking blood with cupping can also be applied. For stimulation of the central zone, Dazhui (GV14), Zhiyang (GV9), Shenzhu (GV12), or auricular points of *Cheek*, *Liver*, *Endocrine* may be selected. For patients with irregular menses, dysmenorrhea or constipation, associate reflex points or acupoints of urogenital or intestinal reflex zones, such as Sanyinjiao (SP6), Xuehai (SP10), Dijì (SP8), Zusanli (ST36).

At the beginning of the treatment, administer acupuncture once daily or once every other day. After the effects have been attained, administer acupuncture once every 3~4 days for a few months.

[Discussion]

For acne, all three therapies below have been reported to be effective: auricular acupuncture ^[604], acupuncture plus cupping ^[605], and pricking blood plus cupping ^[606]. In 41 cases treated by Lian *et al.* of Guiyang, China, a combination of pricking blood at the auricular points of *Fever point*, *Cheek*, and *Liver* with pricking blood plus cupping at Dazhui (GV14), Feishu (BL13), and Weishu (BL21) was applied. The total effective rate was 70.96% ^[607]. Xing of Beijing, China treated 304 cases with acne with application of pricking blood therapy. Results showed that 131 cases completely recovered, 122 cases had excellent results, 48 cases were better. The total effective rate was 100%. Xing's methods included pricking blood at the auricular points (*The groove to reducing blood pressure*, *Fever point*, and *Stomach*), and pricking blood plus cupping at Dazhui (GV14), Zhiyang (GV9), Shenzhu (GV12), Jinsuo (GV8), Shendao

(GV11), and Mingmen (GV4) of the back once every other day. In addition, seven-star needles or filiform needles were occasionally applied for local stimulation, and 2% tincture of iodine was painted on the affected region to prevent infections ^[608].

Because acne is a kind of dermatosis related to endocrine, there are two principles of point selection for acupuncture. The first is to apply superficial stimulation at somatic reflex zones, with a needling method for purgation, such as that administered by

pricking blood or cupping. The second is to stimulate points related to endocrine simultaneously to regulate endocrine function, such as auricular points or GV acupoints. It is known that there is distribution of the vagus fibers on many auricular points, where acupuncture usually can achieve more pronounced regulatory effects of ANS. Many acupoints of GV that mainly pertain to the central reflex zone may have stronger neuro-endocrinal regulation.

Disorders of Endocrine

24.1 Obesity

In the modern society, many obesity or overweight people seek acupuncture for weight loss. Though it is challenging to achieve an ideal outcome, acupuncture can indeed help many obese patients to a certain degree. In addition, obese patients often have a tendency of water retention due to disturbance of hormones, joint pain due to an overload of the lower limbs, or an overeating behavior due to nervousness. For these conditions, acupuncture therapy is particularly suitable as it can elicit positive regulatory effects on the entire body.

【 Therapy 】

For body acupuncture, select Sanyinjiao (SP6) within urogenital reflex zones to regulate endocrine balance and expel excess water from the body. Select Zusanli (ST36) within stomach reflex zones to control appetite and relieve constipation. Select Shenmen (HT7), Baihui (GV20), and Yintang (EX2) within central reflex zones to relieve anxiety that may result in over eating. For other complications, select reflex points at the corresponding reflex zones.

For auricular acupuncture, select the most sensitive auricular reflex points, such as *Stomach*, *Hunger point*, *Endocrine*, *Shenmen*, and *Mouth*, and apply ANEM or APEM routinely. One side of auricle

each session, alternately on both ears every 3~5 days. Instruct the patient to press these embedded tack needles for more than ten seconds each time when hunger appears or before meals.

The above two methods can be used separately or in combination, twice weekly, ten sessions for one course of treatment.

【 Discussion 】

There were some strictly designed clinical studies with small samples, in which no clear picture was painted to show that acupuncture was effective in reducing appetite or body weight ^[609]. For example, according to Mazzoni *et al.* of Italy, a significant improvement in anxiety and depression was only observed in the acupuncture group, with no significant effect of acupuncture on BMI and obesity-related quality of life ^[610]. However, more other studies with large samples conducted have shown that acupuncture is surely effective in losing weight and controlling appetite ^[611].

As for the mechanisms of acupuncture for weight loss, there have been many studies ^[612,613]. Choy and Eidenschenk of USA observed that press needles or ear-clips on *Hunger point* of the tragus could induce slowing of gastric peristalsis, so they concluded that auricular acupuncture might have value in reducing appetite in association with weight loss programs ^[612].

In a study by Richards and Marley of Australia, 60 overweight subjects were randomly divided into an active and a control group and used an AcuSlim device twice daily for four weeks. The active group attached the device to auricular points *Shenmen* and *Stomach*, whereas the control group attached the device to their thumb where there are no acupoints. Of those who responded, 95% of the active group noticed suppression of appetite and a 2 kg weight loss, whereas none of the control group noticed such changes. They concluded that frequent stimulation of specific auricular points is an effective method of appetite suppression, which leads to weight loss ^[613].

However, based on results of animal experiments, the effects of acupuncture for weight reduction may be principally realized through regulation of hypothalamic ventromedial nucleus (VMH, the satiety center) and lateral hypothalamus (LHA, the feeding center). Zhao *et al.* of Nanjing, China, reported that acupuncture could increase the excitability of VMH in rats with experimental obesity ^[614].

Asamoto and Takeshige of Japan further found that stimulation of rat's inner auricular regions, which correspond to the human auricular points of *Pylorus*, *Lungs*, *Trachea*, *Stomach*, *Esophagus*, *Endocrine*, and *Heart*, could evoke potentials in VMH. Needle implantation into any of these points reduced body weight to its initial 290 g after the rat had gained about 410 g in 20 days, and significantly reduced initial 450 g body weights ($P < 0.01$) in 14 days. Stimulation of other auricular points did not evoke VMH potentials and did not reduce body weight. After VMH was lessened, body weight increased and needling of these points had no effect on body weight. Needling of these auricular points evoked no potentials in LHA, and had almost no influence on weight reduction induced by LHA lesion ^[615]. According to a study by Shiraishi *et al.* of Japan, in Wistar experimental (hypothalamic and

dietary) obese rats, while stimulating ipsilateral vagal innervated region of the auricle that is equivalent to the cavum conchae in the human, LHA neuronal activity was depressed 45.6%, and VMH activity was excited 60.5%. These auricular acupuncture stimulation effects were correlated to the degree of obesity. In conclusion, the results suggested that auricular acupuncture stimulation may not reduce appetite, but is more likely concerned with satiation formation and preservation. Thus, auricular acupuncture should be more effective on obese rats than on normal rats ^[616].

Liu *et al.* of Nanjing, China conducted a number of clinical trials and laboratory studies on the mechanisms of acupuncture for weight loss. In order to understand the relationship among patients' adrenal function, simple obesity, and the effect of acupuncture on it, they observed the obesity indices, lipid indices, levels of fasting blood-glucose, noradrenalin, dopamine, adrenalin, and cortisol. Results indicated that patients with simple obesity had hypofunction of the sympathetic-adrenal system and the hypothalamus-pituitary-adrenal system. Acupuncture not only affected weight loss but also enhanced functioning of the two systems, suggesting that the effect of acupuncture on weight loss may be produced by enhancing the functions of both the sympathetic-adrenal system and the hypothalamus-pituitary-adrenal system ^[617]. In 102 cases of simple obesity complicated by cardiovascular diseases, they observed changes of pathogenic and hazardous factors and the regulating function of vegetative nerves on cardiovascular activities. Therapeutic effect of acupuncture was good with a total effective rate of 88.24% ^[618]. In other 41 simple obese patients complicated with hypertension and treated by acupuncture, Liu *et al.* obtained good results with a total effective rate of 87.8%. The results showed that there was the benign regulatory effect of acupuncture

in overeating, the blood pressure, vegetative nervous indices, lipid level, and energy metabolism ^[619]. In other 34 simple obesity patients complicated with hyperlipidemia and treated by acupuncture, marked weight loss effect was achieved, while the level of TC, TG, LDL-C, HDL-C, AI, W.C./H.C, TXB2, 6-Keto-PGF1 alpha in the patients were finely regulated. It suggested that acupuncture might not only treat obesity and hyperlipidemia, but also resist pathogenic and hazard factors predisposing circular diseases, so that it can prevent and treat complicated cardiovascular diseases of obesity ^[620].

To understand the antiobesity effect of acupuncture and its influence on water and salt metabolism in patients, Sun of Nanjing, China observed changes of symptoms and signs, obesity indices, blood sodium, blood potassium, milliosmol of plasma and urinary aldosterone before and after acupuncture treatment in 75 patients with simple obesity (12 cases with swelling, 33 cases without swelling). Results showed that the total effective rate of antiobesity treatment for one month was 89.3%. Before acupuncture, concentrations of blood sodium and aldosterone of patients with swelling were significantly higher than normal people or patients without swelling. However, the concentration of blood potassium and milliosmol of plasma of patients with swelling were significantly lower than normal persons, or patients without swelling. After acupuncture, the concentrations of blood sodium and aldosterone decreased markedly and concentration of blood potassium and milliosmol of plasma increased remarkably in the patients with swelling. It indicated that acupuncture treatment might not only have a good antiobesity effect, but also improve water and salt metabolism of patients with obesity by regulation of the nervous system and body fluid ^[621].

On the other hand, consistent with the effect of weight reduction, acupuncture is also beneficial to

those who are nonobese but expect to have a graceful body shape. Liu *et al.* treated 359 adult female cases of non-obesity with undesirable body shape, by combining application of body acupuncture, moxibustion, and auricular acupuncture. They achieved quite good orthopedic results, suggesting that therapies can effectively regulate the somatotypic indices of body weight, the circumference of chest, loin, hip, and thigh, the ratio of loin to hip, sebum thickness, obesity degree, body mass index and body fat percentage of the cases ^[622]. Shiraishi *et al.* of Japan also demonstrated that auricular acupuncture stimulation at the bilateral cavum conchae could reduce body weight in 35 healthy non-obese subjects ^[623].

Based on our clinical experience, in order to achieve the goal of weight loss and maintain a slim body shape, the following comprehensive therapeutic plan can be applied in addition to the acupuncture treatment.

(1) Practice *qigong* therapy. There were mainly two types of *qigong* for weight loss prevalent in China: **frog *qigong*** and **tiding *qigong* of jade toad**. Both aimed to teach the patient to simulate breathing patterns of the frog and toad, respectively. We have merged them and simplified into a new name: **slim *qigong***. Its mechanisms of weight loss are the elevated abdominal pressure through altering normal breathing patterns, which can inhibit contractions of the empty stomach, and facilitate utilization of the fat storage in the abdominal area. Thus, by practicing the slim *qigong* consistently, patients on diet may decrease their hunger feeling or dizziness due to a lack of energy supply.

(2) Take Chinese herbs. Most of “diet teas” on the market today are composed of Chinese herbs that have laxatives and may promote the intestinal peristalsis and/or reduce absorption of the nutrients. Thus, they are only suitable for patients of strong absorption functions, especially those accompanied

constipation. Some other Chinese herbs without laxatives may be suitable to more patients of obesity.

(3) Check weight regularly. Measure the body weight regularly, at least twice weekly, preferably once daily. This not only allows the patient to monitor the weight changes, but also can help remind one's own consciousness to control weight intentionally. For example, there is a famous USA agency specializing in weight control named as "Weight Watchers". Obviously, when words like "weight loss", "weight control", or "weight watch" are constantly floating in the mind, the patient would probably make more of an effort at proactively adjusting dieting behaviors, seeking out appropriate treatments and conducting daily exercises to achieve the goal.

(4) Adjust mealtime and the structure of meals. To lose weight, remember the good old healthy saying "Eat breakfast like a king, lunch like a queen, and supper like a pauper." The breakfast should be nutritious and full, while dinner should be well structured, consumed at an appropriate amount, and not taken overly late. It is important to rid the bad habit of eating snacks before sleep. In addition to not increasing the meal amount, it is helpful to take multiple meals with small amounts each time instead of the traditional regimen of three meals daily. Among the daily food intake, fat should be kept under 30%, while carbohydrates of vegetables, grains, and fruits between 12%~15%, the remaining may be proteins or lean meats.

(5) Do aerobic exercises. Shafshak of Egypt investigated efficacy of auricular EA on appetite and weight control in three separate studies. First, he observed that stimulation on points of *Stomach* or *Hunger point* was significantly more effective in appetite control than stimulation of placebo points. Then, stimulation of three pairs of auricular points (*Stomach*, *Hunger Point*, and *Shenmen*) was performed

on 61 obese subjects for 8 weeks. Only 43 subjects engaged in adding an exercise program. Seventy-nine percent of the subjects succeeded to follow a low calorie diet for eight weeks with subsequent weight reduction. Active exercises significantly increased weight loss. At last, 19 obese patients with knee osteoarthritis participated in EA, diet, and exercise program and 89% of them lost 5~10 kg in 8 weeks^[624]. Applying a triple therapy, Huang *et al.* of Taiwan, China treated 45 cases of simple obesity with a body mass index (BMI) above 30 kg/m² and percentage of body fat more than 25% in males, and 30% in females. The triple therapy for obesity included weekly auricular acupuncture, diet control, and aerobic exercise counseling for eight weeks. Results showed a (4.4 ± 2.9) kg reduction in body weight and a (5.6 ± 3.0)% reduction in body fat after completing the treatment course. The rate of effectiveness was 86.7%. They concluded that the triple therapy could result in a satisfactory body weight reduction and a good maintenance of target weight after treatment. Furthermore, frequent aerobic exercises during acupuncture treatment have contributed greatly to the reduction and maintenance of body weight, as indicated by correlation analysis^[625].

Finally, note that the goal of weight loss should not be approached hastily. If the goal is to lose over 10 kg, then it should be divided into several stages: the first stage may be set to lose 5 kg in 10 to 20 days. Let the reduced weight stabilize for one to two months then start to the second stage to lose other 5 kg, as well as to stabilize the further reduced weight for another 3~6 months. A consistent but a gradual process of weight reduction will contribute to a sustained positive outcome. Otherwise, the weight might rebound easily.

24.2 Diabetes

Today, for diabetes, acupuncture is merely used as an adjunct therapy to medications. Among diabetic patients, effects of reducing blood sugar by acupuncture are more significant for those with mild or moderate symptoms who pertain to non-insulin dependent type. In addition, acupuncture plays a certain role in preventing and treating neurological and vascular complications of diabetes.

【 Therapy 】

Needling and moxibustion can be applied alone or in combination. Select reflex points or acupoints within pancreas reflex zones, such as Yinlingquan (SP9), Diji (SP8), and Sanyinjiao (SP6) of the lower limb, Shenshu (BL23), Sanjiaoshu (BL22), Geshu (BL17), Pishu (BL20) of the back, as well as Jianli (CV11) and Zhongwan (CV12) of the abdomen. Retain the needles for 30 min, or combine with moxibustion after needling, three *zhuang* per each point. Acupuncture is applied once daily or once every other day, for three consecutive months.

【 Discussion 】

Zhan *et al.* of Jiangxi, China reported that in 14 cases with light and moderate non-insulin-dependent diabetes mellitus (DM) treated by acupuncture only at master acupoints of Pishu (BL20), Geshu (BL17), and Zusanli (ST36), 7 cases showed excellent results, 3 cases were good and improved, and 1 case non-effective. The blood sugar drawn during fasting was average (12.66 ± 0.67)mmol/L before treatment and descended to (7.72 ± 0.39)mmol/L after treatment^[658]. Tu *et al.* of Gansu, China reported 34 cases with non-insulin-dependent DM treated by acupuncture. Combining food control, they observed that 70% of the patients got improvement of symptoms of “eating more, drinking more, urinating more

(polyuria), and weight less”, as well as blood sugar drawn during fasting reduced from the average of 12.93mmol/L before treatment to 8.66mmol/L after treatment. The quantity of urine sugar reduced obviously from the original value 42.57 g to 19.07 g after treatment. T_3 , T_4 descended 19.41% and 37.13% respectively. The self-control test of the insulin content showed previously higher one reduced, while previous lower one increased. After treatment, cAMP decreased and cGMP went up obviously. That research elucidated that acupuncture treatment for disturbance of endocrine and metabolism caused by diabetes mellitus has good adjustment action^[659].

By comparing changes of hemorheology before or after treatment in diabetic patients with or without cardiovascular, cerebrovascular complications, acupuncture could play a stronger and bi-directional regulation action for serious diabetic disturbance of microcirculation. Acupuncture could lower the degree of blood viscosity and erythrocyte volume^[658,659]. Acupuncture also had certain actions in preventing and treating neuropathy that is often complicated with diabetes (refer to Section 14.3).

In 24 dogs with experimental hyperglycemia, Gu *et al.* demonstrated that acupuncture could control the amplitude of blood sugar level; moreover, that action of acupuncture had relatively specificity of acupoints. Stimulation on the *yin* meridians, such as needling on Diji (SP8), Sanyinjiao (SP6), and Chize (LU5), moxibustion on Zhongwan (CV12) and Qihai (CV6), had stronger effects than that from needling points of *yang* meridians, such as Pishu (BL20), Geshu (BL17), and Zusanli (ST36). Both of them could control the peak value of blood sugar. Needling *yin* meridians could also raise the peak value of insulin and serum C peptide that provided a meaningful theoretic basis for acupuncture in treating the non-insulin-dependent diabetes mellitus. Assuming the mechanism of acupuncture controlled blood

sugar in that experiment, acupuncture stimulation raised the sensitivity of insulin? cell receptor to glucose so that insulin secretion increased and sped up the utilization and conversion of the glucose [660].

Moreover, it was reported that efficacy of EA on experimental diabetes was better than that of TENS therapy. In a study by Mo *et al.* of China, the experimental diabetic rats were divided into three groups, EA group ($n=8$), TENS group ($n=8$), at bilateral Shenshu (BL23) and Zusanli (ST36) for 20 min once every 2~3 days for five weeks, and a group without any treatment (DM group, $n=6$) respectively. As compared with the DM group, increased plasma glucose levels were lowered significantly in the EA group ($P<0.05$) and slightly in TENS group ($P>0.05$) by the end of the sixth week, and the symptoms of polyphagia, polydipsia and polyuria were attenuated in the EA group [275].

24.3 Thyroid Diseases

Acupuncture has certain effectiveness for some thyroid diseases, such as hyperthyroidism, thyroiditis, benign thyroma, and simple goiter due to a lack of iodine. Their treatment methods are similar.

【 Therapy 】

Select the center of the diseased thyroid as the master point that coincides with positions of Shuitu (ST10) or Renying (ST9) located on the anterior neck. Apply piercing Renying (ST9) into Shuitu (ST10), i.e., let the filiform needle penetrate the enlarged gland. In addition, ENM (encircling needling method) may be applied. For regional diffuse but non-nodulated enlarged gland, insert 4~5 needles from the edges of the enlarged gland towards the center; while for

those with remarkable nodules, insert needles for the edge to the base of the gland. Slightly lift and thrust needles several times to strengthen the stimulation, but without retaining needles. Avoid touching local blood vessels, trachea and Adam's apple, and prevent bleeding or forming hematoma by applying light pressure for a while on needling locations after removal of needles. If the affected region is not suitable for frequent needling, select adjacent acupoints in central reflex zones of the neck, such as the 3rd~5th Huatuojiayi (EX102), Fengchi (GB20), Fengfu (GV16), or Dazhui (GV14). The distal associate points may be mainly within central reflex zones, of which the most commonly used is Hegu (LI4).

In addition, select associate points according to symptoms: Sizhukong (TE23), Zanzhu (BL2), Chengqi (ST1), and Fengchi (GB20) for exophthalmos with hyperthyroidism; Neiguan (PC6) and Shenmen (HT7) for palpitation; Sanyinjiao (SP6) and Fuli (KI7) for perspiration. Retain needles for 30 min.

Moxibustion may be applied separately or after needling. Indirect moxibustion at local *Ashi* points that are just on the enlarged thyroid gland or central reflex zones on the posterior neck and back, such as Dazhu (BL11), Fengmen (BL12), Fengchi (GB20), Fengfu (GV16), Dazhui (GV14), Shenzhu (GV12), Mingmen (GV4), Feishu (BL13), and Shenshu (BL23). These points can be divided into two groups and stimulated alternately.

Above methods may be administered daily or once every other day until symptoms are under control.

【 Discussion 】

Until now there have been many clinical trials using acupuncture for hyperthyroidism or thyrotoxicosis [661~665]. They have showed that acupuncture has not only the short-term effectiveness, but also satisfied long-

term results. Acupuncture is beneficial for either those with the initial onsets, those with side effects of anti-hyperthyroidism medications or relapse after stopping medications. Li of Beijing, China reported that acupuncture was used in 20 cases of thyroidism (among them 18 cases had the symptom of exophthalmos) when all medications were suspended. Each course of therapy varied from 22 to 124 days. All patients receiving acupuncture treatment showed different degrees of recovery. Among them, ten cases were nearly cured, four cases showed marked improvement and six cases were effective [665]. Applying acupuncture and reflexotherapy, Bochkovskii and Fedotov of Russia treated 183 thyrotoxicosis patients in the preoperative period and observed better and faster effectiveness than giving medications [664].

He *et al.* of Shanghai, China treated 191 cases of hyperthyroidism with acupuncture and made long-term follow-ups of 1~2 years after stopping treatment for 92 cases among them who were under control. Results showed the total relapse rate was 35.87%. The relapse was related to the length of the treatment course and the state of the disease. Patients with continuous treatment for three long courses had lower relapse rate (21.43%), while those who only had one course had higher relapse rate (36.51%). Initial patients had 12.5%, while the non-initials had 43.3%. By follow-up, those patients who had had unsatisfied inhibition of ^{131}I intake rate by thyroid gland had higher relapse rate though they even had had normal levels of T_3 , T_4 in serum. All clinical symptoms of hyper-metabolism and hyper-circulation had subsided after acupuncture treatment. It suggested that acupuncture treatment should be given continuously until the complete recovery of feedback regulation function of pituitary-thyroid axon [666-668]. In short, though acupuncture is effective for hyperthyroidism, it does take time. Moreover, in order to stabilize the results, it is also

recommended to provide a longer treatment courses, or combine with medications.

Clinically, conventional therapy for hyperthyroidism is utilizing antithyroid medications. However, such medications have numerous side effects and a high relapse rate after withdrawal. For this, integrating acupuncture with medications is a more sound approach. By comparison of 120 cases with hyperthyroidism in a randomized control trial, He *et al.* found that total effectiveness rate and relapse rate after one year was 73.91% and 36.36% in acupuncture group, 85.37% and 88.89 in the antithyroid medication (Tapazole, 40 mg/day) group, respectively. The highest effectiveness rate (93.94%) and the lowest relapse rate (29.63%) were in the group combining acupuncture and Tapazole (the same acupuncture technique and the dose of Tapazole applied) respectively. There were significant differences among those three groups. In addition, both the acupuncture group and the combining group had ideal regulation of autoimmunologic functions of the patients [669].

Not only needling, but also moxibustion has similar efficacy to improve thyroid functions. Liao of Chengdu, China treated 30 cases of hyperthyroidism by various moxibustion methods (direct moxibustion, fire needling, etc.) and found short-term cured 4 cases, excellent 11 cases, and improved 15 cases. Many patients had improvement of symptoms after receiving 2~10 treatments of moxibustion [670]. The occurrence of Hashimoto's disease (chronic lymphocytic thyroiditis) is related to the damage of thyroid tissues due to abnormal autoimmune reactions, ultimately resulting in hypothyroidism. Hu *et al.* of Shanghai, China treated 30 cases of Hashimoto's disease with moxibustion. Not only clinical symptoms were improved, but also binding rate of thyroid antibodies and TSH (thyroid stimulating hormone) level reduced markedly, as well as the

serum T_4 , T_3 levels of patients with hypothyroidism, increased strikingly. Whereas T_3 , T_4 and TSH levels in serum of patients with normal thyroid functions had no significant changes. This study indicated that moxibustion could regulate immune functions of patients to normal in addition to improvement of thyroid functions [671]. It has known that mechanisms of acupuncture for thyroopathy are realized through bi-directional regulation of thyroid functions. In animal models with experimental hyperthyroidism or hypothyroidism with drugs (Thyreoidinum or Thiouracilum), blood sugar levels changed correspondingly, while EA or manual acupuncture could reduce higher levels or increase lower levels of blood sugar [672]. Moxibustion showed the same roles, i.e., its effects were related to previous states of the body, always regulated higher or lower thyroid functions to normal, while there were no impacts on the previous normal ones [671].

Hyperthyroidism is a type of autoimmune disorder. Antibody of TSH sensory receptors (TBH) existing in serum of patients is the primary cause. By measurements of serum TBH activities before and after acupuncture in 84 cases of hyperthyroidism, He *et al.* observed TBH activities reduced markedly after one course of treatment that resulted in following decrease of serum T_4 and T_3 . More than two consecutive courses of treatments were beneficial, to further decrease of TBH activities. This study suggested that the mechanisms of acupuncture to reduce higher levels of thyroid hormones in serum and recover normal thyroid functions are through eliminating or reducing TBH activities, i.e., eliminating its pathological stimuli on the thyroid cells [673].

Guo *et al.* of Beijing, China received good results in treatment of benign thyroma with acupuncture on effective points. In 80 cases, needles were directly inserted into the center of tumor or nodule and

surrounding areas, alternately manipulated for 20 min, once every other day, for total 36 sessions of one course. Results showed the total effectiveness rate was 95% based on palpation, and 88.89% in 54 cases evaluated by ultrasonic B-scanning. A long-term follow-up was made for 32 of the 54 cases, that showed persisting effectiveness rate was 40.63%, progressive 37.5% (including approximately cured 25%), regressive 21.86%, and the total stable rate 78.13% [674]. They also studied possible mechanisms of acupuncture for thyroma. First, they observed effects of acupuncture on the body temperature and tumor temperature. By comparing changes of the body temperature before and after acupuncture in 22 cases, they found that optimal body temperature to shrink the tumors was 36.7°C; by directly measuring the temperature within tumor before and after acupuncture in 44 cases, they found that optimal tumor temperature to shrink the tumors was between 36.7~36.8°C. Acupuncture could regulate the body temperature and tumor temperature bi-directionally, had a tendency to keep them at such levels, so was beneficial to shrink the tumors [675]. Second, they demonstrated a local temperature rising effect with acupuncture. Results from applying infrared thermograph showed that skin temperature at centers of diseased thyroid increased markedly after acupuncture. It indicated improvement of local blood circulation and strengthening of metabolism that was obviously helpful to shrink tumors [676].

Among various surgeries completed under acupuncture anesthesia, except for craniocerebral operations, thyroid surgery has almost the highest success rate. In 1066 cases reported by Liu *et al.*, the rate of excellent results was 90.80%, optimal choice of acupoints was bilateral Futu (LI18) [677]. Wang also reported that anesthesia effectiveness of embedding long filiform needles at the subcutaneous tissues of

Futu (LI18) was more satisfactory than that at other acupoints, such as Hegu (LI4) and Neiguan (PC6) [678]. Futu (LI18) is located at the third cervical segment,

and near the surgical section. Tianding (LI17) can also be used to treat thyropathy.

25.1 Smoking Cessation

With the intensified public campaign against smoking in today's civilized world, more and more people, after knowing the potential health risks from smoking (e.g., heart and lung diseases), want to quit smoking quickly and naturally. Consequently, acupuncture is rapidly gaining popularity in the West for smoking cessation, though some questioned its long-term benefits. However, even for its sure quick and short-term results, including effects to relieve anxiety, acupuncture is very welcomed by smokers.

【 Therapy 】

The most commonly used and simple method is ANEM (auricular needle-embedding method). Select three most sensitive points of *Lungs*, *Mouth*, *Liver*, *Subcortex*, and *Shenmen*, and embed tack needles routinely. One treatment course for smoking cessation is composed of four sessions, where only one ear is stimulated each time, and alternately stimulate on both ears every 2~4 days. When embedding needles, patients should feel some intense pain and warmth on the stimulated auricle. Sometimes, patients may feel numbness and electric-shock sensation on the face of the stimulated side, indicating a good therapeutic outcome. Instruct

patients to press needles when they crave for smoking. For tough cases with intense craving, it is applicable to combine with electrical stimulation on both ears through auricular surface electrodes for 20 min.

In addition, combining body acupuncture with ANEM is recommended. Puncture Hegu (LI4) of both hands with intense stimulation, and retain needles for 20 min. It is optimal to sustain needling sensations even after needles are removed. For anxiety or nervousness, Shenmen (HT7) and Yintang (EX2) of central reflex zones can be associated. Body acupuncture is applied once daily or once every other day, eight sessions for one course of treatment.

【 Case Studies 】

Case 109: Patient was a 63-year-old female. She had been smoking for about 40 years, at about 20 cigarettes daily. She had used gums, nicotine patches, and other stop smoking pills to quit smoking, but results were not visible. Her husband was a non-smoker and encouraged her to quit smoking. First, auricular electrical stimulation through electrodes was applied for 20 min, and then ANEM (medium-sized tack needles) was applied at auricular points of *Lungs*, *Subcortex*, and *Shenmen* on a single ear. During the electrical stimulation, she felt very relaxed. Three days later, she came in for

her second session and indicated she had cut down to only 1~2 cigarettes daily. After four sessions, the patient completely quitted smoking to the delight of her husband and the rest of her family.

Case 110: Patient was a 50-year-old male. He had been smoking for 30 years, and currently had about 40 cigarettes daily. Auricular electrical stimulation through electrodes was applied for 20 min, and then ANEM (medium-sized tack needles) were applied at auricular points *Lungs*, *Subcortex*, and *Shenmen* on a single ear. Due to his poor response to the first two sessions of treatment, at his third session, tack needles were switched to the larger size to enhance the stimulation. Punctured Hegu (LI4) on both hands and needles were retained for 20 min. Needling sensations at those auricular points and Hegu (LI4) remained for several hours. The day after treatment, his smoking craving was greatly reduced and it was reported that he did not smoke even a single cigarette. The next day, however, his smoking craving gradually returned to be about 10 cigarettes daily, but that was still less than prior to acupuncture. Later on, through additional two sessions of treatment, his smoking craving finally was eliminated and he eventually quitted smoking.

Case 111: Patient was a 68-year-old male. He had been smoking cigarettes for about 20 years then changed to chewable tobaccos for another 30 years. He was healthy at the time and had no significant illnesses but decided to quit for preventive purposes. He had 4 sessions of treatment in total at twice weekly. Each session, bilateral Hegu (LI4), Yifeng (TE17), and Yintang (EX2) were first punctured with the needles retained for 25 min, then three tack needles were embedded at auricular points *Mouth*, *Shenmen*, and *Subcortex*, alternately on both ears. The outcome was good. Since the initial session, he no longer chewed tobaccos, though some cravings remained. However, after the third session, those

cravings were eliminated. At the 3-month-follow-up, the patient indicated he had completely quit chewable tobaccos after acupuncture.

【 Discussion 】

Since 1970s, when acupuncture was first used for smoking cessation, there have been many successful reports worldwide, but some researchers questioned the findings and suggested that acupuncture effects for smoking cessation were merely placebo. In a randomized, single-blinded, placebo-controlled trial, Waite and Clough evaluated a simple, auricular acupuncture treatment for cessation of smoking. In 78 currently smoking volunteers, a single treatment of EA was given using two needles at an active or a placebo site plus self-retained ear seeds for two weeks. Results were that 12.5% of the active treatment group compared with 0% of placebo group ceased smoking at six months ($P=0.055$). It showed that this simple ear EA treatment was significantly more effective in helping volunteers to quit smoking than placebo treatment ^[626]. In a study with 46 healthy volunteers who reported smoking (20 ± 6) cigarettes daily, He *et al.* of Norway in 2001 confirmed that adequate acupuncture treatment might help motivated smokers to reduce or quit smoking completely. The effect could last 5 years or more and different acupoints may have different effects on smoking cessation ^[627]. However, in 2000, by reviewing identified 18 publications involving 20 comparisons of acupuncture for smoking cessation, White *et al.* of UK found that acupuncture was not superior to sham acupuncture in smoking cessation, at any point of time. Similarly, when acupuncture was compared with other anti-smoking interventions, there were no differences in outcome at any point of time. Acupuncture appeared to be superior to no intervention in the early results, but this difference was not sustained ^[628]. Their own research in a

randomized, sham-controlled trial had the same conclusion ^[629]. Clavel-Chapelon *et al.* of France estimated the smoking cessation rates 4 years after treatment with acupuncture and nicotine gum. The success rates were quite similar in the four groups at the different points of follow-up: sharply decreased between 1 month (around 23%) and 1 year (around 10%). The decrease slowed down thereafter to around 6% at 4 years. Their study suggested that the two treatments did not offer any long-term improvement over placebo ^[630].

Facing the arguments of both sides concerning the effectiveness of acupuncture for smoking cessation, our opinion is below.

First, acupuncture for smoking cessation may have different difficulties for short-term results and long-term outcome. Short-term results of acupuncture for quitting smoking has already been verified, such as the success rate of 28%~82% for auricular acupuncture ^[631]. In our clinic practice, many smokers completely gave up smoking after receiving an average of 3~6 sessions of treatments while some patients might require only one session. Of course, there were unsuccessful cases, where smokers even after they tried various methods including acupuncture, still was unable to quit. However, because smoking is mostly due to an individual habit, the particular smoker's personality, determination or mental toughness and other external factors all can influence the long-term outcome for smoking cessation, regardless of the therapy used. Thus, post-therapy smoking resumption should not completely discount the initial therapeutic success, and those who resumed smoking may still be able to quit smoking permanently after resuming acupuncture.

In a study by Cottraux *et al.*, 558 cigarette smokers were randomized into one of 4 smoking-cessation treatment groups (acupuncture, behavior therapy, placebo, and waiting list) and were administered the

Minnesota Multiphasic Personality Inventory (MMPI) before and after treatment and at one year follow-up. They found that 43% of the smokers had an abnormal MMPI profile. Acupuncture yielded better outcome when MMPI profiles were normal. Behavior therapy and placebo groups had better outcome when the MMPI anxiety index was abnormal. Their findings underscored the role of personality factors in tobacco addiction and their influence on cessation program outcome, so the MMPI scales might be used to predict effectiveness of smoking cessation. In their study, the principal component analysis isolated a Depression-Psychasthenia factor accounting for 61% of the variance in MMPI scores ^[632].

Clinically, even for short-term results of smoking cessation, they may be closely related to the following factors:

- (1) Marital status: Single patients are more challenging than the married.
- (2) Health condition: Healthy patients are less challenging than the diseased.
- (3) Living environment: Patients who live or work in a smoke free environment tend to be less challenging than those surrounded by smokes.

Obviously, these factors can affect much of the smoking cessation process. Effectiveness of acupuncture often could be predetermined from the initial stage of the treatment. For those who have ceased smoking since the initial session often have better outcome through a few continuous sessions even if the craving may remain at some extent. This also reflects the mental readiness of the smoker. If after the initial session the smoker still has strong craving or is not ready to quit smoking completely yet, then results will be generally poorer or require more sessions of the treatment.

Second, it is necessary to see if acupuncture merely has placebo effects or if it also has other mechanisms

besides psychological factors. Many smokers who had given up smoking noted that acupuncture reduced their smoking craving much easier and faster than that of other therapies, such as nicotine gum, patch, pills, or hypnosis. Thus, the effects of acupuncture for smoking cessation are based on patients' own comparisons.

Although the mechanisms on acupuncture for smoking cessation are not clear, it is now generally acknowledged that some psychological factors were involved. However, physiological roles of acupuncture are the primary. Li *et al.* of Shanghai, China observed the short-term effectiveness of auricular acupuncture for smoking cessation was 70% in their double-blinded study and after excluding psychological factors. They also further studied mechanisms on auricular acupuncture for smoking cessation. It was found that auricular acupuncture could reduce the smokers' taste of sweet and sour as well as threshold of pain tolerance. Moreover, acupuncture could inhibit the increase of Leucine-enkephalin (LEK) levels in plasma resulting from smoking, and changes of basic tastes were related to the changes of plasma LEK level. It suggested that one mechanism of acupuncture for smoking cessation may be related to changes of basic tastes. LEK may play an important role for smokers to establish smoking habit and its maintenance. Auricular acupuncture can regulate contents of plasma LEK, so it has efficacy of smoking cessation ^[631].

Third, it seems that results of auricular acupuncture are better than that of body acupuncture, but there is a relative non-specificity of auricular points for smoking cessation. Both auricular and body acupuncture generally have a good short-term outcome of smoking cessation, but auricular acupuncture is simpler to operate with benefits of a prolonged stimulation. Moreover, when ANEM or APPM is given, in addition to its prolonged stimulation, it has

a psychological role of reminding the smoker to not smoke, thus achieving better results. However, between two groups of smokers who received auricular acupuncture, *Mouth, Lungs*, and *Shenmen* applied for one group, and three spots of the helix for the second group, Li *et al.* did not find significant differences of either instant efficacy or plasma LEK levels ^[631]. The results concluded there is a relative non-specificity of auricular points for smoking cessation.

25.2 Alcoholism

Acupuncture therapy for substance abuses such as alcoholism and drug addiction is generally similar, but since their mechanisms may differ, we discuss them here separately.

[Therapy]

Select reflex points mainly within central reflex zones, such as auricular points *Subcortex, Brainstem, Endocrine, Sympathetic, Shenmen* or acupoints Hegu (LI4), Shenmen (HT7), Baihui (GV20), and Yintang (EX2). For auricular acupuncture, select 3~5 points with the highest sensitivity. First, apply ANEM once every other day, alternately on both ears. One course of treatment is composed of 12~16 sessions. When embedding needles, the patient should feel intense pain and warmth on the stimulated ear. Instruct the patient to press the embedded needles whenever they crave for alcohol. For body acupuncture, apply an intense stimulation and retain the needles for 30 min after the generation of needling sensations.

When symptoms from liver or stomach accompany alcoholism are encountered, combine with stimulation on the reflex points within liver or

stomach reflex zones, such as Sanyinjiao (SP6), Ququan (LR8), Zusanli (ST36), and Neiguan (PC6), as well as auricular points *Liver* and *Stomach*.

【 Discussion 】

Auricular acupuncture is currently one of the more commonly used therapies for substance abuse such as alcoholism and drug addiction, and appears to be a safe and inexpensive modality that is easily administered and produces significant results ^[633]. Killeen *et al.* investigated the immediate effects of a single acupuncture intervention on symptoms of acute withdrawal and craving who were dependent on a variety of substances including alcohol and cocaine. Results suggested that there might be some immediate benefit from a single auricular acupuncture intervention with regard to craving and symptoms of discomfort, which often accompany early withdrawal ^[634]. In a placebo-controlled study by Bullock *et al.*, 80 severe recidivist alcoholics received acupuncture either at points specific for treatment of substance abuse (treatment group) or at nonspecific points (control group). 21 of 40 patients in the treatment group completed the program compared with one of 40 controls. Significant treatment effects persisted at the end of six-month follow-up: by comparison with treatment patients, more control patients expressed a moderate to strong need for alcohol, and had more than twice the number of both drinking episodes and admissions to a detoxification center ^[635]. Gaa'l and Freebairn conducted a follow-up survey for 95 out of 190 alcoholics treated with auricular acupuncture relaxation therapy. Sixty-two replied to their letters and were interviewed. Sixteen (25.8%) said that they had maintained total sobriety for over 12 months, while 54 (87%) said that their life-style, drinking pattern and physical and mental health had improved ^[636].

However, there are still arguments about long-term benefits of acupuncture for alcoholism. Sapir-Weise *et al.* of Sweden concluded that the effects of acupuncture for alcoholics are less pronounced than those previously reported. In their study, 72 alcoholics were treated with acupuncture to the ear in a randomized, single-blinded, controlled design over ten weeks. There was no difference in the number of drinking days or level of craving between treatment and control patients. However, among females, those in the treatment group reported reduction of anxiety after one month, more often than those in the control group ($P < 0.05$) ^[637]. Worner *et al.* of New York, USA, also observed that fixed point-specific, standardized acupuncture did not improve the outcome comparing with sham transdermal stimulation or standard care (control) in their small racially mixed sample of 56 urban outpatient alcoholics ^[638].

Mechanisms of acupuncture for alcoholism may contain the following aspects. The first is relief of alcoholics' nervousness and anxiety. *Drinking alcohol to reduce worries* is an ancestral Chinese proverb, which suggests that anxiety and worries are common causes of alcoholism. Accordingly, mental relaxation after acupuncture can reduce the craving for alcoholic beverages. The second is the regulation of the autonomic nervous functions. Tabeeva of Russia found that Grade II alcoholics had autonomic disorders that were polymorphic in both cardiovascular and other systems. Corporal auricular acupuncture changed the autonomic nervous control that was evidenced in 12~13 sessions of EA point measurement. Acupuncture increased parasympathetic influences. Data reflected stabilization of adaptive mechanisms, which were deteriorated in alcoholic patients ^[639]. The third is the reducing sensitivity of an alcoholic's sensory systems to alcohol and increasing their dissent of alcohol.

The sensitivity of an alcoholic's sensory systems to alcohol is a good indication of treatment efficacy in this disease. Timofeev of Russia compared influence of pharmacotherapy and acupuncture therapy on sensitivity of visual, acoustic, olfactory and taste systems to alcohol irritants. Results showed that pharmacotherapy changed threshold sensitivity of sensory systems to alcohol irritants but did not cause aversion of sensory systems to alcohol irritants. In acupuncture treatment, results could be divided into four groups: Group 1, no aversion of acoustic was produced to alcohol irritants; Group 2, no aversion of taste and olfactory were produced to alcohol irritants; Group 3, no aversion of visual to alcohol irritants; and group 4, no aversion was recorded to alcohol irritants. He supposed that one of the sensory systems of the organism was generically leading in organizing sensory-emotional operation of information, and other sensory systems were subordinates. Therefore, before acupuncture treatment for alcoholism, it was necessary to cause excitation to ethanol-dependent system (target-system) by means of irritation to the leading sensory system of the patient ^[640].

To enhance the therapeutic effectiveness of alcoholism, acupuncture-antidepressant regimens are also practicable. For example, in a private practice by Lewenberg, 50 alcoholics were treated with a combination of ear EA and small doses (50 mg/day) of antidepressant Maprotiline Hydrochloride. Sixty-seven percent of patients evaluated stopped drinking within one week of treatment, 49% were abstinent for at least two or three months, and 38% either remained abstinent through-out the six-month period or became abstinent after an interim period of light or moderate drinking. Overall, 79% were improved for at least two or three months and 64% for at least six months. No patients exhibited or reported acute withdrawal symptoms.

25.3 Drug Addiction

Since 1970s, acupuncture has been advocated in the West as a safe effective treatment for addictive diseases, such as opium (heroin), cocaine, marijuana, alcohol, and nicotine dependence ^[642,643].

[Therapy]

Mainly apply auricular acupuncture on selected points, such as *Shenmen*, *Liver*, *Lungs*, and *Sympathetic*. The key for effectiveness is acquiring intense needling sensations. Select 3~4 points on a single ear, retain needles for 30~40 min. Treatment can be administered once daily, alternately on both ears for eight consecutive weeks or even a longer time. An alternative way is to apply electrical stimulation with auricular electrodes. Detect drug metabolite levels three times weekly to evaluate effectiveness.

For tough cases with severe craving, ANEM or APPM may be applied after needling. Alternately, combine body acupuncture with auricular needling, such as puncturing Hegu (LI4) during the needle-retaining period of auricular needles. Retain the needles for 30 min after the generation of needling sensations or connect them to an electric stimulator. During the treatment, psychological therapies can be incorporated.

[Discussion]

It was found that acupuncture could relieve the withdrawal symptoms, prevent craving for drugs, and increase the participation rate of patients in long-term treatment programs ^[644]. Schwarts *et al.* compared detoxification readmission rates of clients treated at outpatient acupuncture programs (used by 1 104 clients) and at short-term residential programs (used by 6 907 clients), two options available to persons seeking substance abuse detoxification.

They found that acupuncture clients were less likely to be readmitted for detoxification within six months ^[645].

Shuaib of Pakistan successfully applied EA for treatment of withdrawal symptoms of 19 drug abusers. The drug common to all was Opium. Other drugs were Amphetamine, Methaqualone (Mandrax) and barbiturates by mouth and cannabis (charas) smoking. It was found that all the cases showed a definite response to EA and that their withdrawal symptoms, especially those of Opium, were controlled within 30 min of the application. The need for subsequent treatment varied, but all patients were symptom free and chemical free on the sixth to eighth day of treatment. Thus, the period of active treatment was much shorter than that with Codeine substitution therapy. The sample of the study is too small to draw statistical conclusions, but it is worth stating that EA is an effective, simple, and economical method for the detoxification of Opiate dependents ^[646]. According to Zhang *et al.* of Beijing, China, 181 cases of Heroin addiction with obvious withdrawal syndrome were divided into two groups: 121 cases were randomly assigned to be treated with electrical stimulation at acupoints, and the other 60 cases were taken as the control group. Acupoints selected were Hegu (LI4), Laogong (PC8), Neiguan (PC6), Waiguan (TE5), Zusanli (ST36), and Sanyinjiao (SP6). Results indicated the electrical stimulation is obviously effective in relieving the withdrawal syndrome in Heroin addicts ^[647].

Lincoln Hospital, New York City, USA, is the most famous hospital in the USA where acupuncture is given for drug addiction. According to Smith *et al.*, the best results were obtained by treating patients in an open-group setting, using points in the external ear with needles without electrical stimulation. The same points were used at each visit, regardless of the type of drug to which the person is addicted ^[644].

Lipton *et al.* examined the efficacy of auricular acupuncture in reducing Cocaine or crack craving and consumption via a single-blinded, placebo experiment of 150 individuals. Urinalysis results over the one-month study period favored the experimental group. Experimental subjects in treatment over two weeks had significantly lower cocaine metabolite levels relative to placebo subjects in treatment for a comparable period. Relative to pre-treatment usage, a significant decrease in cocaine consumption was reported by both groups. Treatment retention with both groups was similar ^[648].

Auricular points of *Shenmen*, *Liver*, *Lungs*, and *Sympathetic*, as well as Hegu (LI4) are the commonly used points for drug addiction. However, Margolin, Avants, and Bullock *et al.* at Yale Univ., School of Medicine, USA, considered that there seemed to be little scientific basis for pre-selection of specific points for needle-insertion within auricular zones. Needle placement should be based upon clinical judgment ^[649–653]. They had methodological investigations for a multisite trial of auricular acupuncture in 34 cocaine-abusing subjects. The trial's active zones (*Shenmen*, *Liver*, *Lungs*, and *Sympathetic*) and control zones (located on the ear helix) were divided into quadrants and assessed along four dimensions: electrical resistance, skin discoloration, skin topography, and tenderness. Acute effects of needles inserted into points of low electrical resistance in one ear and high electrical resistance in the other were also assessed. Results showed that active zones had lower overall electrical resistance and more subcutaneous ridges than control zones. Zones did not possess significant variability along any single dimension. Acute effects of needling high and low resistance points were similar, differing only for "fullness". Based on these findings, and in view of difficulty of accurately measuring electrical resistance at auricular points,

they did not recommend the use of electrical devices for point determination in the multisite study ^[649].

In another study, Margolin *et al.* compared subjective evaluations of needles inserted into sham and real auricular points. Both ears were punctured concurrently, one in sham sites and the other in active points used in treatment of Cocaine addiction. Subjects then completed a questionnaire rating intensity of five sensations in each ear, and attempted to identify which ear received sham and which ear received real acupuncture. Results showed that real points were more painful than sham and that there were no other overall differences. Ability to identify which ear received sham and which ear received real acupuncture did not rise above the level of chance ^[650]. They also conducted a six-week, single-blinded study of acupuncture in 40 Methadone-maintained patients. These patients were randomly assigned to receive daily acupuncture in three auricular sites plus one body site Hegu (LI4), or in control sites within 2–3 mm of the four active sites. Cocaine use decreased significantly for patients in both needle puncture groups. The only statistically significant difference between the two types of needle puncture was on ratings of craving. These findings suggested that very large sample sizes would be required to detect treatment differences between this control condition and the active acupuncture ^[651].

In two linked but concurrent studies on auricular acupuncture in the treatment of cocaine addiction, Bullock *et al.* observed similar results with the above. In the first study, 236 residential clients were randomized to true acupuncture, sham acupuncture, and conventional psychosocial treatment without acupuncture. Treatment group subjects received acupuncture at three auricular points considered specific for treatment of substance abuse. Control subjects received three nonspecific (sham) points. In the second study, 202 clients were randomized to

one of three dose levels of true acupuncture (28, 16, or 8 treatments) and received acupuncture at five, rather than three, specific auricular points. With rare exception, data failed to identify significant treatment differences among true and sham acupuncture, and psychosocial groups. Furthermore, no differences were observed among the three dose levels of true acupuncture ^[652].

Accordingly, though auricular acupuncture is effective for drug abuse, there is a lack of specificity of actions in auricular points. We also experienced that during auricular acupuncture, acquiring stronger needling sensations is generally more important than selecting specific points to raise effectiveness.

There have been many studies on mechanisms of acupuncture for drug abuse. It was reported that ACTH, cortisol (corticosterone), cAMP were elevated during abstinence and these compounds were reduced after EA treatment. Fraction I of the Opiate activity in the brains of mice was found to be increased after EA. It has been suggested that this could be a β -endorphin. Recently it was found that during abstinence plasma β -lipoprotein and β -endorphin were elevated but not reduced after EA. However, the CSF (cerebrospinal fluid) met-enkephalin was within normal limits during abstinence but greatly elevated after half an hour of EA. It is suggested that acupuncture affects not only the somatosensory nervous system but also ANS, as well as the neuro-endocrine system in drug abusers ^[654]. Due to that enkephalin has stronger binding affinity to Opiate sensory receptors than morphine, which suggests that enkephalin, the product of the nervous system released by acupuncture may contribute to the acupuncture analgesia as well as the suppression of opiate withdrawal symptoms created by acupuncture ^[655].

Many cocaine-dependent and opiate-dependent

patients may still take Methadone or Buprenorphine as maintenance agents during acupuncture treatments for drug abuse. Avants *et al.* of USA conducted a randomized and controlled study with 82 Cocaine-dependents, Methadone-maintained patients. Longitudinal analysis of urine data showed that patients assigned to acupuncture were significantly more likely to provide Cocaine-negative urine samples relative to the both controls (no-needle relaxation control and a needle-insertion control). Findings from this study suggested that acupuncture shows promise for treatment of Cocaine dependence ^[656]. Buprenorphine is a maintenance agent for treating Heroin-addicted individuals. Recent studies indicated it did not block auricular acupuncture, supporting the provisional recommendation that Cocaine-abusing patients maintained on Buprenorphine should not be excluded from receiving auricular acupuncture or from participating in clinical studies of this treatment modality ^[657].

25.4 HIV/AIDS

With the prevalence of acupuncture, an increasingly proportion of people in the West, especially in the HIV/AIDS community, are seeking alternative or complimentary forms of healthcare, one of the most commonly used therapies is TCM including acupuncture ^[679–681].

【 Therapy 】

The main therapeutic principle for HIV/AIDS is focused on strengthening immune functions of the whole body and symptomatic relief. Select reflex points or acupoints mainly within overlapping areas

of central reflex zones and multiple visceral reflex zones, such as Hegu (LI4), Quchi (LI11), Zusanli (ST36), Xuanzhong (GB39), Sanyinjiao (SP6), and Dazhui (GV14) as master points plus other associate points for various symptoms. A combination of needling and moxibustion is preferred. Moxibustion can be also applied at reflex points in central reflex zones of GV and 2 *cun* bilateral to GV.

Apply acupuncture once daily or once every other day, and retain the needles for 30 min. For moxibustion, it is recommended to teach patients or their relatives to practice by themselves once daily. When symptoms are relieved, continuous treatments are still required, but the interval between two sessions can be gradually prolonged to once or twice weekly.

【 Discussion 】

According to a review by Goh *et al.*, since 1982, acupuncture treatment for AIDS has become increasingly popular in the USA. For example, Acupuncture projects for AIDS were started to help hundreds of thousands of people living with AIDS. Studies found people with HIV(+) by having acupuncture treatments regularly, could extend their survival rate and a substantial reduction of the symptoms and side effects to HIV related drugs. With acupuncture, CBC (complete blood count) blood counts were frequently normalized, and relief of symptoms and conditions associated with AIDS and chronic infectious disease were attained. After four to five sessions of acupuncture, most patients reported a reduction in fatigue, abnormal perspiration, diarrhea, and acute skin reactions. Some patients had a 15~25 pound weight gain and were able to return to long hours of work ^[680].

Based on data collected over a 6-year period in an American urban family practice, Stemmler suggested that using acupuncture as a complementary approach to traditional standard treatment of

HIV disease may have a beneficial effect on the survival and quality of life of such patients ^[682]. Another report was from the ACTCM (American College of Traditional Chinese Medicine) that has been funded for years to provide Chinese medical treatment to over 300 symptomatic HIV-positive patients. A recent study of the medical records of these patients, and of quarterly health surveys, has identified seven HIV-related conditions that appear to be most responsive to Chinese medicine: weight loss, diarrhea or loose stools, abdominal pain, nausea, headaches, enlarged lymph nodes and neuropathy ^[683]. For acupuncture methods treating neuropathy related to HIV, refer to Section 14.3.

Young and Sinclair reported that 391 patients with HIV infection were recruited into a 12-week program with TCM treatment. Out of them, 286 completed the study. Average weight gain was 1.5 pounds per person. Statistically significant improvements were found with infectious processes, gastrointestinal symptoms, and psychological factors ^[679]. Acupuncture was also found to be able to reduce depression, anxiety, and anger in HIV infected inmates greatly, and that it may help reduce their emotional violent behaviors when responding to the life-threatening medical diagnosis ^[684].

It has been known that acupuncture may activate the defense systems of the body, such as influencing specific and nonspecific cellular and humoral immunities; activating cell proliferation, including blood, reticuloendothelial and traumatized cells; and activating leucocytosis, microbicidal activity, antibodies, globulin, complement and interferon. Thus, acupuncture can be used to treat immunomediated conditions or diseases ^[35]. In 2002, Mori *et al.* of Japan reported unique immunomodulation by EA in humans possibly via stimulation of ANS. They not only observed that EA could modulate levels of granulocytes and lymphocytes, i.e., tended to

normalize the pattern of leukocytes, but also confirmed that acupuncture induced parasympathetic nerve stimulation, resulting in a decrease in heart rate. Their results suggested possible mechanisms underlying how acupuncture ameliorates the condition of patients with many chronic diseases ^[32]. It might be the principal mechanism in the treatment of acupuncture for AIDS.

As for what acupoints are most effective for AIDS, it should be analyzed from the various efficacies of acupoints. According to a review by Rogers, immunostimulant points include Hegu (LI4), Quchi (LI11), Zusanli (ST36), Xuanzhong (GB39), Sanyinjiao (SP6), Dazhui (GV14), Dazhu (BL11), Pishu (BL20), Shenshu (BL23), Qihai (BL24), Dachangshu (BL25), Guanyuanshu (BL26), Xiaochangshu (BL27), Pangguangshu (BL28), and Zhongwan (CV12). Some, such as Hunmen (BL47), are immunosuppressive. Antifebrile points include Dazhui (GV14) and Zusanli (ST36). Reactive reflex *shu* points, *mu* points and auricular points are useful in organic diseases. In immunomediated diseases, some or all of these points can be used with other points, especially local points and points of major symptoms or points of the affected body part, area, function, or organ ^[35].

Actually, the majority of above acupoints are located within central reflex zones that can be simplified into two regions. First is at the most sensitive terminals and flexible joints of the limbs, such as Hegu (LI4), Quchi (LI11), Zusanli (ST36), Xuanzhong (GB39), and Sanyinjiao (SP6). Second is at midlines of the trunk, such as Dazhui (GV14), Dazhu (BL11), Pishu (BL20), Shenshu (BL23), Qihai (BL24), Dachangshu (BL25), Guanyuanshu (BL26), Xiaochangshu (BL27), Pangguangshu (BL28), and Zhongwan (CV12). Actually, other acupoints located on these regions but that have not yet been reported might also have similar immunological

functions. In addition, whether the specificity of acupoints could exist for inhibition or the activation of the immune system needs further studies. Based on the general regulation principle of acupuncture, we assume the direction of acupuncture effects on the immune system should be mainly related to previous state of the body before acupuncture rather than the difference of point locations applied, though the degree of effects from different acupoints or reflex points may vary (refer to Section 4.2).

25.5 Cancers

Acupuncture has been used in the treatment of most malignant tumors, as an adjunctive therapy, mainly for pain relief from tumor oppression and for improvement of the general body conditions. Moreover, acupuncture can alleviate radiotherapy or chemotherapy-induced side effects such as leukocytopenia, nausea, loss of appetite, constipation, or diarrhea, as well as raise the immune system of the body. Thus, it is beneficial to apply acupuncture to prolong the survival time of cancer patients and improve their quality of life.

【 Therapy 】

Select reflex points or sensitive acupoints within reflex zones corresponded to the viscus or organ suffering from the primary or metabased cancer. Seek reflex points with tenderness, hard nodules, or regional prominence of tissues and apply them as master points. Select points within central reflex zones that might have regulatory impacts on the immune function as associate points, such as Zusanli (ST36), Sanyinjiao (SP6), Quchi (LI11), Hegu (LI4) as well as other points on the back. Either needling

alone or combining with moxibustion after needling is applicable. For leukemia or malignant lymphoma, acupuncture methods are the same as those for HIV or AIDS (refer to Section 25.4).

In addition, symptomatic point selection may be associated. For instance, for analgesia, certain points of Huatuoji (EX102) at the spinal segments corresponded to the affected organ can be stimulated by EA. Auricular acupuncture is also applicable.

【 Case Studies 】

Case 87: Nausea, fatigue, numbness of hands and feet, headache, sleeping disturbance and so on due to multiple cancers (refer to Section 21.1).

Case 39: Lateral and femoral pain and numbness after radiation for a prostate cancer (refer to Section 22.4).

【 Discussion 】

The beneficial effects of acupuncture therapy in anti-cancer treatment may be summarized as the following three aspects:

The first application is to increase the immunity of the body, which may combine with surgery, chemotherapy, and radiotherapy to improve effectiveness or prolong the survival time of patients. Some clinical studies have demonstrated that acupuncture therapy could heighten cellular immune function of cancer patients [685~687]. For example, puncturing Neiguan (PC6), Hegu (LI4), Zusanli (ST36), and Guanyuan (CV4) every day for consecutive 10 days could increase significantly the percentage of CD3⁺ and CD4⁺, as well as the ratio of CD4⁺/CD8⁺ in plasma. In addition, puncturing Zusanli (ST36), Quchi (LI11), and Qihai (CV6) could increase the level of interleukin-2 and immunological activity of natural killer in peripheral blood. These reasons may explain why acupuncture could inhibit growth of Ehrlich ascites tumor cells to a certain

degree, and why the survival time of tumor infected mice receiving acupuncture was longer than that in the controls ^[35,688]. In tumor-bearing mice, the cellular immune functions of those groups receiving moxibustion treatment were maintained at a relatively higher level. Among them, the Guanyuan (CV4) group seemed to be the best in immune regulation^[36]. Other experimental result demonstrated that moxibustion on Guanyuan (CV4) point could promote hyperplasia of pituitary and adrenal gland that showed atrophy, so that increased level of serum β -endorphine significantly and kept it at the high level for quite a long time ^[689]. Certain inhibition of moxibustion on growth of transplanted tumors was seen ^[690]. The longest mean survival time of tumor-bearing mice could be prolonged significantly after treatment of moxibustion ^[691].

The second application is to prevent or relieve toxic side effects caused by chemotherapy or radiotherapy ^[692,693] or post-surgical pain ^[694], so that patients may successfully complete scheduled courses of chemotherapy or radiotherapy, as well as recover rapidly from surgery. For instance, acupuncture could palliate xerostomia due to radiation therapy ^[693], nausea (refer to Section 21.1) and leukocytopenia due to chemotherapy. According to Chen and Huang, effects of acupuncture on 376 cases of chemotherapy-induced leukocytopenia were observed in patients with malignant tumors in intermediary and advanced stages. Findings revealed that total effect in 121 cases (88.4%) occurred in the group treated with needling and moxibustion with warming needle; while total effect in 221 cases (90.9%) was in the group treated with moxibustion. A comparison made between the two groups showed no significant difference ($P>0.05$). Total effective rate was 38.2% when compared with the control group using Batylalcohol and Pentoxyl and so the difference was significant ($P<0.01$). Analysis

found that with patients having higher basic value of white blood cells (WBC), the effect would be higher. These findings suggest that acupuncture in raising the effect on WBC is influenced by the extent to which bone marrow is inhibited ^[695].

According to Wu *et al.*, in treating 62 post-operational, chemotherapy-treated stomach cancer, and colorectal cancer patients, a Q-wave millimeter microwave (QWMM) was used to irradiate Xuehai (SP10) and Geshu (BL17). They observed that QWMM irradiation at these acupoints could promote hematopoietic function of bone marrow and raise level of peripheral WBC. Total effective rate was 77.4%. Irradiation performed one week before chemotherapy yielded even better protection of bone marrow ^[696]. Acupuncture is also an effective treatment for radiation-induced swelling of the extremities. Best results were obtained in cases of stage I-II swelling ^[697]. Chekalina *et al.* reported that acupuncture resulted in significant decreases in functional activity of blood platelets and in increases in fibrinolytic activity ^[698]. It was suggested that combination of acupuncture and reflexotherapy should be used in patients with late radiation-induced fibrosis and secondary neuritis, as early as possible ^[699]. In a study conducted by He *et al.* of Germany, 48 patients with mammary cancer after ablation and axillary lymphadenectomy, were treated with acupuncture (group I), while a control group of 32 patients with the same operation but without acupuncture was compared (group II). Acupuncture seemed to be an effective treatment to relieve pain and improve arm-movements after surgery. There was statistically significant difference in the maximum abduction angle between group I and group II at indolency with respect to the maximum tolerable pain until discharge ^[700].

The third is the alleviation of some symptoms of cancer patients at the late stage, especially pain ^[701] and dysphagia, so acupuncture may improve life

quality and less distress of patients. Due to increasing endorphin level of the body by acupuncture, many cancer patients with severe pain could reduce the need of injecting Morphine and had better relieve of pain ^[702,703]. Rico and Trudnowski of USA reported 22 cancer patients who were treated with EA to relieve back pain radiated to other areas, which had been present for two months to five years. Ten patients were treated by placing acupuncture needles along the paravertebral line at the level of vertebra above and below dermatome of pain area. 4 to 12 needles were inserted about 1.25 cm into the back. Electrical impulses were transmitted through needles at an intensity of 6 volts for 15~30 min at a frequency of 6~8/sec. Patients were treated once daily for 6~7 days. Thirteen other patients were treated by applying the needle at a point on the back where pain was most pronounced in both gluteal folds and popliteal areas and on the median aspect of heel. Patients were treated for 1~2 days. When pain reappeared 5~10 days later, stimulation was reapplied. Both groups had similar pain relief. Most patients obtained relief after the second or third treatment. As a result, most patients had a sense of well being, improved appetite, and slept well ^[199]. According to Rydholm and Strang of Sweden, 20 patients (17 cancer patients) in late-stage palliative care reporting dryness of mouth and associated problems were treated for five weeks with ten sessions of acupuncture. Ten patients were also evaluated for speech problems (articulation) and dysphagia caused by **xerostomia**. Acupuncture had a dramatic effect on xerostomia and, subsequently, on dysphagia and articulation, with subjects showing definite improvement after five sessions of treatments ^[704].

To explore the safety and efficacy of acupuncture for relief of cancer-related breathlessness, Filshie *et al.* of UK treated 20 patients who were breathless at

rest and whose breathlessness was directly related to primary or secondary malignancy. Some sternal acupoints and Hegu (LI4) were used. Outcome measures included pulse, respiratory rate, oxygen saturation, and patient-rated visual analogue scales (VAS) of breathlessness, pain, anxiety, and relaxation. At each time, mean values of these variables were calculated and compared to their pre-treatment levels. Seventy percent (14/20) of patients reported marked symptomatic benefit from treatment; there were significant changes in VAS scores of breathlessness, relaxation and anxiety at least up to 6 hours post acupuncture which were measured to be maximal at 90 min ($P<0.005$, $P<0.001$, respectively). There was a significant reduction in respiratory rate, which was sustained for 90 min post acupuncture ($P<0.02$) ^[705].

Based on the above, the conventional treatment of malignant tumors combining acupuncture is beneficial. Keep in mind, however, that acupuncture is merely one kind of reflexotherapy, after all. For the majority of rapid growing malignant tumors, its intervention is relative weak and it takes effects slowly. Thus, a single application of acupuncture usually is insufficient in controlling the tumor growth or its symptoms effectively. Until now, acupuncture is merely serving as an adjunctive or complimentary therapy for cancers.

In recent years, there were some studies about the diagnosis of tumors applying visual inspections of appearance or measurements of electrical resistance at auricular points ^[196], but their samples were not large enough to reach a scientific conclusion. If any breakthrough at this aspect can be done in the future, such as determining the exact corresponding reflex points or specificity of acupoints existing on the body surface for various types of tumors, it will definitely raise the value of acupuncture in the battle against cancers.

The Atlas of Whole Body Reflex Zones

Whole Body Reflex Zones (WBRZ) is a novel concept that we, the authors proposed to replace or substitute the meridian system. They can be categorized into three primary reflex zones: visceral, somatic, and central. To display these zones more distinctly, an atlas of WBRZ has been illustrated from the anterior, posterior, and lateral sides (Color Figures 2~5,13~17) in which their territories are marked by different colors and locations of some acupoints, as well as being contrasted with the 14 meridians. Moreover, those acupoints have both Chinese names and English codes. On the other hand, as multiple reflex zones lie on the body surface simultaneously, it is inevitable to have local overlapping of certain zones, which are shown in Color Figures 2~4, while single zones are shown in Color Figures 5,13~17.

Note that the borderlines of various reflex zones are mainly derived from the efficacies of common acupoints, extraordinary or newly discovered points, and the consequence of their categorization. In addition, familiar distribution patterns of visceral referred pain, somatic radiating pain, or propagating pain on the body surface have been incorporated. However, the atlas of WBRZ is still preliminary and approximate, unable to include every extraordinary or new point in existence. Of course, the efficacy of many points remains uncertain. Furthermore, there is a large individual difference between distribution

patterns of the visceral referred pain and somatic radiating pain. Accordingly, the borderlines for every reflex zone may have not been set in stone, and could be further perfected.

Besides the three types of reflex zones, this appendix has also described reflex zones of eyes, ears, nose, mouth, and throat and illustrated their territories on the head (Color Figure 18). As for locations of all 361 acupoints as well as those extraordinary or new points mentioned in the book, refer to Appendix B.

1.1 Visceral Reflex Zones

There are three distribution rules for visceral reflex zones. First, they lodge on the dorsal and ventral sides of the trunk next to viscera. Second, they are mainly at the *yin* side of the extremities, i.e., the medial side of the upper limb and the anteromedial side of the lower limb. Third, reflex zones for viscera above the diaphragm (lung, heart and small parts of the stomach) are at the medial side of the upper limb, while that for viscera below the diaphragm (large parts of stomach, intestine, liver, spleen, gallbladder, kidney, urinary bladder, and genitalia) are at anteromedial sides of the lower limb. Visceral

reflex zones can be further classified into six subzones: lungs, intestine, heart, urogenital system, stomach, and liver/gallbladder/spleen/and pancreas. Those are illustrated by Color Figures 2~4 (merged) and 12~15, respectively. As for their subzone abbreviations, tail numbers 1, 2, 3, 4, 5 represent parts of the anterior trunk, posterior trunk, upper limbs, lower limbs, as well as the head, face and neck, respectively. When certain viscera are disordered, some external reactions usually may appear within corresponding visceral reflex zones. Stimulation on these zones may regulate functions of the viscera or treat the disorders.

1.1.1 Reflex zones of lungs

The lungs are located above the diaphragm, one per each side. Reflex zones of lungs (VL) are distributed on the medial side of the upper limbs (VL3) (distal zones) symmetrically, as well as on the chest (VL1) and the upper back (VL2), local or adjacent zones (Color Figure 13).

Zone of the anterior trunk (VL1): Its shape and size are similar to the reflection of lungs on the chest, but slightly extend to the anterior area of neck. Upper border is along Renying (ST9), Futu (LI18), Quepen (ST12), and Yunmen (LU2), while the lower border is at the level of Jiuwei (CV15), Qimen (LR14), and Dabao (SP21).

Main acupoints used for pulmonary and bronchial diseases in this zone include Tiantu (CV22), Xuanji (CV21), Huagai (CV20), Zigong (CV19), Yutang (CV18), Tanzhong (CV17), Zhongting (CV16), Jiuwei (CV15), Juque (CV14), Shufu (KI27), Yuzhong (KI26), Shencang (KI25), Lingxu (KI24), Shenfeng (KI23), Bulang (KI22), Futu (LI18), Tianding (LI17), Renying (ST9), Shuitu (ST10), Qishe (ST11), Quepen (ST12), Qihu (ST13), Kufang (ST14), Wuyi (ST15), Yingchuang (ST16), Rugen (ST18), Tianchi (PC1), Yunmen (LU2), Zhongfu (LU1), Dabao (SP21),

Zhourong (SP20), Xiongxiang (SP19), Tianxi (SP18), Shidou (SP17), and Zhejin (GB23). This zone partially overlaps with VH1, VS1, VE1, and VLG1, respectively.

Zone of the posterior trunk (VL2): Located at the region three inches away from the midline of the upper back. Upper border is along Dazhui (GV14), Waidingchuan (EX83), and Jianzhongshu (SI15) (the lower end of the spinous process of seventh cervical vertebra), while the lower border is at the level of Zhiyang (GV9) and Geshu (BL17) (the lower end of spinous process of seventh thoracic vertebra). Main acupoints used for pneumonic and bronchial diseases in this zone include Dazhui (GV14), Shenzhu (GV12), Lingtai (GV10), Zhiyang (GV9); Dazhu (BL11), Fengmen (BL12), Feishu (BL13), Jueyinshu (BL14), Xinshu (BL15), Geshu (BL17), Pohu (BL42), Gaohuangshu (BL43), Shentang (BL44), Yixi (BL45), Jianzhongshu (SI15), Huatuojiayi (EX102) points within this region (87), and Waidingchuan (EX83) [83]. This zone partially overlaps with VH2, VS2, and VLG2, respectively.

Zone of the upper limb (VL3): Located at the medial side of upper limb mainly along the course of LU meridian, also extending to parts of PC meridian. Main acupoints used for pulmonary and bronchial diseases in this zone include Tianfu (LU3), Xiabai (LU4), Chize (LU5), Kongzui (LU6), Lieque (LU7), Jingqu (LU8), Taiyuan (LU9), Yuji (LU10), Shaoshang (LU11), Tianquan (PC2), Quze (PC3), and Neiguan (PC6). This zone partially overlaps with VH3 and VS3, respectively.

1.1.2 Reflex zones of the intestine

Because the large and small intestines fill in the entire abdominal cavity and are located near the anterior abdominal wall, their local or adjacent reflex zones (VI) are distributed primarily on the anterior abdominal wall and on the lower back. In addition,

because the large and small intestines are below the diaphragm, their distal reflex zones on the limbs mainly lodge at the anteromedial side of the lower limb as well as the popliteal fossa (Color Figure 13). Though other acupoints such as Chengfu (BL36), Chengjin (BL56), and Chengshan (BL57) at the posterior side of lower limb, as well as Quchi (LI11), Shousanli (LI10) and Hegu (LI4) at the radial side of forearm might also be used for constipation, hemorrhoids, and anal diseases, they are not categorized into the intestinal reflex zones. Effects from their stimulation might be related to the non-specificity of acupoints, namely an indirect effect due to stimulation on corresponding somatic reflex zones. The distal end of rectum and anus actually are consisted of striated muscles, so they may be considered as a part of the soma rather than that of the viscera.

Zone of the anterior trunk (VI1): Located at the middle and lower abdomen, corresponding to the reflection area of large and small intestines at the abdomen. Upper border is at the level of Zhongwan (CV12), Yindu (KI19), Liangmen (ST21), Fuai (SP16), and Zhangmen (LR13). Lower border is along Guanyuan (CV4), Qixue (KI13), Shuidao (ST28), Weidao (GB28), and Wushu (GB27). Main acupoints are Zhongwan (CV12), Jianli (CV11), Xiawan (CV10), Shuifen (CV9), Shenque (CV8), Yinjiao (CV7), Qihai (CV6), Shimen (CV5), Guanyuan (CV4), Yindu (KI19), Shiguan (KI18), Shangqu (KI17), Huangshu (KI16), Zhongzhu (KI15), Siman (KI14), Qixue (KI13), Liangmen (ST21), Guanmen (ST22), Taiyi (ST23), Huaroumen (ST24), Tianshu (ST25), Wailing (ST26), Daju (ST27), Shuidao (ST28), Fuai (SP16), Daheng (SP15), Fujie (SP14), Fushe (SP13), Chongmen (SP12), Zhangmen (LR13), Jimai (LR12), Daimai (GB26), Wushu (GB27), and Weidao (GB28). This zone partially overlaps with VS1 and VU1, respectively.

Zone of the posterior trunk (VI2): Composed of the

upper zone and lower zone and mainly used for intestinal disorders that occur at the upper abdomen (mainly from the duodenum, jejunum and transverse colon) and the lower abdomen (mainly from the colon, rectum and anus), respectively.

Upper zone (VI2-1): Upper border is at the level of the tenth thoracic vertebra including Zhongshu (GV7), Danshu (BL19), and Yanggang (BL48). Lower border is along Mingmen (GV4) and Zhishi (BL52). Main acupoints used for intestinal disorders include Zhongshu (GV7), Jizhong (GV6), Xuanshu (GV5), Mingmen (GV4), Danshu (BL19), Pishu (BL20), Weishu (BL21), Sanjiaoshu (BL22), Yanggang (BL48), Yishe (BL49), Weicang (BL50), Huangmen (BL51), Zhishi (BL52), and Jingmen (GB25), as well as Huatuojiayi (EX102) points within this region. This zone partially overlaps with VS2 and VU2, respectively.

Lower zone (VI2-2): Upper border is at the level of the fifth lumbar vertebra including Yaoyangguan (GV3) and Dachangshu (BL25). Lower border is along Changqiang (GV1), Huiyang (BL35), and Zhibian (BL54). Main acupoints use for intestinal disorders include Yaoyangguan (GV3), Yaoshu (GV2), Changqiang (GV1), Dachangshu (BL25), Guanyuanshu (BL26), Xiaochangshu (BL27), Pangguangshu (BL28), Zhonglushu (BL29), Baihuanshu (BL30), Shangliao (BL31), Ciliao (BL32), Zhongliao (BL33), Xialiao (BL34), Huiyang (BL35), Baohuang (BL53), and Zhibian (BL54). This zone partially overlaps with VU2.

Zone of the lower limb (VI4): It can be divided into VI4-1 and VI4-2.

Zone of the anteromedial side of the lower limb (VI4-1): Mainly distributed below the knees. Upper border is at the level of Yinlingquan (SP9), Ququan (LR8), and Yingu (KI10). Main acupoints used for intestinal disorders in this zone include Yinlingquan (SP9), Diji (SP8), Lougu (SP7),

Sanyinjiao(SP6), Shangqiu (SP5), Gongsun (SP4), Taibai (SP3), Dadu (SP2), Yinbai (SP1), Zusanli (ST36), Shangjuxu (ST37), Xiajuxu (ST39), Jiexi (ST41), Xiangu (ST43), Neiting (ST44), Lidui (ST45), Ququan (LR8), Zhongdu (LR6), Ligou (LR5), Zhongfeng (LR4), Taichong (LR3), Xingjian (LR2), Dadun (LR1), Yingu (KI10), Jiaoxin (KI8), Fuliu (KI7), Zhaohai (KI6), and Rangu (KI2), as well as the Appendix point (EX150)^[83, 84]. This zone completely overlaps with VS4.

Zone of the popliteal fossa (VI4-2): Mainly including Fuxi (BL38), Weiyang (BL39), Weizhong (BL40), Heyang (BL55), it connects with VI4-1 and partially overlaps with VU4.

1.1.3 Reflex zones of the heart

The heart is located above the diaphragm, in the middle of the trunk but tilting slightly to the left. Its reflex zones are distributed on the chest, back, and the medial side of the upper limb. They are mostly symmetric but the parts on the left side are more important (Color Figure 14).

Zone of the anterior trunk (VH1): Distributed on both sides of the chest, but mainly at the left and anterior chest. Upper border is along Xuanji (CV21), Shufu (KI27), Qihu (ST13), and Yunmen (LU2). Lower border is along Jiuwei (CV15), Bulang (KI22), Rugen (ST18), and Shidou (SP17). It contains Xuanji (CV21), Huagai (CV20), Zigong (CV19), Yutang (CV18), Tanzhong (CV17), Zhongting (CV16), Jiuwei (CV15), Shufu (KI27), Yuzhong (KI26), Shencang (KI25), Lingxu (KI24), Shenfeng (KI23), Bulang (KI22), Qihu (ST13), Kufang (ST14), Wuyi (ST15), Yingchuang (ST16), Yunmen (LU2), Zhongfu (LU1), Tianchi (PC1), Dabao (SP21), Zhou rong (SP20), Xiongxiang (SP19), and Tianxi (SP18). This zone partially overlaps with VL1, VS1, VE1, and VLG1, respectively.

Zone of the posterior trunk (VH2): Located on the

middle area of upper back, and heart-shaped, it is surrounded by Shenzhu (GV12), Jueyinshu (BL14), Shentang (BL44), Yixi (BL45), and Zhiyang (GV9). Upper border is at the lower end of spinous process of the third thoracic vertebra, and lower border is at the lower end of spinous process of the seventh thoracic vertebra. Main acupoints at this zone that can be used for cardiac diseases include Shenzhu (GV12), Shendao (GV11), Lingtai (GV10), Zhiyang (GV9), Jueyinshu (BL14), Xinshu (BL15), Dushu (BL16), Shentang (BL44), Yixi (BL45), and Huatuoji (EX102) points within this region. This zone partially overlaps with VL2, VS2, and VLG2, respectively.

Zone of the upper limb (VH3): Located on the medial side of forearms and upper arms, covering approximately areas along HT and PC. Main acupoints used for cardiac diseases or chest pain in this zone include Jiquan (HT1), Qingling (HT2), Shaohai (HT3), Lingdao (HT4), Tongli (HT5), Yinxi (HT6), Shenmen (HT7), Shaofu (HT8), Shaochong (HT9), Tianquan (PC2), Quze (PC3), Ximen (PC4), Jianshi (PC5), Neiguan (PC6), Daling (PC7), Laogong (PC8), Zhongchong (PC9), Jingqu (LU8), and Taiyuan (LU9), as well as Gongzhong (EX120) that is 2.5 *cun* inferior to PC2^[83]. This zone partially overlaps with VS3 on the forearms and palms, as well as with VL3 on the forearms.

Zone of the forehead (VH5): Located on the middle area of the forehead, it includes Yintang (EX2), Ezhong (EX3) which is 1 *cun* above Yintang (EX2)^[83, 84], as well as Shenting (GV24) and Zanzhu (BL2). All of those acupoints may be used for symptoms of palpitation and hypertension. This zone partially overlaps with VS5.

1.1.4 Reflex zones of urogenital system

Because functions of the urinary system and the reproductive system are closely associated, and there is less specificity in actions of acupoints or reflex

points applied for their diseases, we classified their reflex zones as a single zone, namely the reflex zone of urogenital system (VU). Viscera of the urogenital system are located below the diaphragm, so this zone is distributed on the lower abdomen, lumbosacral area, groin and lower limbs (Color Figure 14). Since the kidneys and ureters are near the lower back, their reflex zone is primarily at the posterior side of trunk. The bladder and uterus are near the abdominal wall, their local zone is mainly at the anterior side of trunk, but it may be extended to the lumbosacral area and lateral thigh when their area expands or when the uterus is retro positioned. The zone for prostate, urethra, and external genital may appear at the groin and perineum areas continuously besides its distribution on the lower abdomen. Distal reflex zone for the urogenital system mainly lodge at the medial side of the lower limbs, especially that of the legs and feet.

Zone of the anterior trunk (VU1): Corresponds to the reflection area of urogenital system, mainly bladder and uterus at the lower and middle abdomen. Upper border is at the level of Shuifen (CV9) and Tianshu (ST25). Lower border is along Qugu (CV2), Henggu (KI11), and Qichong (ST30). Main acupoints at this zone include Shuifen (CV9), Shenque (CV8), Yinjiao (CV7), Qihai (CV6), Shimen (CV5), Guanyuan (CV4), Zhongji (CV3), Qugu (CV2), Zhongzhu (KI15), Siman (KI14), Qixue (KI13), Dahe (KI12), Henggu (KI11), Tianshu (ST25), Wailing (ST26), Daju (ST27), Shuidao (ST28), Guilai (ST29), and Qichong (ST30), as well as Zigong (EX93) that are 3 *cun* lateral to Zhongji (CV3)^[83], and Qimen (EX94) that are 3 *cun* lateral to Guanyuan (CV4)^[84]. It connects with VU4-1 and partially overlaps with VU1.

Due to the bladder and uterus possessing rather extendable characteristics, their reflex zones can be enlarged along with their extensions, and sometimes

the entire lower abdomen may be involved.

Zone of the posterior trunk (VU2): Includes two regions, as shown in Color Figure 14. The first region is a symmetric area surrounded by Pishu (BL20), Sanjiaoshu (BL22), Shenshu (BL23), Zhishi (BL52), and Yishe (BL49) of both sides. It corresponds to the reflective areas of kidneys on the back. Upper border is Pishu (BL20) and Yishe (BL49) at the level of the tenth thoracic vertebra; lower border is at Mingmen (GV4), Shenshu (BL23), and Zhishi (BL52) of the second lumbar vertebra. Main acupoints of this zone include Pishu (BL20), Weishu (BL21), Sanjiaoshu (BL22), Yishe (BL49), Weicang (BL50), Huangmen (BL51), Zhishi (BL52), and Mingmen (GV4).

The second is an inversed triangle shaped region located at the middle lumbosacral area, surrounded by Yaoyangguan (GV3), Yaoshu (GV2), and bilateral Xiaochangshu (BL27), Yaoyi (EX114), Pangguangshu (BL28), and Zhongliao (BL33). When suffering from disorders of the bladder, uterus, or prostate, there are usually some external reactions such as local swelling or tenderness. Upper border is at the level of the fourth lumbar vertebra along Yaoyangguan (GV3) and Dachangshu (BL25), lower border is along Yaoshu (GV2), Huiyang (BL35), Baihuanshu (BL30), and Zhibian (BL54). Main acupoints of this zone include Yaoyangguan (GV3), Yaoshu (GV2); Dachangshu (BL25), Guanyuanshu (BL26), Xiaochangshu (BL27), Pangguangshu (BL28), Zhonglushu (BL29), Baihuanshu (BL30), Shangliao (BL31), Ciliao (BL32), Zhongliao (BL33), Xialiao (BL34), Huiyang (BL35), Baohuang (BL53), and Zhibian (BL54), as well as Huatuoji (EX102) points within this region, and Shiqizhuixia (EX111)^[83]. This zone partially overlaps with VS2 and VL2, respectively.

Zone of the lower limb (VU4): Divided into VU4-1, VU4-2, VU4-3, VU4-4, and VU4-5.

Zone of the groin area (VU4-1): Main points of this

zone include Daimai (GB26), Wushu (GB27), Weidao (GB28), Fushe (SP13), Chongmen (SP12), Jimai (LR12), Yinlian (LR11), Zuwuli (LR10), and Weibao (EX137)^[84]. It merges with VU1 and VU4-2, and partially overlaps with VI4.

Zone of the perineum area (VU4-2): Connects to VU4-1, and its center is at Huiyin (CV1) (not shown in Color Figure 14).

Zone of the medial side of the lower limb (VU4-3): Covers areas along the meridians of SP and LR above the knee, along the meridians of SP, KI, and LR below the knee. Urinary reflex zone is mainly along KI but can spread to SP and LR, while reproductive reflex zone is mainly along SP and KI and expanded to LR. With the upper border at Jimen (SP11), this zone includes Jimen (SP11), Xuehai (SP10), Yinlingquan (SP9), Diji (SP8), Lougu (SP7), Sanyinjiao (SP6), Shangqiu (SP5), Gongsun (SP4), Taibai (SP3), Dadu (SP2), Yinbai (SP1), Yinbao (LR9), Ququan (LR8), Zhongdu (LR6), Ligou (LR5), Zhongfeng (LR4), Taichong (LR3), Xingjian (LR2), Dadun (LR1), Yingu (KI10), Zhubin (KI9), Jiaoxin (KI8), Fuli (KI7), Zhaohai (KI6), Shuiquan (KI5), Dazhong (KI4), Taixi (KI3), Rangu (KI2), Yongquan (KI1), Sangyinling (EX155), and Jiaoyi (EX161)^[83]. This zone partially overlaps with VS4 and VI4 and has two emphasized regions where reflex points or common acupoints lodge more closely. The first is on the medial side of the knee surrounded by Yinlingquan (SP9), Shangyinling (EX155), Ququan (LR8), and Yingu (KI10). The second is on the medial side of the ankle surrounded by Sanyinjiao (SP6), Shangqiu (SP5), Zhaohai (KI6), Shuiquan (KI5), Dazhong (KI4), Taixi (KI3), Fuli (KI7), and Jiaoxin (KI8).

Zone of the popliteal fossa (VU4-4): Mainly including Fuxi (BL38), Weiyang (BL39), Weizhong (BL40), and Heyang (BL55), it merges with VU4-3 and partially overlaps with VI4.

Zone of the lateral side of the lower limb (VU4-5):

Located at the middle section of the lateral thigh, it includes Fengshi (GB31), Zhongdu (GB32), Shangfengshi (EX142) that is 2 *cun* above Fengshi (GB31), and Qianfengshi (EX143) that is 2 *cun* before Fengshi (GB31)^[84]. When an enlarged uterus due to physiological or pathological causes or prostate hypertrophy stimulates the lumbosacral region, reflections may occur on this zone.

1.1.5 Reflex zones of the stomach and esophagus

The stomach passing through the diaphragm is mainly located above the diaphragm, and only a small portion of stomach is below the diaphragm. Accordingly, its reflex zone (VS) is distributed at either the upper or the lower limbs, and is mostly symmetrical on both sides. The esophagus is located above the diaphragm and connects to the upper part of stomach, so its reflex zone (VE) distributed on the upper limb, posterior trunk and forehead completely overlaps with VS, while its reflex zones distributed on anterior trunk partially overlaps with VS. Due to the close association of the stomach and esophagus, as well as the lack of specificity of actions in their reflex points, they are classified as one zone (VSE) (Color Figure 15).

Zone of the anterior trunk (VS1 and VE1): Reflex zone of stomach at this region (VS1) lodges mainly on the lower chest and upper, middle abdomen. Upper border is along Tanzhong (CV17), Bulang (KI22), Burong (ST19), and Qimen (LR14), while its lower border is at the level of Shenque (CV8), Huangshu (KI16), Huaroumen (ST24), and Fuai (SP16). Because the stomach is very expandable, especially when suffering from gastropnoia, it may have a much lower position in the abdomen, so lower border of VS1 may have large variations. Main acupoints used for gastric diseases in this zone include Tanzhong (CV17), Zhongting (CV16), Jiuwei (CV15), Juque

(CV14), Shangwan (CV13), Zhongwan (CV12), Jianli (CV11), Xiawan (CV10), Shuifen (CV9), Shenque (CV8), Bulang (KI22), Youmen (KI21), Futonggu (KI20), Yindu (KI19), Shiguan (KI18), Shangqu (KI17), Huangshu (KI16), Burong (ST19), Chengman (ST20), Liangmen (ST21), Guanmen (ST22), Taiyi (ST23), Huaroumen (ST24), Qimen (LR14), Riyue (GB24), and Fuai (SP16), as well as Shicang (EX95), Shiguan (EX96), Diwei (EX97), and Weile (EX98) ^[83].

The upward extension of VS1 is the reflex zone of esophagus (VE1) that is centered on the sternum, corresponded to the reflection area of esophagus on the anterior wall of chest. This zone includes Tiantu (CV22), Xuanji (CV21), Yutang (CV18), Tanzhong (CV17), Zhongting (CV16), Shufu (KI27), Yuzhong (KI26), Shencang (KI25), and Lingxu (KI24). This zone partially overlaps with a small portion of VS1. Both VS1 and VE1 partially overlap with VH1, VL1, and VI1, respectively.

Zone of the posterior trunk (VSE2): Located at region within 3~4 inches away from and including the midline of upper back. Lower part is wider than its upper part. Upper border is along Shendao (GV11), Jueyinshu (BL14), and Gaohuangshu (BL43) (the lower end of spinous process of the fourth thoracic vertebra), and its lower border is at the level of Mingmen (GV4), Shenshu (BL23), and Zhishi (BL52) (the lower end of spinous process of the second lumbar vertebra). Main acupoints used for gastric diseases in this zone include Shendao (GV11), Lingtai (GV10), Zhiyang (GV9), Jinsuo (GV8), Jueyinshu (BL14), Xinshu (BL15), Dushu (BL16), Geshu (BL17), Danshu (BL19), Pishu (BL20), Weishu (BL21), Sanjiaoshu (BL22), Gaohuangshu (BL43), Shentang (BL44), Yixi (BL45), Geguan (BL46), Hunmen (BL47), Yanggang (BL48), Yishe (BL49), Weicang (BL50), Huangmen (BL51), and Zhishi (BL52), as well as Huatuojiayi (EX102) points within this region. Pigen (EX109), Weishu (EX116) and

Kuiyangxue (EX117) ^[83]. This zone partially overlaps with VH2, VL2, VI2, and VLG2, respectively.

Zone of the upper limb (VSE3): Consistent with the course of PC with the upper border at Quze (PC3). Main acupoints used for gastric diseases in this zone include Quze (PC3), Ximen (PC4), Jianshi (PC5), Neiguan (PC6), Daling (PC7), Laogong (PC8), and Zhongchong (PC9). This zone partially overlaps with VH3 and VL3 on the forearm, as well as with VH3 on the palm.

Zone on the lower limb (VS4): Divided into two regions, one is located on the upper parts of legs, along with the course of ST: Zusanli (ST36), Shangjuxu (ST37), and Tiaokou (ST38), as well as Erliban (EX148) and Jianwei (EX151) ^[84]. Another one is distributed on the medial side of foot dorsum, along with the course of SP: Shangqiu (SP5), Gongsun (SP4), Taibai (SP3), Dadu (SP2), and Yinbai (SP1). These two regions partially overlap with VI4, but their ranges are much smaller than VI4.

Zone of the forehead (VSE5): On the middle area of forehead, surrounded by Yintang (EX2), Zanzhu (BL2), Yangbai (GB14), and Ezhong (EX3) that is its upper border. Its lower border is at Yintang (EX2) and Zanzhu (BL2). All of those acupoints may be used to treat symptoms of nausea, vomiting, and hiccups. This zone partially overlaps with VH5.

1.1.6 Reflex zones of liver, gallbladder, spleen, and pancreas

Because the anatomical locations of the liver, gallbladder, spleen, and the pancreas are relatively close in proximity to each other and their functions are linked, we classify their reflex zones as a single zone (VLG) (Color Figure 16). Because all of these viscera are located below the diaphragm, their distal reflex zones on the limbs are only distributed on the lower limbs, while their local or adjacent reflex zones are distributed on the upper abdomen and back.

Note that it is very difficult to sort acupoints based on their efficacy for these four viscera due to either lack of related clinical reports or difficulties in identifying if the efficacy is particular for these four viscera or for general symptoms of digestive tracts such as low appetite, vomiting, meteorism, abdominal pain, and ascites. Thus, main acupoints or reflex points included in this zone merely are those often used for diseases or symptoms of liver and gallbladder.

Zone of the anterior trunk (VLG1): Reflex points of liver and gallbladder are mainly on the right upper abdomen. Reflex points of spleen are mainly on the left upper abdomen while reflex points of pancreas are mainly on the middle upper abdomen. These points all correspond to their reflection areas respectively. This zone's upper border is along Jiuwei (CV15) and Rugen (ST18) while the lower border is at the level of Jianli (CV11), Guanmen (ST22), and Zhangmen (LR13). Main acupoints used for liver and gallbladder diseases or splenomegaly in this zone include Jiuwei (CV15), Juque (CV14), Qimen (LR14), Zhangmen (LR13), Rugen (ST18), Chengman (ST20), Guanmen (ST22), Riyue (GB24), Fuai (SP16), as well as Ganfang (EX99), Ganshi (EX100), and Chuangxinmen (EX101)^[83]. Acupoints at this zone used to treat pancreatitis are almost consistent with acupoints of VS1. This zone partially overlaps with VS1, VE1, VL1, and VI1, respectively.

Zone of the posterior trunk (VLG2): Divided into two regions: one is at the center and bilateral areas of the back while the other is at the scapula.

Zone of the midline and bilateral areas of the back (VLG2-1): Upper border of this zone is at the level of Shendao (GV11) and Geshu (BL17) with the lower border at Jizhong (GV6), Sanjiaoshu (BL22), Huangmen (BL51), and Pigen (EX109). Reflex points of liver and gallbladder are mainly on the right side, while reflex points of spleen and pancreas are mainly

on the left side. Main acupoints at this zone include Shendao (GV11), Lingtai (GV10), Zhiyang (GV9), Jinsuo (GV8), Zhongshu (GV7), and Jizhong (GV6), Geshu (BL17), Ganshu (BL18), Danshu (BL19), Pishu (BL20), Weishu (BL21), Sanjiaoshu (BL22), Hunmen (BL47), Yanggang (BL48), Yishe (BL49), Weicang (BL50), and Huangmen (BL51), as well as Huatuojiayi (EX102) points within this region, such as Ganre (EX103), Bire (EX104), Bazhuixia (EX105), Shubian (EX107), Zhuoyu (EX108), and Pigen (EX109)^[83]. This zone partially overlaps with VH2, VL2, and VS2, respectively.

Zone of the scapula (VLG2-2): It mainly pertains to the reflex zone of the gallbladder and distributes along the course of SI meridian, including Tianzong (SI11), Bingfeng (SI12), and Quyuan (SI13).

Zone of the lower limb (VLG4): Divided into three regions: VLG4-1, VLG4-2, and VLG4-3.

Zone of the lateral side of the leg (VLG4-1): Located on the upper parts of the lateral leg, mainly covers the course of GB meridian. It includes Yanglingquan (GB34), Waiqiu (GB36) and Gallbladder Point (EX152)^[83], expanding to Zusanli (ST36) and Xiajuxu (ST39). This zone is mainly used for cholecystitis and cholelithiasis, so it can be called as the reflex zone of gallbladder.

Zone of the lateral side of the foot (VLG4-2): This mainly pertains to reflex zone of gallbladder, and is distributed along the course of GB meridian, including Qiuxu (GB40) and Xiaxi (GB43).

Zone of the medial side of the leg and the foot (VLG4-3): This is mainly distributed along the course of LR meridian, also involving parts of SP and KI meridian courses. Main acupoints or reflex points of this zone are Ququan (LR8), Zhongdu (LR6), Ligou (LR5), Zhongfeng (LR4), Taichong (LR3), Yinlingquan (SP9), Sanyinjiao (SP6), Shangqiu (SP5), Taixi (KI3), and Rangu (KI2), as well as Ganyan (EX162)^[84]. Most of those acupoints are applicable for hepatitis and

jaundice, so this zone can be called the reflex zone of liver. This zone partially overlaps with VS4, VI4, and VU4, respectively.

Reflex zones for pancreas or spleen on the lower limb are difficult to be identified. Though there were acupoints used for symptoms of diabetes documented in classical TCM literature, such as Taixi (KI3) and Rangu (KI2), their functions lack modern studies and proofs. In recent reports about acupuncture for pancreatitis, master acupoints applied are mostly those for diseases of digestive tracts, such as Zusanli (ST36). As for diseases of spleen such as splenomegaly, there were few references not only in classical TCM literature but also from modern practice of acupuncture.

Zone of the face (VLG5): Surrounded by Sibai (ST2), Yingxiang (LI20), and Bijiao (EX68)^[84], which may be used to treat biliary ascariasis and jaundice.

1.2 Somatic Reflex Zones

Somatic reflex zones are distributed continuously on entire body surface. They may be longitudinally divided into three sub-zones: anterior, lateral, and posterior zones (Color Figure 5). On the trunk and limbs, boundaries between the anterior and lateral zones, as well as that between the anterior and posterior zones, are approximately corresponded to the border zone of central reflex zones. In other words, somatic anterior and posterior zones are located on *yin* and *yang* sides of the body, respectively, while somatic lateral zone is corresponded to the crossing region between *yin* and *yang* sides. The border zone of central reflex zones lodges on the same crossing regions of *yin* and *yang* sides of the body as if it is

the central line of the somatic lateral zone. Besides, somatic reflex zones may appear on the body surface via reciprocal reflexes of corresponding areas between bilateral sides, between the upper and lower parts, and between the anterior and posterior trunk (Color Figure 7).

Lateral and posterior zones of somatic reflex zones located at the *yang* side have most extensive clinical applications. Reflexes of most common diseases or injuries of motor organs appear within these two zones. When they are stimulated, greater effects of treating somatic diseases may be yielded.

Somatic zones are closely associated with the meridian system. Their longitudinal and continuous distribution on the body surface is completely consistent with the traveling courses of the 14 meridians. Actually, they include all courses of the meridian system running on the body surface, including the 12 regular meridians, 8 extraordinary meridians, 12 muscle regions, 12 cutaneous regions, and 15 collaterals.

1.2.1 Anterior somatic zone

Anterior somatic zone (SA) is distributed on the forehead, face, the anterior side of neck, chest, and abdomen, as well as the anteromedial side of the lower limb and the flexional side of the upper limb. On the head and neck, the borderline between SA and SP is along Shangxing (GV23), Wuchu (BL5), and Muchuang (GB16), while the borderline between SA and SL is along Benshen (GB13), Touwei (ST8), Xiaguan (ST7), Jiache (ST6), Futu (LI18), Tianding (LI17), and Jugu (LI16). On the trunk and lower limbs, the borderline between SA and SL is approximately along the anterior margin of BL meridian. The borderline between SA and SP is along the posterior margin of KI meridian on thighs and the lateral side of Weizhong (BL40) and Heyang (BL55), as well as the posterior margin of Xiguan

(LR7), Diji (SP8), Zhongdu (LR6), Lougu (SP7), Zhubin (KI9), Fuliu (KI7), Taixi (KI3), and Shuiquan (KI5) on legs. On the upper limbs, the borderline between SA and SL is along the radial side of LI meridian while the borderline between SA and SP is along the posterior margin of HT meridian on forearms and along the ulnar side of TE on the upper arms.

This zone includes traveling courses of **three-foot-yin** meridians, **three-hand-yin** meridians, and ST on the body surface, as well as their attached muscle regions, cutaneous regions and collaterals. It also contains CV (**conception vessel**), Chongmei (**penetrating vessel**), and the anterior parts of Daimai (**belt or girdle vessel**), Yinweimei (**yin link vessel**), Yinqiaomei (**yin heel vessel**), and Bie collateral of CV.

1.2.2 Lateral somatic zone

Lateral somatic zone (SL) is distributed on all lateral sides of the soma. The borderline between SL and SP is along the posterior margin of GB and TE on the head, posterior neck, shoulder, and the upper limbs as well as along the postaxillary line on the trunk, and along the posterior margin of GB on the lower limb. The borderline between SL and SA refers to the above section.

This zone includes surface courses of GB, TE, and LI (except its courses on the face), their attached muscle regions, cutaneous regions and collaterals, Yangweimei (**yang link vessel**) and Yangqiaomei (**yang heel vessel**), as well as the major collateral of spleen.

1.2.3 Posterior somatic zone

Posterior somatic zone (SP) is distributed on the posterior side of the head, neck, trunk and the lower limbs, as well as the partial region on the ulnar and extension sides of the upper limb. This zone includes entire surface courses of BL and SI (except its courses on the face and neck), their attached muscle regions,

cutaneous regions, collaterals, the posterior parts of GV (**governing vessel**) and belt (**girdle**) vessel, as well as GV itself.

Note the reasons we divided somatic reflex zones into the above three zones of SA, SL, and SP instead of more zones is because PNSAM caused by puncturing acupoints on the extremities is diffused within certain ranges rather than still propagated along the meridians when they reach the chest, abdomen and head including the face. Moreover, when clinically using distal acupoints of the limbs for somatic diseases on the chest, abdomen, head, or face, it is often unnecessary to strictly select acupoints along the meridians passing the affected region. In other words, the phenomenon of *homotherapy with heteromeridian* is very popular in treating somatic diseases at these portions of the body.

Of course, somatic reflex zones on the limbs can be classified more elaborately (refer to Figure 3.7 of Section 3.7). For example, SA zones on the lower limb can be further divided into at least two regions. One is the region of ST that is located on the extensor side of limbs and centered with the course of ST meridian, another is the region of three-yin meridians that is located on the medial side of limbs and centered with SP, LR, and KI meridians. Those two sub-zones, however, merge into one, i.e., SA zone after ascending to the abdomen. Similarly, SL zones on the upper limb can be further divided into the dorsal region of TE meridian and the radial region of LI meridian. SA zones on the medial side of the upper limb can be further divided into the region of HT meridian, the region of PC meridian, and the region of LU meridian, which all merge into one, i.e., SA after ascending to shoulders or the chest. SP zones also can be divided into the region of BL meridian and the region of SI meridian. The former covers the dorsal side of the head, trunk, and lower

limbs while the latter covers the dorsal and ulnar sides of the upper limb extending to scapulas and the hind head, merging on the head. Thus, when treating somatic disorders of the limbs, choosing corresponding meridian regions pertains to classical **point selection along the meridians**.

Accordingly, it is advised to select corresponding meridian regions (or point selection along the meridians) for somatic diseases of the limbs, and select reflex points within the corresponding somatic subzone for somatic diseases occurring on the head, face or chest and abdomen. Because those meridian regions on the limbs have same names and are consistent with corresponding meridians, their illustrations are omitted in Color Figure 5.

1.3 Central Reflex Zones

The relationship between central reflex zones and the meridian system on the body surface is shown in Color Figure 17. Central reflex zones are classified as the **midline zone (CM)** that is distributed in the midlines of the head, face, and trunk, the **borderline zone (CB)**, as well as the **scalp zone (CS)** near the brain.

CM, where various diseases of CNS may show their reflex points, is a primary part of central reflex zones. **CB** has a broader territory than **CM**, and is more complicated. It approximately lodges on the boundaries of the anterior and posterior sides (*yin* and *yang* sides) of the body, i.e., it seems to split the soma into the anterior and posterior halves. However, **CB** on the shoulder and knee are somewhat special because of the exterior eminence of the shoulder and knee. Their exterior surface pertains to *yang* side while the axillary and popliteal fossas

pertain to *yin* side. **CB** located below the elbow and knee, especially on the hand and foot is most important. Most acupoints located within **CB** can be used to treat nervous and mental diseases. In addition, the higher nervous centers reside within the skull cavity, and their local central reflex zone is distributed on the surface of skull, namely the scalp, which is **CS**.

Stimulation of central reflex zones may have distinct effects on CNS, the hypothalamus-pituitary system that controls ANS and endocrine system, the immune system of the entire body, as well as the regulation of the body temperature and so on.

1.3.1 Midline reflex zones

Posterior midline zone on the trunk, head and neck (CM1):

Located at the posterior midline and 0.5~1 inch away from the line, covering all acupoints of GV, Shangliao (BL31), Ciliao (BL32), Zhongliao (BL33), Xialiao (BL34), and Huiyang (BL35) of BL, as well as Huatuojiagi (EX102) points within this region.

Anterior midline zone on the trunk, head and neck (CM2):

Located at the anterior midline and 0.5~1 inch away from the line. It covers all acupoints of GV and CV within this region, Youmen (KI21), Futonggu (KI20), Yindu (KI19), Shiguan (KI18), Shangqu (KI17), Huangshu (KI16), Zhongzhu (KI15), Siman (KI14), Qixue (KI13), Dahe (KI12), and Henggu (KI11) of KI on the abdomen, as well as Yintang (EX2), and Nianshou (EX69)^[84].

1.3.2 Border reflex zones

(1) Border zone of the head (CB1):

Distributed along the natural anterior and lateral hairline or behind ears. Main acupoints of this zone include Shenting (GV24), Meichong (BL3), Qucha (BL4), Tianzhu (BL10), Tinghui (GB2), Shangguan (GB3), Hanyan (GB4), Xuanlu (GB5), Xuanli (GB6), Qubin (GB7), Wangu (GB12), Benshen (GB13),

Toulinqi (GB15), Fengchi (GB20), Tianliao (TE15), Yifeng (TE17), Chimai (TE18), Luxi (TE19), Jiaosun (TE20), Ermen (TE21), Erheliao (TE22), Tinggong (SI19), Touwei (ST8), and Xiaguan (ST7).

(2) Lateral zone of shoulders and the neck (CB2):

Distributed along LI and GB meridians, including Jugu (LI16), Jianjing (GB21), as well as Xinshe (EX74), and Xiaxinshe (EX75)^[83]. This zone is connected to CB1.

(3) Border zone of the trunk (CB3):

Approximately distributed between the middle and anterior lines of axillae, including Yuanye (GB22), Daimai (GB26), and Dabao (SP21).

(4) Border zone of the upper limb (CB4):

Lateral region of upper arms and forearms (CB4-1):

Mainly located along LI, containing Binao (LI14), Shouwuli (LI13), Quchi (LI11), Shousanli (LI10), Shanglian (LI9), Xialian (LI8), Wenliu (LI7), and Pianli (LI6). It also includes those acupoints of LU that near LI, such as Jingqu (LU8) and Lieque (LU7). It is connected to CB3 and CB4-3.

Medial region of upper arms and forearms (CB4-2):

This is the area between SI and TE containing Xiaohai (SI8), Zhizheng (SI7), Yanglao (SI6), Shaohai (HT3), Lingdao (HT4), Tongli (HT5), Yinxi (HT6), and Shenmen (HT7). It also includes those acupoints of TE that near SI, such as Naohui (TE13), Xiaoluo (TE12), Qinglengyuan (TE11), and Tianjing (TE10). It is connected to CB3 and CB4-3.

Border region of the hand (CB4-3): This is the border area between the palms and hand dorsums and includes all fingers and their webs. Main points of this region are Hegu (LI4), Erjian (LI2), Sanjian (LI3), Shangyang (LI1), Taiyuan (LU9), Yuji (LU10), Shaoshang (LU11), Yanggu (SI5), Wangu (SI4), Houxi (SI3), Qianggu (SI2), Shaoze (SI1), Shaofu (HT8), Shaochong (HT9), Zhongzhu (TE3), Yemen (TE2), and Zhongchong (PC9), as well as Shixuan (EX128) and Baxie (EX132).

(5) Border zone of the lower limb (CB5):

Lateral region of thighs and legs (CB5-1): Distributed along GB on the thighs and between GB and BL on the legs. Main points of this region are Juliao (GB29), Fengshi (GB31), Zhongdu (GB32), Xiyangguan (GB33), Yanglingquan (GB34), Xuanzhong (GB39), Feiyang (BL58), and Fuyang (BL59). It is connected to CB3 and CB5-3.

Medial region of thighs and legs (CB5-2): This is the area behind KI on the thighs and the area between SP and KI on the legs, including Xiguan (LR7), Dijì (SP8), Zhubin (KI9), and Fuliú (KI7). It is connected to CB5-3.

Border region of feet (CB5-3): It is the border area of the foot bottom and foot dorsum including all toes and their webs. It is distributed along BL and KI on the lateral and medial sides of feet, respectively. Main points of this region are Kunlun (BL60), Pucan (BL61), Shenmai (BL62), Jinmen (BL63), Jinggu (BL64), Shugu (BL65), Zutonggu (BL66), Zhiyin (BL67), Qiuxu (GB40), Zulinqi (GB41), Diwuhui (GB42), Xiáxi (GB43), Zuqiaoyin (GB44), Xiangú (ST43), Neiting (ST44), and Lidui (ST45), Gongsun (SP4), Taibai (SP3), Dadu (SP2), Yinbai (SP1), Shuiquan (KI5), Dazhong (KI4), Taixi (KI3), and Rangu (KI2), as well as Bafeng (EX163).

1.3.3 Scalp reflex zones

Central scalp zones (CS), which can be stimulated via scalp acupuncture, are mainly located on the scalp covered by hair. There are two referencing lines on the scalp in locating those stimulation areas: the anterior is approximately corresponded to functional orientations of the cerebral cortex, including the *Motor area*, *Sensory area*, *Choreatrembling controlled area*, *Vertigo-auditory area*, *Second speech area*, *Third speech area*, *Usage area*, *Foot motor sensory area*, *Optic area*, *Balance area*, *Gastric area*, *Thoracic area*, and the *Reproduction area*. Both *Motor area* and *Sensory area* can be further divided into five even parts: the upper

1/5 represents the lower limbs and the trunk; the middle 2/5 represents the upper limbs; the lower 2/5 represents the face. The lower 2/5 of the motor area is also called the *First speech area*. In locating these regions, there are two additional referencing lines: the posterior median line and the eyebrow-occipital line (the horizontal line connecting the midpoint of the upper border of eyebrow and the highest prominence of external occipital protuberance). For more details, refer to Color Figure 7 or related books on scalp acupuncture^[78, 79].

There is a standard nomenclature of Chinese scalp acupuncture lines, in which the above stimulation areas of scalp can be expressed as 14 lines that pertain to four regions respectively. Relationship between them and acupoints of the head is as follows ^[81, 82].

Forehead region:

Midline of forehead: 1 *cun* from Shenting (GV24) straightly downward along GV;

Line 1 lateral to the forehead: 1 *cun* from Meichong (BL3) straight downward along BL, corresponded to the *Thoracic area*;

Line 2 lateral to the forehead: 1 *cun* from Toulinqi (GB15) straight downward along the GB, corresponded to the *Gastric area*;

Line 3 lateral to the forehead: 1 *cun* from the point 0.75 *cun* to Touwei (ST8) straight downward, corresponded to the *Reproduction area*.

Vertex region:

Midline of vertex: from Baihui (GV20) to Qianding (GV21) along GV.

Anterior oblique line of the vertex-temporal: from Qianding (GV21) obliquely to Xuanli (GB6), passing across GV, BL and GB, corresponded to the *Motor area*.

Posterior oblique line of the vertex-temporal: from Baihui (GV20) obliquely to Qubin (GB7), passing

across the GV, BL and GB, corresponded to the *Sensory area*.

Line 1 lateral to the vertex: 1 *cun* from Chengguang (BL6) backward along BL, corresponded to the *Foot motor sensory area*.

Line 2 lateral to the vertex: 1.5 *cun* from Zhengying (GB17) backward along the GB.

Temporal region:

Anterior temporal line: from Hanyan (GB4) to Xuanli (GB6).

Posterior temporal line: from Shuaigu (GB8) to Qubin (GB7), corresponded to the *Vertigo-auditory area*.

Occipital region:

Upper-midline of occiput: from Qiangjian (GV18) to Naohu (GV17).

Upper-lateral line of occiput: 0.5 *cun* lateral and parallel to the upper-midline of occiput, corresponded to the *Visual area*.

Lower-lateral line of occiput: from Yuzhen (BL9) to Tianzhu (BL10), corresponded to the *Equilibrium area*.

In summary, comparing the standard nomenclature of Chinese scalp acupuncture lines with classical scalp stimulation areas, there are five additional lines: the midline of forehead, the midline of vertex, and the upper-midline of the occiput that are located at the midline of the head, i.e., GV, as well as the line 2 lateral to the vertex and the anterior temporal line. The upper-midline of the occiput can be used to treat optical diseases, so we named it *Visual area 2*, which is located within the following optical reflex zones with the upper-lateral line of the occiput. In addition, Line 2 lateral to the vertex is mainly used to treat paralysis and numbness of the upper limb, so we call it *Hand-kinesthetic sensory area*.

1.4 Optic and Otorhinolaryngologic Reflex Zones

Eyes, ears, nose, mouth and throat located on the head also have their particular reflex zones. Beside local and adjacent reflex zones (Color Figure 18), they are also distributed on distal parts of the extremities. Because their distal reflex zones are more scattered, here we only describe them text. However, they have two common characteristics: the first is that they overlap with central reflex zones on the extremities; the second is that the organs and their corresponding distal reflex zones are located on the same sides of the body (the anterior, lateral, or the posterior side). For example, since eyes, nose, mouth, and throat are on the somatic anterior zone (SA), their distal reflex zones are also located on SA. Since ears are at the somatic lateral zone (SL), their distal reflex points on the limbs are on SL. For most newly discovered extraordinary points listed on the following reflex zones, refer to *Atlas on the Extraordinary Points for Acupuncture*^[73].

1.4.1 Optic reflex zones

Optic reflex zones or the so-called eye zones (EY) contain local, adjacent, and distal zones. The local one is the area between two circles that surround the interior and exterior borders of the orbit, while the adjacent is located on the forehead, hind head, and neck (Color Figure 18). As for the distal one, it is mainly distributed on ventral reflex zones on the extremities and the anterior somatic zone below the knees. They are usually used to treat kinds of ophthalmologic symptoms or diseases, such as ophthalmalgia, lacrimation, or dryness of the eye, blurred vision, conjunctivitis, corneritis, myopia, optic nerve atrophy, retinitis pigmentosa, and

glaucoma.

Zones of the inner margin of orbit (EY1): Divided into four sub-zones at the upper, lower, left, and right to the eyeball.

Region of the inner canthus (EY1-1): Centered at Jingming (BL1), including Waijingming (EX5), Shangjingming (EX6), Xiajingming (EX7), Jingguang (EX8), Dongming 6 (EX18), and Dongming 1 (EX13).

Region of the external canthus (EY1-2): Centered at Tongziliao (GB1), including Waiming (EX9), Dongming 5 (EX17), and Xiaoqingming (EX10).

Region of the supraorbital inner margin (EY1-3): Contains Jianming 4 (EX27), Xinzanzhu (EX12), Dongming 3 (EX15), Dongming 2 (EX14), Zengming 1 (EX19), Zengming 2 (EX20), Dongming 4 (EX16), and Xiaoqingming (EX11).

Region of the infraorbital inner margin (EY1-4): Contains Chengqi (ST1) and Jianming (EX23), Jingxia (EX21), Daiming (EX22), Jianming 1 (EX24), Jianming 2 (EX25), Qiuhou (EX28), Yueliang (EX29), and Jianming 3 (EX26).

Zone surrounding orbit (EY2): Mainly contains Zanzhu (BL2), Sizhukong (TE23), Yuyao (EX31), Kuangshang (EX30), Yuwei (EX32), and Meishao (EX36), which are located on the upper orbit and forehead, as well as Sibai (ST2) at the inferior orbit and Taiyang (EX4) at the lateral side of orbit.

Zone of forehead (EY3): Contains Yangbai (GB14), Toulinqi (GB15), Muchuang (GB16); Shangxing (GV23), and Touwei (ST8), as well as Yangbaineiyicun (EX34), Yushang (EX33), and Xinming 2 (EX35).

Zone of the hind head and neck (EY4): Contains Fengchi (GB20), Tianzhu (BL10), Yuzhen (BL9), as well as Xinshe (EX74), Visual Area, and Upper-Midline of occiput of the scalp.

Zone on the upper limb (EY5): Contains Binao (LI14), Quchi (LI11), Yangxi (LI5), Hegu (LI4), Qinglengyuan (TE11), Yangchi (TE4), Zhongzhu (TE3), Guanchong (TE1), Yanglao (SI6), Houxi (SI3),

Qianggu (SI2), and Shaoze (SI1), as well as Jianming (EX121)^[84] that also pertain to central reflex zones.

Zone on the lower limb (EY6): Contains Fengshi (GB31), Guangming (GB37), Zuqiaoyin (GB44), Zusanli (ST36), Jiexi (ST41), Xianggu (ST43), Neiting (ST44), Taichong (LR3), Xingjian (LR2), Jinggu (BL64), Shugu (BL65), Zhiyin (BL67), Zhaohai (KI6), and Yongquan (KI1), as well as Wanli (EX149). Most of them are also within central reflex zones. However, Zusanli (ST36), Wanli (EX149), and Jiexi (ST41) are not located on central reflex zones, Neiting (ST44), Xianggu (ST43), Taichong (LR3), Xingjian (LR2), and Zhaohai (KI6) are within the anterior somatic zones.

1.4.2 Otic reflex zones

Otic reflex zones or ear zones (ER) contain local or adjacent zone that is the area surrounding ears (Color Figure 18), as well as distal reflex points that are mainly distributed at the lateral somatic zone below the elbows and knees and at the central zones of hands and feet. They are usually used to treat kinds of otic symptoms or diseases, such as deafness, tinnitus, otic pain, and median otitis.

Zone surrounding ears (ER1): Divided further into three sub-zones:

Region before ears (ER1-1): It is also below hair border. It contains acupoints of Ermen (TE21), Erheliao (TE22), Tinggong (SI19), Tinghui (GB2), Shangguan (GB3), and Xiaguan (ST7), as well as Zhilong3 (EX43), Tingxue (EX37), Tingling1 (EX39), Tingling (EX38), Tingling2 (EX40), Tingcong (EX41), Xiatinghui (EX42), and Zhilong4 (EX44). All of these points are within CB1 and CB2 of central reflex zones.

Region below and behind ears (ER1-2): It contains Yifeng (TE17), Chimai (TE18), Luxi (TE19), Fengchi (GB20), Naokong (GB19), Touqiaoyin (GB11), and Tianchuang (SI16), as well as Long7 (EX45), Houcong

(EX46), Houtinggong (EX47), Xinqihao (EX54), Xiachimai (EX49), Houting (EX50), Houtinghui (EX51), Xinyihao (EX52), Xinerhao (EX53), Anmian2 (EX60), Ergen (EX62), Yiming (EX55), Tingmin (EX61), Houyiming (EX56), Yimingxia (EX57), and Tianting (EX82). All of these points are within CB1 and CB2 of central reflex zones.

Region above ears (ER1-3): It contains Yuntingqu (EX48), Jiaosun (TE20), and Fubai (GB10), as well as Baihui (GV20) that is located on the vertex.

Zone on the upper limb (ER2): Contains Tianjing (TE10), Sidu (TE9), Sanyangluo (TE8), Huizong (TE7), Waiguan (TE5), Yangchi (TE4), Zhongzhu (TE3), Yemen (TE2), Yanggu (SI5), Wangu (SI4), Houxi (SI3), Qianggu (SI2), Shaoze (SI1), Yangxi (LI5), and Hegu (LI4), as well as Yingxia (EX123), Luo-shang (EX125)^[84]. Among them, those located at the hands mostly pertain to central reflex zones, while those located at the forearms pertain to the lateral somatic reflex zones.

Zone on the lower limb (ER3): Centered below the capitulum of fibula, a small area with length of 3 inches extended from Yanglingquan (GB34) downward, and including Feilong (EX153), Lingxia (EX156), Feitouxia (EX158), and Zuyicong (EX159). It also contains Diwuhui (GB42), Xiaxi (GB43), Neiting (ST44), Shenmai (BL62), and Taixi (KI3), as well as Zu 20 (EX166) and Zu 46 (EX170) that are located at the feet. Most of them are also within central reflex zones, and those acupoints at the legs pertain to the lateral somatic zones.

1.4.3 Nasal reflex zones

Nasal reflex zones (NS) contain local zone surrounding the nose and adjacent zone at the forehead and vertex (Color Figure 18 as well as distal reflex points that are scattered at the central reflex zone of hands and feet). They are usually used to treat nasal diseases or symptoms, such as rhinitis, sinusitis,

nasal obstruction, rhinorrhagia, and loss of smell.

Nasal and paranasal zone (NS1): Contains Suliao (GV25), Shuigou (GV26), Duiduan (GV27), Yingxiang (LI20), Kouheliao (LI19), Sibai (ST2), and Juliao (ST3), as well as Bitong (EX65), Zhibi1 (EX66), and Tongqi (EX67).

Zone of the forehead and vertex (NS2): Contains Yintang (EX2), Shenting (GV24), Shangxing (GV23), Xinhui (GV22), Baihui (GV20), Meichong (BL3), Qucha (BL4), Wuchu (BL5), Chengguang (BL6), Tongtian (BL7), and Luoque (BL8).

Zone of the posterior neck (NS3): Contains Fengchi (GB20), Tianzhu (BL10), Tianliang (EX79), and Liujiangzuipang (EX80)^[84].

Zone on the upper limb (NS4): Contains Hegu (LI4), Lieque (LU7), and Bichuxuedian (EX135).

Zone on the lower limb (NS5): Contains Neiting (ST44), Zutonggu (BL66), Zhiyin (BL67), and Yongquan (KI1).

1.4.4 Oral and throat reflex zones

Oral and throat reflex zones (OT) include local zone that is at the area surrounding the lip, the face, the anterior and posterior neck (Color Figure 18), as well as distal reflex zones that are distributed at the extremities. The later is mainly within central zones of the hands and feet as well as at the anterior somatic zones below the elbows and knees. They are usually used to treat kinds of symptoms or diseases, such as sore throat, tonsillitis, laryngitis, disorders of vocal cord, aphonia, stomatitis, mouth ulcer, glottitis, ptyalism, parotiditis, and toothache. However, note that some acupoints beside those zones also can be used to treat toothache due to relative specificity in analgesia actions of acupoints.

Zone surrounding mouth (OT1): Contains Dicang (ST4), Chengjiang (CV24), Shuigou (GV26), and Duiduan (GV27), as well as Yaoji (EX70) and Dihui (EX71).

Zone of the face (OT2): Contains Xiaguan (ST7), Jiache (ST6), Daying (ST5), and Qianzheng (EX63).

Zone of the posterior neck (OT3): Contains Fengchi (GB20), Tianzhu (BL10), Dazhui (GV14), Yamen (GV15), Fuyin (EX73), Jingqi (EX77), and Qijingzuipang (EX78).

Zone of the anterior neck (OT4): Contains Lianquan (CV23), Tiantu (CV22), Tianding (LI17), Tianchuang (SI16), Shuitu (ST10), Qishe (ST11), as well as Shanglianquan (EX84), Xinglianquan (EX85), Zengyin (EX87), Zengyinshang (EX88), Yadian (EX89), Tongqi 1 (EX91), Biantaoti (EX90), and Qiangyin (EX86).

Zone on the upper limb (OT5): Contains Shangyang (LI1), Erjian (LI2), Sanjiang (LI3), Hegu (LI4), Yangxi (LI5), Pianli (LI6), Wenliu (LI7), Qianggu (SI2), Guanchong (TE1), Yemen (TE2), Tianjing (TE10), Shaoshang (LU11), Yuji (LU10), Taiyuan (LU9), Lieque (LU7), Kongzui (LU6), Chize (LU5), Laogong (PC8), Daling (PC7), Shenmen (HT7), and Tongli (HT5), as well as Baxie (EX132), Laozhen (EX133), Hougou (EX122), Xinyangxi (EX126), Shanghegu (EX127), and Yanhoudian (EX136). Among them, those located at the hands mostly pertain to central reflex zones, while those points located at forearms such as Lieque (LU7), Kongzui (LU6), Chize (LU5), Hougou (EX122), Pianli (LI6), and Wenliu (LI7), as well as Laogong (PC8) and Daling (PC7) located at the hands pertain to the anterior somatic zones.

Zone on the lower limb (OT6): Contains Jiexi (ST41), Chongyang (ST42), Neiting (ST44), Lidui (ST45), Taixi (KI3), Zhaohai (KI6), Rangu (KI2), Yongquan (KI1), Taichong (LR3), Yanglingquan (GB34), as well as Bafeng (EX163), Shangbafeng (EX164), Zu19 (EX165), Zu21 (EX167), Zu27 (EX168), and Zu28 (EX169). Most of those points pertain to central reflex zones. Among them, points near Yanglingquan (GB34), Yongquan (KI1), and Zu21 (EX167) also are within the anterior somatic zones.

Index of Acupoints and Extraordinary Points

Here the anatomical locations of all 361 classical acupoints and most commonly used extraordinary points are presented. There are four methods to locate acupoints clinically, i.e., proportional measurement, anatomical landmarks, finger measurement, and simple measurement. Generally speaking, 1 *cun* (pronouncing *Tsun*), that is the basic unit of measurement, equals approximately one inch.

(1) The Lung Meridian of Hand-Taiyin (LU)

LU1 (Zhongfu):	At the level of the first intercostal space, 6 <i>cun</i> lateral to the midline, 1 <i>cun</i> inferior to the fossa clavicularis.
LU2 (Yunmen):	6 <i>cun</i> from the midline in the fossa clavicularis, superior to the coracoid process.
LU3 (Tianfu):	On the antero-lateral aspect of the upper arm, 3 <i>cun</i> inferior to the axillar fold on the radial edge of the biceps brachii muscle.
LU4 (Xiabai):	1 <i>cun</i> inferior to LU3 on the radial edge of the biceps brachii muscle.
LU5 (Chize):	In the cubital fold in the depression on the radial side of the biceps brachii muscle.
LU6 (Kongzui):	7 <i>cun</i> superior to the inferior wrist crease on the radial medial side of the forearm on the connecting line between LU5 and LU9 (the distance is 12 <i>cun</i>).
LU7 (Lieque):	1.5 <i>cun</i> superior to the wrist crease in the depression inferior to the radial tyloid, in the cleft between tendons of the brachioradialis muscle and the ductor pollicis muscle.
LU8 (Jingqu):	1 <i>cun</i> superior to the inferior wrist crease in the depression between the radial styloid and radialis artery.
LU9 (Taiyuan):	On the radial end of the inferior wrist crease, to the outside of the radialis artery, ulnar to the tendon of the adductor pollicis muscle.
LU10 (Yuji):	In the depression superior to the metacarpophalangeal joint in the center of the first metacarpal bone, on the border between red and white flesh.
LU11 (Shaoshang):	0.1 <i>cun</i> superior to the radial side of the thumbnail.

(2) The Large Intestine Meridian of Hand-Yangming (LI)

LI1 (Shangyang):	0.1 <i>cun</i> from the corner of the radial border of the nail of the index finger.
LI2 (Erjian):	In the depression just distal to the side of the second metacarpophalangeal joint of a loosely clenched fist.
LI3 (Sanjian):	In the depression just proximal to the second metacarpophalangeal joint of a loosely clenched fist.
LI4 (Hegu):	On the dorsum of the hand, to the side of the midpoint of the second metacarpal bone, in the adductor pollicis muscle.
LI5 (Yangxi):	On the radial side of the dorsal wrist crease, in the center of the hollow formed between the tendons of the extensor pollicis longus and brevis muscles, when the thumb is erect.
LI6 (Pianli):	3 <i>cun</i> proximal to the dorsal wrist crease on the lateral aspect of the lower arm on the connection line between LI5 and LI11 (the distance is 12 <i>cun</i>) with a slightly bent elbow.
LI7 (Wenliu):	5 <i>cun</i> proximal to LI5.
LI8 (Xialian):	4 <i>cun</i> distal to LI11.
LI9 (Shanglian):	3 <i>cun</i> distal to LI11.
LI10 (Shousanli):	2 <i>cun</i> distal to LI11.
LI11 (Quchi):	With elbow bent to 90 degrees, between the lateral end of the cubital crease and the lateral epicondyle of the humerus.
LI12 (Zhouliiao):	1 <i>cun</i> proximal to LI11, to the lateral aspect of the edge of the humerus.
LI13 (Shouwuli):	3 <i>cun</i> proximal to LI11, on the lateral side of the humerus.
LI14 (Binao):	7 <i>cun</i> proximal to LI11, on the lateral aspect of the upper arm, at the beginning of the deltoid muscle.
LI15 (Jianyu):	When the arm is abducted horizontally, between the front and middle parts of the deltoid muscle, in the anterior and inferior depression of the acromion.
LI16 (Jugu):	In the depression between the lateral end of the clavicle and the scapular spine.
LI17 (Tianding):	On the posterior border of the sternocleidomastoid muscle, 1 <i>cun</i> inferior to LI18.
LI18 (Futu):	3 <i>cun</i> lateral to the laryngeal prominence, just between the muscle heads of the sternocleidomastoid muscle, 1 <i>cun</i> cranial to LI17.
LI19 (Kouheliao):	Cranial to the upper lip, directly inferior to the lateral edge of the nostril, at the level of GV26.
LI20 (Yingxiang):	In the nasolabial groove, near the midpoint of the lateral border of the ala nasi.

(3) The Stomach Meridian of Foot-Yangming (ST)

ST1 (Chengqi):	With the patient staring directly ahead, just below the pupil, between the
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	eyeball and the inferior infraorbital foramen.
ST2 (Sibai):	Below the pupil, in the depression at the infraorbital foramen.
ST3 (Juliao):	Below the pupil, on the level of the lower edge of the ala nasi.
ST4 (Dicang):	Below the pupil, at 0.4 <i>cun</i> lateral to the corner of the mouth.
ST5 (Daying):	On the front edge of the masseter muscle, 1.3 <i>cun</i> anterior and inferior to the corner of the jaw, superior to the palpable facialis artery.
ST6 (Jiache):	At the prominence of the masseter muscle when the jaw is firmly clenched.
ST7 (Xiaguan):	In the depression between the zygomatic arch and the incisura mandibulae.
ST8 (Touwei):	0.5 <i>cun</i> within the ideal anterior hairline in the temple corner, 4.5 <i>cun</i> lateral to the midline.
ST9 (Renying):	On the front edge of the sternocleidomastoid muscle, 1.5 <i>cun</i> lateral to the upper edge of the laryngeal prominence, next to the carotid artery.
ST10 (Shuitu):	On the front edge of the sternocleidomastoid muscle, at the level of the lower point of the laryngeal prominence, between ST9 and ST11.
ST11 (Qishe):	On the upper edge of the medial end of the clavicle, between the clavicular and sternal onset of the sternocleidomastoid muscle.
ST12 (Quepen):	In the center of the supraclavicular fossa, 4 <i>cun</i> lateral to the ventral midline.
ST13 (Qihu):	Caudal to the center of the lower edge of the clavicle, 4 <i>cun</i> lateral to the ventral midline.
ST14 (Kufang):	In the first intercostal space, 4 <i>cun</i> lateral to the ventral midline.
ST15 (Wuyi):	In the second intercostal space, 4 <i>cun</i> lateral to the ventral midline.
ST16 (Yingchuang):	In the third intercostal space, 4 <i>cun</i> lateral to the ventral midline.
ST17 (Ruzhong):	In the fourth intercostal space, 4 <i>cun</i> lateral to the ventral midline in the center of the nipple.
ST18 (Rugen):	In the fifth intercostal space, caudal to the lower edge of the chest, 4 <i>cun</i> lateral to the ventral midline.
ST19 (Burong):	6 <i>cun</i> superior to the umbilicus, 2 <i>cun</i> lateral to the ventral midline.
ST20 (Chengman):	5 <i>cun</i> superior to the umbilicus, 2 <i>cun</i> lateral to the ventral midline.
ST21 (Liangmen):	4 <i>cun</i> superior to the umbilicus, 2 <i>cun</i> lateral to the ventral midline.
ST22 (Guanmen):	3 <i>cun</i> superior to the umbilicus, 2 <i>cun</i> lateral to the ventral midline.
ST23 (Taiyi):	2 <i>cun</i> superior to the umbilicus, 2 <i>cun</i> lateral to the ventral midline.
ST24 (Huaroumen):	1 <i>cun</i> superior to the umbilicus, 2 <i>cun</i> lateral to the ventral midline.
ST25 (Tianshu):	2 <i>cun</i> lateral to the umbilicus.
ST26 (Wailing):	1 <i>cun</i> inferior to the umbilicus, 2 <i>cun</i> lateral to the ventral midline.
ST27 (Daju):	2 <i>cun</i> inferior to the umbilicus, 2 <i>cun</i> lateral to the ventral midline.
ST28 (Shuidao):	3 <i>cun</i> inferior to the umbilicus, 2 <i>cun</i> lateral to the ventral midline.
ST29 (Guilai):	4 <i>cun</i> inferior to the umbilicus, 2 <i>cun</i> lateral to the ventral midline.
ST30 (Qichong):	5 <i>cun</i> inferior to the umbilicus, 2 <i>cun</i> lateral to the ventral midline, immediately above the groin.

ST31 (Biguan):	At the level of the inferior gluteal fold, on the connecting line between the anterior superior iliac spine and the superior lateral corner of the patella, opposite BL36.
ST32 (Futu):	On the connecting line between the anterior superior iliac spine and the superior lateral corner of the patella, at 6 <i>cun</i> proximal to this corner.
ST33 (Yinshi):	On the connecting line between the anterior superior iliac spine and the superior lateral corner of the patella, at 3 <i>cun</i> proximal to this corner.
ST34 (Liangqiu):	With the knee flexed, on the connecting line between the anterior superior iliac spine and the superior lateral corner of the patella, at 2 <i>cun</i> proximal to this corner.
ST35 (Dubi):	With the knee flexed, in the depression on the lower edge of the patella, lateral to the patellar ligament.
ST36 (Zusanli):	3 <i>cun</i> inferior to ST35, one middle fingerbreadth lateral to the anterior crest of the tibia, at the level of the distal edge of the tuberosity of the tibia.
ST37 (Shangjuxu):	6 <i>cun</i> inferior to ST35, one middle fingerbreadth lateral to the anterior crest of the tibia.
ST38 (Tiaokou):	8 <i>cun</i> inferior to ST35, one middle fingerbreadth lateral to the anterior crest of the tibia.
ST39 (Xiajuxu):	9 <i>cun</i> inferior to ST35, one middle fingerbreadth lateral to the anterior crest of the tibia.
ST40 (Fenglong):	8 <i>cun</i> proximal to the prominence of the lateral malleolus, at the level of ST38, 2 middle fingerbreadths (1.5 <i>cun</i>) lateral to the anterior crest of the tibia.
ST41 (Jiexi):	In the depression of the center of the ventral fold of the upper ankle joint, between the tendons of the extensor hallucis longus and digitorum longus muscles.
ST42 (Chongyang):	On the highest point of the foot dorsum, between the tendons of the extensor hallucis longus and digitorum longus muscles.
ST43 (Xianggu):	In the depression of the proximal corner of the second metatarsalphalangeal joint, between the second and third metatarsal bones.
ST44 (Neiting):	At the edge of the interdigital skin, between the second and third toes, at the dividing line between red and white flesh.
ST45 (Lidui):	0.1 <i>cun</i> proximal to the lateral border and base of the nail of the second toe.

(4) The Spleen Meridian of Foot-Taiyin (SP)

SP1 (Yinbai):	0.1 <i>cun</i> proximal to the corner of the nail of the big toe.
SP2 (Dadu):	In the depression distal and inferior to the first metatarsalphalangeal joint, at the dividing point between red and white flesh.
SP3 (Taibai):	In the depression proximal and inferior to the first metatarsalphalangeal joint,

	at the dividing point between red and white flesh.
SP4 (Gongsun):	In the depression distal and inferior to the basis of the first metatarsal bone, at the dividing point between red and white flesh.
SP5 (Shangqiu):	In the depression ventral and distal to the medial malleolus, in the middle between the tuberosity of the navicular and the prominence of the medial malleolus.
SP6 (Sanyinjiao):	3 <i>cun</i> proximal to the prominence of the medial malleolus, dorsal to the medial crest of the tibia.
SP7 (Lougou):	6 <i>cun</i> proximal to the prominence of the medial malleolus, dorsal to the medial crest of the tibia.
SP8 (Diji):	3 <i>cun</i> inferior to SP9, on the connection line between the prominence of the medial malleolus and SP9.
SP9 (Yinlingquan):	In the depression distal and dorsal to the medial condyle of the tibia.
SP10 (Xuehai):	With the knee flexed, 2 <i>cun</i> proximal to the medial superior border of the patella on the bulge of the vastus medialis muscle.
SP11 (Jimen):	6 <i>cun</i> proximal to SP10 on the connecting line between SP10 and SP12.
SP12 (Chongmen):	On the lateral end of the groin, 3.5 <i>cun</i> lateral to the central point of the upper edge of the symphysis, lateral to the iliaca externa artery.
SP13 (Fushe):	0.7 <i>cun</i> superior and lateral to SP12, 4 <i>cun</i> lateral to the ventral midline and inferior to the umbilical center.
SP14 (Fujie):	1.3 <i>cun</i> inferior to SP15, 4 <i>cun</i> lateral to the ventral midline.
SP15 (Daheng):	4 <i>cun</i> lateral to the center of the umbilicus.
SP16 (Fuai):	3 <i>cun</i> superior to the center of the umbilicus, 4 <i>cun</i> lateral to the ventral midline.
SP17 (Shidou):	6 <i>cun</i> lateral to the ventral midline, in the fifth intercostal space.
SP18 (Tianxi):	6 <i>cun</i> lateral to the ventral midline, in the fourth intercostal space.
SP19 (Xiongxiang):	6 <i>cun</i> lateral to the ventral midline, in the third intercostal space.
SP20 (Zhourong):	6 <i>cun</i> lateral to the ventral midline, in the second intercostal space.
SP21 (Dabao):	At the midaxillary line, in the sixth intercostal space.

(5) The Heart Meridian of Hand-Shaoyin (HT)

HT1 (Jiquan):	At the tip of the axilla superior to the palpable axillaries artery.
HT2 (Qingling):	3 <i>cun</i> proximal to the cubital crease on the medial side of the upper arm, on the connecting line between HT1 and HT3.
HT3 (Shaohai):	With the elbow flexed, at the midway between the medial end of the cubital crease and the medial epicondyle of the humerus.
HT4 (Lingdao):	1.5 <i>cun</i> proximal to the distal wrist crease, on the radial side of the tendon of flexor carpi ulnaris.
HT5 (Tongli):	1 <i>cun</i> proximal to the distal wrist crease, on the radial side of the tendon of

flexor carpi ulnaris.

- HT6 (Yinxi): 0.5 *cun* proximal to the distal wrist crease, on the radial side of the tendon of flexor carpi ulnaris.
- HT7 (Shenmen): At the ulnar end of the distal wrist crease, in the depression between the radial side of the tendon of flexor carpi ulnaris, at the proximal border of the pisiform bone.
- HT8 (Shaofu): On the palm between the fourth and the fifth metacarpal bones, where the tip of the little finger lies when a fist is clenched.
- HT9 (Shaochong): 0.1 *cun* proximal and lateral to the radial corner of the nail of the little finger.

(6) The Small Intestine Meridian of Hand-Taiyang (SI)

- SI1 (Shaoze): 0.1 *cun* proximal and lateral to the ulnar corner of the nail of the little finger.
- SI2 (Qianggu): With the fist loosely clenched, at the ulnar end of the distal crease of the fifth metacarpophalangeal joint, on the dividing line between red and white flesh.
- SI3 (Houxi): With the fist loosely clenched, at the ulnar end of the proximal crease of the fifth metacarpophalangeal joint, on the dividing line between red and white flesh.
- SI4 (Wangu): In the depression between the base of the fifth metacarpal bone and the triquetral bone, on the dividing line between red and white flesh.
- SI5 (Yanggu): In the depression distal to the styloid process of the ulna, at the level of the ulnar end of the distal wrist crease.
- SI6 (Yanglao): With the palm placed on the chest, on the outer aspect of the lower arm, in the depression proximal and radial to the styloid process of the ulna.
- SI7 (Zhizheng): On the outside aspect of the lower arm, 5 *cun* proximal to the dorsal wrist crease, on the connecting line between SI5 and SI8 (the distance is 12 *cun*).
- SI8 (Xiaohai): In the depression between the olecranon process and the epicondyle of the humerus.
- SI9 (Jianzhen): With the arm in adducted position, 1 *cun* superior to the dorsal end of the axillary crease.
- SI10 (Naoshu): With the arm in adducted position, superior to the dorsal end of the axillary crease in the depression inferior to the inferior edge of the scapular spine.
- SI11 (Tianzong): In the center of the fossa infraspinata, at the dividing line from the upper to middle third of the connecting line, between the lower border of the scapular spine and the inferior angle of the scapula.
- SI12 (Bingfeng): Superior to SI11, in the depression in the midpoint of the fossa supraspinata.
- SI13 (Quyuan): At the medial side of the fossa supraspinata, at the midpoint between SI10 and the spinous process T2.
- SI14 (Jianwaishu): At the level of the depression inferior to the spinous process T1, 3 *cun* lateral to

- the dorsal midline.
- SI15 (Jianzhongshu): At the level of the depression inferior to the spinous process C7, 2 *cun* lateral to the dorsal midline.
- SI16 (Tianchuang): On the posterior border of the sternocleidomastoid muscle lateral to the laryngeal prominence, dorsal to LI18.
- SI17 (Tianrong): Dorsal to the angle of the jaw, in the depression at the anterior border of the sternocleidomastoid muscle.
- SI18 (Quanliao): Directly below the outer canthus in the depression inferior to the zygomatic bone.
- SI19 (Tinggong): With the mouth slightly opened, in the depression ventral to the tragus and dorsal to the caput manibulae.

(7) The Bladder Meridian of Foot-Taiyang (BL)

- BL1 (Jingming): In the depression 0.1 *cun* medial and superior to the inner canthus of the eye.
- BL2 (Zanzhu): In the depression at the medial end of the eyebrow in the incisura frontalis.
- BL3 (Meichong): Directly superior to BL2, 0.5 *cun* within the ideal anterior hairline.
- BL4 (Qucha): 0.5 *cun* within the ideal anterior hairline, 1.5 *cun* lateral to the midline, at the crossing from the medial to the central third of the connecting line, between GV24 and ST8.
- BL5 (Wuchu): 1 *cun* within the ideal anterior hairline, 1.5 *cun* lateral to the midline.
- BL6 (Chengguang): 2.5 *cun* within the ideal anterior hairline, 1.5 *cun* lateral to the midline.
- BL7 (Tongtian): 4 *cun* within the ideal anterior hairline, 1.5 *cun* lateral to the midline.
- BL8 (Luoque): 5.5 *cun* within the ideal anterior hairline, 1.5 *cun* lateral to the midline.
- BL9 (Yuzhen): 2.5 *cun* within the ideal anterior hairline, at the level of the upper ridge of the external occipital protuberance, 1.3 *cun* lateral to the midline.
- BL10 (Tianzhu): 0.5 *cun* within the ideal anterior hairline, 1.3 *cun* lateral to the midline in the depression at the lateral edge of the trapezius muscle.
- BL11 (Dazhu): At the level of the depression inferior to the spinous process T1, 1.5 *cun* lateral to the dorsal midline (the distance from the midline to the medial border of the scapula is 3 *cun*).
- BL12 (Fengmen): At the level of the depression inferior to the spinous process T2, 1.5 *cun* lateral to the dorsal midline.
- BL13 (Feishu): At the level of the depression inferior to the spinous process T3, 1.5 *cun* lateral to the dorsal midline.
- BL14 (Jueyinshu): At the level of the depression inferior to the spinous process T4, 1.5 *cun* lateral to the dorsal midline.
- BL15 (Xinshu): At the level of the depression inferior to the spinous process T5, 1.5 *cun* lateral to the dorsal midline.

BL16 (Dushu):	At the level of the depression inferior to the spinous process T6, 1.5 <i>cun</i> lateral to the dorsal midline.
BL17 (Geshu):	At the level of the depression inferior to the spinous process T7, 1.5 <i>cun</i> lateral to the dorsal midline.
BL18 (Ganshu):	At the level of the depression inferior to the spinous process T9, 1.5 <i>cun</i> lateral to the dorsal midline.
BL19 (Danshu):	At the level of the depression inferior to the spinous process T10, 1.5 <i>cun</i> lateral to the dorsal midline.
BL20 (Pishu):	At the level of the depression inferior to the spinous process T11, 1.5 <i>cun</i> lateral to the dorsal midline.
BL21 (Weishu):	At the level of the depression inferior to the spinous process T12, 1.5 <i>cun</i> lateral to the dorsal midline.
BL22 (Sanjiaoshu):	At the level of the depression inferior to the spinous process L1, 1.5 <i>cun</i> lateral to the dorsal midline.
BL23 (Shenshu):	At the level of the depression inferior to the spinous process L2, 1.5 <i>cun</i> lateral to the dorsal midline.
BL24 (Qihaihu):	At the level of the depression inferior to the spinous process L3, 1.5 <i>cun</i> lateral to the dorsal midline.
BL25 (Dachangshu):	At the level of the depression inferior to the spinous process L4, 1.5 <i>cun</i> lateral to the dorsal midline.
BL26 (Guanyuanshu):	At the level of the depression inferior to the spinous process L5, 1.5 <i>cun</i> lateral to the dorsal midline.
BL27 (Xiaochangshu):	At the level of the first dorsal sacral foramen, 1.5 <i>cun</i> lateral to the dorsal midline.
BL28 (Pangguangshu):	At the level of the second dorsal sacral foramen, 1.5 <i>cun</i> lateral to the dorsal midline.
BL29 (Zhonglushu):	At the level of the third dorsal sacral foramen, 1.5 <i>cun</i> lateral to the dorsal midline.
BL30 (Baihuanshu):	At the level of the fourth dorsal sacral foramen, 1.5 <i>cun</i> lateral to the dorsal midline.
BL31 (Shangliao):	At the midpoint between the posterior superior iliac spine and the dorsal midline in the first dorsal sacral foramen.
BL32 (Ciliao):	Medial and inferior to the posterior superior iliac spine in the second dorsal sacral foramen.
BL33 (Zhongliao):	Medial and inferior to BL32, in the third dorsal sacral foramen.
BL34 (Xialiao):	Medial and inferior to BL33, in the fourth dorsal sacral foramen.
BL35 (Huiyang):	0.5 <i>cun</i> lateral to the tip of the coccyx.
BL36 (Chengfu):	In the center of the inferior gluteal crease.
BL37 (Yinmen):	6 <i>cun</i> distal to BL36, on the connecting line between BL36 and BL40, about 8 <i>cun</i> proximal to BL39.

BL38 (Fuxi):	1 <i>cun</i> proximal to BL39, on the medial side of the tendon of the biceps femoris muscle.
BL39 (Weiyang):	At the lateral end of the popliteal crease, on the medial side of the biceps femoris muscle.
BL40 (Weizhong):	In the middle of the popliteal crease.
BL41 (Fufen):	At the level of the depression inferior to the spinous process T2, 3 <i>cun</i> lateral to the dorsal midline at the level of BL12.
BL42 (Pohu):	At the level of the depression inferior to the spinous process T3, 3 <i>cun</i> lateral to the dorsal midline.
BL43 (Gaohuangshu):	At the level of the depression inferior to the spinous process T4, 3 <i>cun</i> lateral to the dorsal midline.
BL44 (Shentang):	At the level of the depression inferior to the spinous process T5, 3 <i>cun</i> lateral to the dorsal midline.
BL45 (Yixi):	At the level of the depression inferior to the spinous process T6, 3 <i>cun</i> lateral to the dorsal midline.
BL46 (Geguan):	At the level of the depression inferior to the spinous process T7, 3 <i>cun</i> lateral to the dorsal midline.
BL47 (Hunmen):	At the level of the depression inferior to the spinous process T9, 3 <i>cun</i> lateral to the dorsal midline.
BL48 (Yanggang):	At the level of the depression inferior to the spinous process T10, 3 <i>cun</i> lateral to the dorsal midline.
BL49 (Yishe):	At the level of the depression inferior to the spinous process T11, 3 <i>cun</i> lateral to the dorsal midline.
BL50 (Weicang):	At the level of the depression inferior to the spinous process T12, 3 <i>cun</i> lateral to the dorsal midline.
BL51 (Huangmen):	At the level of the depression inferior to the spinous process L1, 3 <i>cun</i> lateral to the dorsal midline.
BL52 (Zhishi):	At the level of the depression inferior to the spinous process L2, 3 <i>cun</i> lateral to the dorsal midline.
BL53 (Baohuang):	At the level of the second sacral foramen, 3 <i>cun</i> lateral to the dorsal midline (at the same level as BL28 and BL32).
BL54 (Zhibian):	At the level of the fourth sacral foramen, 3 <i>cun</i> lateral to the dorsal midline.
BL55 (Heyang):	2 <i>cun</i> distal to BL40 on the connecting line between BL40 and BL57 (the distance is 16 <i>cun</i>).
BL56 (Chengjin):	5 <i>cun</i> distal to BL40 at the center of the belly of the gastrocnemius muscle on the connecting line between BL40 and BL57.
BL57 (Chengshan):	At the tip of the depression formed between the twin bellies of the gastrocnemius muscle, in the center between BL40 and BL60.
BL58 (Feiyang):	7 <i>cun</i> proximal to BL60, 1 <i>cun</i> lateral and distal to BL57, between the gastrocnemius

	muscle and the soleus muscle.
BL59 (Fuyang):	3 <i>cun</i> directly proximal to BL60.
BL60 (Kunlun):	At the midpoint between the prominence of the lateral malleolus and the Achilles tendon.
BL61 (Pucan):	Dorsal and distal to the lateral malleolus, distal to BL60 on the side of the calcaneus, between red and white flesh.
BL62 (Shenmai):	In the depression distal to the lateral malleolus.
BL63 (Jinmen):	Distal to the anterior border of the lateral malleolus, distal to the cuboid bone.
BL64 (Jinggu):	Inferior to the tuberosity of the fifth metatarsal bone, at the dividing line between the red and white flesh.
BL65 (Shugu):	Proximal to the fifth metatarsophalangeal joint, at the dividing line between the red and white flesh.
BL66 (Zutonggu):	Inferior to the fifth metatarsophalangeal joint, at the dividing line between the red and white flesh.
BL67 (Zhiyin):	0.1 <i>cun</i> proximal and lateral to the lateral border and base of the nail of the little toe.

(8) The Kidney Meridian of Foot-Shaoyin (KI)

KI1 (Yongquan):	With the foot plantar flexed, in the depression formed in the anterior part of the sole, approximately one third of the distance from the anterior and posterior aspect of the sole.
KI2 (Rangu):	On the medial side of the foot plantar to the navicular tuberosity, on the dividing line between red and white flesh.
KI3 (Taixi):	In the depression between the prominence of the medial malleolus and the Achilles tendon.
KI4 (Dazhong):	0.5 <i>cun</i> distal and dorsal to KI3, on the medial side of the Achilles tendon.
KI5 (Shuiquan):	Distal and dorsal to the medial malleolus, 1 <i>cun</i> inferior to KI3, in the depression medial to the calcaneal tuberosity.
KI6 (Zhaohai):	In the depression directly inferior to the medial malleolus.
KI7 (Fuliu):	2 <i>cun</i> proximal to KI3, ventral to the Achilles tendon.
KI8 (Jiaoxin):	2 <i>cun</i> proximal to KI3, 0.5 <i>cun</i> ventral to KI7, at the posterior border of the tibia.
KI9 (Zhubin):	5 <i>cun</i> proximal to KI3, on the connecting line between KI3 and KI10.
KI10 (Yingu):	With the knee flexed, in the medial part of the popliteal fossa between the tendons of the semitendinosus muscle and the semimembranosus muscle.
KI11 (Henggu):	5 <i>cun</i> inferior to the umbilicus, 0.5 <i>cun</i> lateral to the ventral midline, on the superior border of the symphysis pubis.
KI12 (Dahe):	4 <i>cun</i> inferior to the umbilicus, 0.5 <i>cun</i> lateral to the ventral midline.
KI13 (Qixue):	3 <i>cun</i> inferior to the umbilicus, 0.5 <i>cun</i> lateral to the ventral midline.

KI14 (Siman):	2 <i>cun</i> inferior to the umbilicus, 0.5 <i>cun</i> lateral to the ventral midline.
KI15 (Zhongzhu):	1 <i>cun</i> inferior to the umbilicus, 0.5 <i>cun</i> lateral to the ventral midline.
KI16 (Huangshu):	0.5 <i>cun</i> lateral to the umbilicus.
KI17 (Shangqu):	2 <i>cun</i> superior to the umbilicus, 0.5 <i>cun</i> lateral to the ventral midline.
KI18 (Shiguan):	3 <i>cun</i> superior to the umbilicus, 0.5 <i>cun</i> lateral to the ventral midline.
KI19 (Yindu):	4 <i>cun</i> superior to the umbilicus, 0.5 <i>cun</i> lateral to the ventral midline.
KI20 (Futonggu):	5 <i>cun</i> superior to the umbilicus, 0.5 <i>cun</i> lateral to the ventral midline.
KI21 (Youmen):	6 <i>cun</i> superior to the umbilicus, 0.5 <i>cun</i> lateral to the ventral midline.
KI22 (Bulang):	2 <i>cun</i> lateral to the ventral midline, in the fifth intercostal space.
KI23 (Shenfeng):	2 <i>cun</i> lateral to the ventral midline, in the fourth intercostal space.
KI24 (Lingxu):	2 <i>cun</i> lateral to the ventral midline, in the third intercostal space.
KI25 (Shencang):	2 <i>cun</i> lateral to the ventral midline, in the second intercostal space.
KI26 (Yuzhong):	2 <i>cun</i> lateral to the ventral midline, in the first intercostal space.
KI27 (Shufu):	2 <i>cun</i> lateral to the ventral midline, on the inferior border of the clavicle.

(9) The Pericardium Meridian of Hand-Jueyin (PC)

PC1 (Tianchi):	1 <i>cun</i> lateral to the nipple, in the fourth intercostal space, 5 <i>cun</i> lateral to the ventral midline.
PC2 (Tianquan):	On the inside of the arm, 2 <i>cun</i> lateral to the ventral end of the axillary fold, between the long and short heads of the biceps brachii muscle.
PC3 (Quze):	At the midpoint of the cubital crease, ulnar to the biceps brachii muscle.
PC4 (Ximen):	On the inside of the arm, 5 <i>cun</i> proximal to the distal wrist crease, on the connecting line between PC3 and PC7 (the distance is 12 <i>cun</i>) between the palmaris longus and flexor carpi radialis tendons.
PC5 (Jianshi):	3 <i>cun</i> proximal to the distal wrist crease, on the connecting line between the palmaris longus and flexor carpi radialis tendons.
PC6 (Neiguan):	2 <i>cun</i> proximal to the distal wrist crease, on the connecting line between PC3 and PC7, between palmaris longus and flexor carpi radialis tendons.
PC7 (Daling):	In the middle of the distal wrist crease, between the palmaris longus and flexor carpi radialis tendons.
PC8 (Laogong):	On the point of the palm of the hand, between the second and third metacarpal bones, where the middle finger rests when the hand is closed into a fist.
PC9 (Zhongchong):	In the middle of the tip of the middle finger.

(10) The Triple Energizer Meridian of Hand-Shaoyang (TE)

TE1 (Guanchong):	0.1 <i>cun</i> proximal and lateral to the base and corner of the nail of the ring finger.
TE2 (Yemen):	Distal to the fourth metacarpophalangeal joint, at the border of the skin between

	the ring and little finger, at the dividing line between red and white flesh.
TE3 (Zhongzhu):	On the dorsum of the hand proximal to the fourth metacarpophalangeal joint at the angle between the heads of the fourth and fifth metacarpal bones.
TE4 (Yangchi):	In the center of the dorsum, at the wrist joint, in the depression inferior to the tendon of the extensor digitorum communis.
TE5 (Waiguan):	2 <i>cun</i> proximal to the dorsal wrist crease between the ulna and radius.
TE6 (Zhigou):	3 <i>cun</i> proximal to the dorsal wrist crease, between the ulna and radius, on the connecting line between TE4 and the olecranon.
TE7 (Huizong):	3 <i>cun</i> proximal to the dorsal wrist crease, ulnar to TE6, on the radial edge of the ulna.
TE8 (Sanyangluo):	4 <i>cun</i> proximal to the dorsal wrist crease, between the radius and ulna, on the connecting line between TE4 and the olecranon.
TE9 (Sidu):	5 <i>cun</i> distal to the tip of the olecranon, between the radius and ulna, on the connecting line between TE4 and the olecranon.
TE10 (Tianjing):	With the elbow flexed, in the depression 1 <i>cun</i> proximal to the tip of the olecranon.
TE11 (Qinglengyuan):	With the elbow flexed, 2 <i>cun</i> proximal to the tip of the olecranon, 1 <i>cun</i> proximal to TE10.
TE12 (Xiaoluo):	At the midpoint between TE11 and TE13, on the connecting line between the tip of the olecranon and TE14.
TE13 (Naohui):	3 <i>cun</i> distal to TE14, on the connecting line between TE14 and the tip of the olecranon, on the posterior border of the deltoid muscle.
TE14 (Jianliao):	With the arm abducted, in the depression dorsal and distal to the acromion dorsal to LI15.
TE15 (Tianliao):	At the midpoint between GB21 and SI13, at the superior corner of the scapula.
TE16 (Tianyou):	On the posterior border of the sternocleidomastoid muscle, caudal to the posterior border of the mastoid process, at the level of the corner of the jaw.
TE17 (Yifeng):	Dorsal to the earlobe, in the depression between the mastoid process and the lower jaw.
TE18 (Chimai):	In the center of the mastoid process, at the line between the lower and middle third of the connecting line, between TE17 and TE20, alongside the helix rim.
TE19 (Luxi):	At the line between the middle and upper third of the connecting line, between TE17 and TE20.
TE20 (Jiaosun):	Directly above the auricular apex, on the hairline.
TE21 (Ermen):	Ventral to the supratragic notch, in the depression dorsal and cranial to the condyloid process of the mandible.
TE22 (Erheliao):	On the posterior border where the temple meets the hairline, ventral to the anterior border of the root of the ear muscle, dorsal to the temporalis artery.
TE23 (Sizhukong):	In the depression at the lateral end of the eyebrow, near the bony limit of

the orbit.

(11) The Gallbladder Meridian of Foot-Shaoyang (GB)

GB1 (Tongziliao):	0.5 <i>cun</i> lateral to the outer canthus of the eye, in the depression at the lateral end of the orbit.
GB2 (Tinghui):	With the mouth open, in front of the intertragic notch, in the depression inferior to the condyloid process of the mandible.
GB3 (Shangguan):	Directly above ST7, in the depression at the superior border of the zygomatic arch.
GB4 (Hanyan):	In the temporal region within the hairline, at the dividing line between the upper and second quarter of the shortened connecting line between ST8 and GB7.
GB5 (Xuanlu):	In the temporal region within the hairline, in the middle of the shortened connecting line between ST8 and GB7.
GB6 (Xuanli):	In the temporal region within the hairline, at the dividing line between the lower and next quarter of the shortened connecting line between ST8 and GB7.
GB7 (Qubin):	At the point of intersection of one horizontal through the auricular apex with a vertical alongside the dorsal hairline of the ear.
GB8 (Shuaigu):	Directly above the auricular apex and TE20, and 1.5 <i>cun</i> within the ideal hairline.
GB9 (Tianchong):	Directly above the posterior border of the root of the ear muscle, 2 <i>cun</i> within the hairline, 0.5 <i>cun</i> dorsal to GB8.
GB10 (Fubai):	Dorso-cranial to the mastoid process, at the dividing line between the middle to the upper third of the shortened connecting line between GB9 and GB12.
GB11 (Touqiaoyin):	Dorso-cranial to the mastoid process, at the dividing line between the middle to the lower third of the shortened connecting line between GB9 and GB12.
GB12 (Wangu):	In the depression dorso-cranial to the mastoid process.
GB13 (Benshen):	0.5 <i>cun</i> within the ideal anterior hairline, 3 <i>cun</i> lateral to the midline, at the dividing line between the middle and lateral third of the connecting line between GV24 and ST8.
GB14 (Yangbai):	Directly above the pupil, 1 <i>cun</i> above the eyebrow.
GB15 (Toulinqi):	Directly above the pupil, 0.5 <i>cun</i> within the ideal anterior hairline, in the middle between GV24 and ST8.
GB16 (Muchuang):	1.5 <i>cun</i> within the ideal anterior hairline, 2.25 <i>cun</i> lateral to the midline, on the connecting line between GB15 and GB20.
GB17 (Zhengying):	2.5 <i>cun</i> within the ideal anterior hairline, 2.25 <i>cun</i> lateral to the midline, on the connecting line between GB15 and GB20.
GB18 (Chengling):	4 <i>cun</i> within the ideal anterior hairline, 2.25 <i>cun</i> lateral to the midline, on the

- connecting line between GB15 and GB20.
- GB19 (Naokong): At the level of the superior border of the external occipital protuberance, 2.25 *cun* lateral to the midline.
- GB20 (Fengchi): Below the occipital bone at the level of GV16, in the depression between the start of the sternocleidomastoid process and the trapezius muscle.
- GB21 (Jianjing): At the midpoint between the depression inferior to the spinous process C7 (GV14) and the acromion.
- GB22 (Yuanye): With the arm lifted, in the midaxillary line, 3 *cun* inferior to the axilla in the fourth intercostal space.
- GB23 (Zhejin): 1 *cun* ventral to GB22, in the fourth intercostal space, at the level of the nipple.
- GB24 (Riyue): Directly below the nipple, in the seventh intercostals space, 4 *cun* lateral to the ventral midline.
- GB25 (Jingmen): On the inferior border of the free end of the twelfth rib, 1.8 *cun* dorso-caudal to LR13.
- GB26 (Daimai): At the point of intersection of one vertical through the free end of the eleventh rib, and one horizontal through the umbilicus, 1.8 *cun* ventro-caudal to LR13.
- GB27 (Wushu): At the level 3 *cun* caudal to the umbilicus, 0.5 *cun* ventral to the anterior superior iliac spine.
- GB28 (Weidao): Ventro-caudal to the anterior superior iliac spine, 0.5 *cun* ventro-caudal to GB27.
- GB29 (Juliao): At the midpoint between the antero-superior iliac spine and the highest point of the major femur trochanter.
- GB30 (Huantiao): With the hip lifted, in the hip joint, at the dividing line between the middle and lateral third of the connecting line between the major femoral trochanter and the sacral hiatus.
- GB31 (Fengshi): On the lateral aspect of the upper leg, 7 *cun* proximal to the popliteal crease, with a standing posture, the tip of the middle finger of a relaxed arm indicates the point (the distance from the tip of the major femoral trochanter to the middle of the knee is 19 *cun*).
- GB32 (Zhongdu): 5 *cun* proximal to the popliteal crease, between the vastus lateralis and the biceps femoris muscles.
- GB33 (Xiyangguan): 3 *cun* proximal to GB34, in the depression proximal to the lateral epicondyle of the femur.
- GB34 (Yanglingquan): In the depression ventral and distal to the head of the fibula.
- GB35 (Yangjiao): 7 *cun* proximal to the prominence of the lateral malleolus on the posterior border of the fibula at the level of GB36 (the distance from the lower border of the patella to the lateral malleolus is 16 *cun*).
- GB36 (Waiqiu): 7 *cun* proximal to the prominence of the lateral malleolus on the anterior border of the fibula at the level of GB35.
- GB37 (Guangming): 5 *cun* proximal to the maximum prominence of the lateral malleolus, on the

	anterior border of the fibula.
GB38 (Yangfu):	4 <i>cun</i> proximal to the maximum prominence of the lateral malleolus, on the anterior border of the fibula.
GB39 (Xuanzhong):	3 <i>cun</i> superior to lateral malleolus.
GB40 (Qixu):	Ventral and distal to the lateral malleolus, in the depression lateral to the tendon of the extensor digitorum longus.
GB41 (Zulinqi):	On the dorsum of the foot, in the proximal angle between the fourth and fifth metatarsal bones, in the depression lateral to the tendon of the extensor digiti minimi longus.
GB42 (Diwuhui):	On the dorsum of the foot, between the fourth and fifth metatarsal bones, proximal to the fourth metatarsophalangeal joint, in the depression medial to the tendon of the extensor digiti minimi longus.
GB43 (Xiayi):	Between the fourth and fifth metatarsophalangeal joints, on the border of the interdigital skin between the fourth and fifth toes, on the dividing line between red and white flesh.
GB44 (Zuqiaoyin):	1 <i>cun</i> proximal and lateral to the base and border of the nail of the fourth toe.

(12) The Liver Meridian of Foot-Jueyin (LR)

LR1 (Dadun):	0.1 <i>cun</i> proximal and lateral to the base and corner of the nail of the big toe.
LR2 (Xingjian):	Between the first and second metatarsophalangeal joints, on the border of the interdigital skin between the first and second toes, on the dividing line between red and white flesh.
LR3 (Taichong):	On the dorsum of the foot, in the depression distal to the proximal corner between the first and second metatarsal bones.
LR4 (Zhongfeng):	Ventral to the medial malleolus, on the connecting line between SP5 and ST41, in the depression medial to the anterior tibialis muscle.
LR5 (Ligou):	5 <i>cun</i> proximal to the greatest prominence of the medial malleolus in the center of the medial surface of the tibia.
LR6 (Zhongdu):	7 <i>cun</i> proximal to the greatest prominence of the medial malleolus in the center of the medial surface of the tibia.
LR7 (Xiguan):	Dorsal and distal to the medial condyle of the tibia, 1 <i>cun</i> dorsal to SP9.
LR8 (Ququan):	With the knee flexed, at the medial end of the popliteal crease, dorsal to the medial condyle of the tibia, in the depression at the anterior border of the onset of the semimembranosus and semitendinosus muscles.
LR9 (Yinbao):	4 <i>cun</i> proximal to the medial condyle of the tibia, between the vastus medialis and sartorius muscles.
LR10 (Zuwuli):	3 <i>cun</i> distal to the upper border of the pubic symphysis (ST30), at the edge of the adductor longus muscle.

- LR11 (Yinlian): 2 *cun* distal to the upper border of the pubic symphysis (ST30), at the edge of adductor longus muscle.
- LR12 (Jimai): Lateral to the symphysis, 2.5 *cun* lateral to the ventral midline, lateral and distal to ST30, in the groin superior to the palpable femoral artery.
- LR13 (Zhangmen): The inferior border of the free end of the eleventh rib.
- LR14 (Qimen): Below the nipple in the sixth intercostal space, 4 *cun* lateral to the ventral midline.

(13) The Governing Vessel (GV)

- GV1 (Changqiang): On the midline, in the center between the tip of the coccyx and the anus.
- GV2 (Yaoshu): On the dorsal midline directly in the sacral hiatus.
- GV3 (Yaoyangguan): On the dorsal midline, in the depression inferior to the spinous process L4.
- GV4 (Mingmen): On the dorsal midline, in the depression inferior to the spinous process L2.
- GV5 (Xuanshu): On the dorsal midline, in the depression inferior to the spinous process L1.
- GV6 (Jizhong): On the dorsal midline, in the depression inferior to the spinous process T11.
- GV7 (Zhongshu): On the dorsal midline, in the depression inferior to the spinous process T10.
- GV8 (Jinsuo): On the dorsal midline, in the depression inferior to the spinous process T9.
- GV9 (Zhiyang): On the dorsal midline, in the depression inferior to the spinous process T7.
- GV10 (Lingtai): On the dorsal midline, in the depression inferior to the spinous process T6.
- GV11 (Shendao): On the dorsal midline, in the depression inferior to the spinous process T5.
- GV12 (Shenzhu): On the dorsal midline, in the depression inferior to the spinous process T3.
- GV13 (Taodao): On the dorsal midline, in the depression inferior to the spinous process T1.
- GV14 (Dazhui): On the dorsal midline, in the depression inferior to the spinous process C7.
- GV15 (Yamen): On the dorsal midline, 0.5 *cun* cranial to the midpoint of the posterior hairline inferior to C1.
- GV16 (Fengfu): On the dorsal midline, 1 *cun* within the midpoint of the posterior hairline, inferior to the external occipital protuberance, in the gap between the right and left trapezius muscles.
- GV17 (Naohu): On the dorsal midline, 2.5 *cun* within the midpoint of the posterior hairline, 1.5 *cun* cranial to GV16, in the depression at the superior border of the external occipital protuberance.
- GV18 (Qiangjian): On the dorsal midline, 4 *cun* within the midpoint of the posterior hairline, 1.5 *cun* cranial to GV17.
- GV19 (Houding): On the dorsal midline, 5.5 *cun* within the midpoint of the posterior hairline, 3 *cun* cranial to GV17.
- GV20 (Baihui): On the dorsal midline, 5 *cun* within the midpoint of the ideal anterior hairline, at the midpoint between the two auricular apices.
- GV21 (Qianding): On the dorsal midline, 3.5 *cun* within the midpoint of the ideal anterior hairline,

	1.5 <i>cun</i> frontal to GV20.
GV22 (Xinhui):	On the midline, 2 <i>cun</i> within the midpoint of the ideal anterior hairline 3 <i>cun</i> frontal to GV20.
GV23 (Shangxing):	On the midline, 1 <i>cun</i> within the midpoint of the ideal anterior hairline.
GV24 (Shenting):	On the midline, 0.5 <i>cun</i> within the midpoint of the ideal anterior hairline.
GV25 (Suliao):	In the midpoint of the tip of the nose.
GV26 (Shuigou):	On the ventral midline, at the dividing line between the upper and middle thirds of the philtrum.
GV27 (Duiduan):	On the ventral midline, at the tuberculum of the upper lip, at the junction between the philtrum and the red of the lip.
GV28 (Yinjiao):	On the ventral midline, on the inside of the upper lip, at the junction between the frenum of the upper lip and the gum.

(14) The Conception Vessel (CV)

CV1 (Huiyin):	On the midline at the midpoint between the anus and the dorsal commissure of the major labia, or the posterior border of scrotum.
CV2 (Qugu):	On the ventral midline, 5 <i>cun</i> inferior to the umbilicus, at the midpoint of the superior border of the pubic symphysis.
CV3 (Zhongji):	On the ventral midline, 4 <i>cun</i> inferior to the umbilicus, 1 <i>cun</i> superior to CV2.
CV4 (Guanyuan):	On the ventral midline, 3 <i>cun</i> inferior to the umbilicus, 2 <i>cun</i> superior to CV2.
CV5 (Shimen):	On the ventral midline, 2 <i>cun</i> inferior to the umbilicus, 3 <i>cun</i> superior to CV2.
CV6 (Qihai):	On the ventral midline, 1.5 <i>cun</i> inferior to the umbilicus.
CV7 (Yinjiao):	On the ventral midline, 1 <i>cun</i> inferior to the umbilicus.
CV8 (Shenque):	In the center of the umbilicus.
CV9 (Shuifen):	On the ventral midline, 1 <i>cun</i> superior to the umbilicus.
CV10 (Xiawan):	On the ventral midline, 2 <i>cun</i> superior to the umbilicus.
CV11 (Jianli):	On the ventral midline, 3 <i>cun</i> superior to the umbilicus.
CV12 (Zhongwan):	On the ventral midline, 4 <i>cun</i> superior to the umbilicus.
CV13 (Shangwan):	On the ventral midline, 5 <i>cun</i> superior to the umbilicus.
CV14 (Juque):	On the ventral midline, 6 <i>cun</i> superior to the umbilicus.
CV15 (Jiuwei):	On the ventral midline, 7 <i>cun</i> superior to the umbilicus, 1 <i>cun</i> inferior to the xiphoid process.
CV16 (Zhongting):	On the ventral midline, at the midpoint of the xiphsternal joint.
CV17 (Tanzhong):	On the ventral midline, at the level of the fourth intercostal space, at the midpoint between the nipples.
CV18 (Yutang):	On the ventral midline, at the level of the third intercostal space.
CV19 (Zigong):	On the ventral midline, at the level of the second intercostal space.
CV20 (Huagai):	On the ventral midline, at the level of the first intercostal space, at the

	midpoint of the manubriosternal synchondrosis (angulus sterni).
CV21 (Xuanji):	On the ventral midline, 1 <i>cun</i> inferior to CV22, at the midpoint of the sternal manubrium.
CV22 (Tiantu):	In the middle of the suprasternal fossa.
CV23 (Lianquan):	On the ventral midline, in the depression superior to the hyoid bone.
CV24 (Chengjiang):	On the ventral midline, in the middle of the mentolabial groove.

(15) Extraordinary Points (EX)

The numbering of extraordinary points (EX) in this book is done by the authors. Most of the novel points are listed on the references^[73, 83, 84], the remaining are experienced points by Master Jiao (**) and by the authors (***).

Head and neck

Top of the head

EX1 (Sishencong):	1 <i>cun</i> anterior, posterior, and lateral to GV20. There are total 4 points at the vertex of the scalp.
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The region of the inner margin of the orbit and surrounding the orbit

EX2 (Yintang):	On the ventral midline, between the eyebrows.
EX3 (Ezhong):	1.5 <i>cun</i> superior to EX2.
EX4 (Taiyang):	1 <i>cun</i> behind the lateral end of the eyebrow and the outer canthus.
EX5 (Waijingming):	0.1 <i>cun</i> lateral and superior to BL1.
EX6 (Shangjingming):	0.2 <i>cun</i> superior to BL1.
EX7 (Xiajingming):	0.1 <i>cun</i> inferior to the inner canthus.
EX8 (Jingguang):	0.3 <i>cun</i> superior to BL1.
EX9 (Waiming):	0.3 <i>cun</i> superior to the external canthus.
EX10 (Xiaoqingming):	At the external canthus.
EX11 (Xiaqingming):	At the junction of lateral 1/4 and medial 3/4 of the superior border of orbit.
EX12 (Xinzanzhu):	0.7 <i>cun</i> lateral and superior to BL1.
EX13 (Dongming1):	0.4 <i>cun</i> lateral and superior to BL1.
EX14 (Dongming2):	At the midpoint between EX13 and EX15.
EX15 (Dongming3):	At the midpoint of the superior border of orbit.
EX16 (Dongming4):	0.4 <i>cun</i> lateral to EX15.
EX17 (Dongming5):	0.15 <i>cun</i> superior to the external canthus.
EX18 (Dongming6):	At the inner canthus, the midway between the upper and lower openings of the lachrymal gland.

EX19 (Zengming1):	0.2 <i>cun</i> medial to EX15.
EX20 (Zengming2):	0.2 <i>cun</i> lateral to EX15.
EX21 (Jingxia):	0.5 <i>cun</i> inferior and lateral to the inner canthus.
EX22 (Daiming):	At the midpoint between ST1 and the point that is 0.2 <i>cun</i> inferior to BL1.
EX23 (Jianming):	0.4 <i>cun</i> inferior and slightly lateral to BL1.
EX24 (Jianming1):	At the midpoint between ST1 and EX23.
EX25 (Jianming2):	At the midpoint between ST1 and EX28.
EX26 (Jianming3):	At the junction of lateral 1/8 and medial 7/8 of the inferior border of orbit.
EX27 (Jianming4):	0.5 <i>cun</i> superior to BL1.
EX28 (Qiuhou):	At the intersection of the lateral to the next quarter of the inferior border of the orbit.
EX29 (Yueliang):	At the intersection of the lateral to the 1/3 of the inferior border of the orbit.
EX30 (Kuangshang):	At the supreorbital foramen.
EX31 (Yuyao):	Staring straight ahead, directly above the pupil, in the eyebrow.
EX32 (Yuwei):	0.3 <i>cun</i> lateral to the midpoint between the lateral end of eyebrow and the external canthus.
EX33 (Yushang):	0.5 <i>cun</i> inferior to GB14.
EX34 (Yangbaineiyicun):	1 <i>cun</i> medial to GB14.
EX35 (Xinming2):	1 <i>cun</i> superior to lateral end of eyebrow.
EX36 (Meishao):	0.33 <i>cun</i> superior and 0.1 <i>cun</i> lateral to the lateral end of eyebrow.

The region surrounding the ear

EX37 (Tingxue):	At the midpoint between SI19 and GB2.
EX38 (Tingling):	At the junction of upper 1/4 and lower 3/4 of the line between SI19 and GB2.
EX39 (Tingling1):	2 mm posterior to EX37.
EX40 (Tingling2):	2 mm posterior to EX38.
EX41 (Tingcong):	2 mm inferior to GB2.
EX42 (Xiatinghui):	0.5 <i>cun</i> inferior to GB2.
EX43 (Zhilong3):	2 mm posterior to the midpoint between TE21 and SI19.
EX44 (Zhilong4):	At the inferior border of the ear lobe.
EX45 (Long7):	0.5 <i>cun</i> inferior and posterior to TE20.
EX46 (Houcong):	At the midpoint between the root of the auricle and the posterior to the natural line of the hair.
EX47 (Houtinggong):	Within the temple, at the root of the auricle back and on the level of SI19.
EX48 (Yuntingqu):	1.5 cm superior to the auricular apex, a horizontal line of 4 cm long (extending forward and backward 2 cm respectively).
EX49 (Xiachimai):	0.5 <i>cun</i> inferior to TE18.
EX50 (Houting):	At the temple, the root of the auricle back and the corresponding level of the junction between the tragus and the intertragic notch on the medial side of the

	auricle.
EX51 (Houtinghui):	In the depression 0.5 <i>cun</i> superior to TE20.
EX52 (Xinyihao):	On the root of the auricle, at the junction of the anterior margin of the mastoid process and the auricle.
EX53 (Xinerhao):	At the temple and the end of the sternocleidomastoid muscle, 0.5 <i>cun</i> superior to the depression inferior to the mastoid process.
EX54 (Xinqihao):	At the temple, on the junction of the natural line of the hair and the horizontal line through the middle of tragus.
EX55 (Yiming):	Behind the earlobe, 1 <i>cun</i> dorsal to TE17.
EX56 (Houyming):	0.5 <i>cun</i> behind EX55.
EX57 (Yimingxia):	0.5 <i>cun</i> inferior to EX55.
EX58 (Anmian1):	At the midpoint between TE17 and EX55.
EX59 (Dousi):	0.5 <i>cun</i> posterior and superior to EX55.
EX60 (Anmian2):	At the midpoint between GB20 and EX55.
EX61 (Tingmin):	At the root of the ear lobe.
EX62 (Ergen):	0.5 <i>cun</i> inferior to TE17.
EX63 (Qianzheng):	0.5~1 <i>cun</i> to the front of the ear lobe.
EX64 (Qianyifeng):	16 mm anterior and superior to TE17, near the center of skin fold of the ear lobe.

The region surrounding the nose

EX65 (Bitong):	At the superior end of the nasolabial fold, at the junction between the nose bone and nose cartilage.
EX66 (Zhibi1):	0.2 <i>cun</i> medial to LI20.
EX67 (Tongqi):	1.5 <i>cun</i> inferior to BL1.
EX68 (Bijiao):	In the slight depression of the peak of the nasal bone when pressing downward along the nose from the midway of the medial ends of the eyebrows.
EX69 (Nianshou):	0.2 <i>cun</i> inferior to the midpoint between the inner canthuses.

The region surrounding the mouth

EX70 (Yaoji):	0.5 <i>cun</i> inferior to the angle of the mouth.
EX71 (Dihu):	At the junction of the vertical line through the angle of the mouth and the margin of mandible.
EX72 (Jiachengjiang):	1 <i>cun</i> to CV24, at the mental foramen.

The region of posterior neck

EX73 (Fuyin) ***:	Band-shaped hard nodules that are at 0.3~0.5 <i>cun</i> lateral to C3~C6.
EX74 (Xinshe):	1.5 <i>cun</i> lateral to the middle point between C3~C4.
EX75 (Xiaxinshe):	0.5 <i>cun</i> inferior to EX74.

- EX76 (Bailao): 1 *cun* lateral to the midline of the back, 2 *cun* superior to GV14.
- EX77 (Jing7): At the upper margin of C7, just above GV14.
- EX78 (Qijingzui pang): 0.5 *cun* lateral to the point that is 0.5 *cun* superior to GV14.
- EX79 (Tianliang): At the lateral margin of the trapezium muscle, just inferior to the occipital bone.
- EX80 (Liujiangzui pang): 0.5 *cun* lateral to the point that is 1 *cun* superior to GV14.
- EX81 (Shiqu): 2 lines of 4 cm long, superior to the external occipital protuberance, 1 *cun* lateral and parallel to the upper-midline of occiput. It is actually the visual area.
- EX82 (Tianting): 0.5 *cun* inferior to the midpoint between GB20 and EX55.
- EX83 (Waidingchuan): 1.5 *cun* lateral to GV14.

The region of anterior neck

- EX84 (Shanglianquan): 1 *cun* superior to CV23.
- EX85 (Xinglianquan): At the front midline of the neck, the midway between the thyroid cartilage and the tracheal cartilages.
- EX86 (Qiangyin): 2 *cun* lateral to the laryngeal prominence, posterior and anterior to ST9.
- EX87 (Zengyin): At the midpoint between the laryngeal prominence and the angle of the mandible. Superior and anterior to ST9.
- EX88 (Zengyinshang): 1 cm superior to EX87.
- EX89 (Yadian): Below the angle of the mandible, in the depression of the anterior border of the sternocleidomastoid muscle. Anterior to SI16.
- EX90 (Biantaoti): 0.5 *cun* inferior to the angle of the mandible or 1 fingerbreadth inferior to ST6.
- EX91 (Tongqi1): 0.3 *cun* inferior and anterior to EX90.
- EX92 (Jingbei): 1 *cun* superior to junction of the inner 1/3 and the external 2/3 of the clavicle, at the posterior border of the sternocleidomastoid muscle.

Trunk

The region of the chest and abdomen

- EX93 (Zigong): 3 *cun* lateral to CV3.
- EX94 (Qimen): 3 *cun* lateral to CV4.
- EX95 (Shicang): 3 *cun* lateral to CV12.
- EX96 (Shiguan): 1 *cun* lateral to CV11.
- EX97 (Diwei): 4 *cun* lateral to CV12.
- EX98 (Weile): 4 *cun* lateral to CV9.
- EX99 (Ganfang): Corresponded to ST18.
- EX100 (Ganshi): Below the nipple, in the sixth intercostal space.
- EX101 (Chuangxinmen): At the level of the eighth intercostal space, midway between SP16 and EX97.

The region of the back

- EX102 (Huatuojiayi): 0.5 *cun* lateral to the lower border of the each spinous process from T1 to L5. One point at each left and right side of the vertebra. There are thirty-four points altogether.
- EX103 (Ganre): 0.5 *cun* lateral to the spinous process T5.
- EX104 (Bire): 0.5 *cun* lateral to the spinous process T6.
- EX105 (Bazhuixia): Below the spinous process T8.
- EX106 (Yishu): 1.5 *cun* lateral to the spinous process T8.
- EX107 (Shubian): 1 *cun* lateral to the spinous process T10.
- EX108 (Zhuoyu): 2.5 *cun* lateral to the spinous process T10.
- EX109 (Pigen): 3.5 *cun* lateral to the lower border of the spinous process L1.
- EX110 (Xiajishu): Below the spinous process of L3.
- EX111 (Shiqizhuixia): Below the spinous process of L5.
- EX112 (Yaoyan1): In the depression, 3~4 *cun* lateral to the lower border of the spinous process L3.
- EX113 (Yaoyan2): In the depression, 4 *cun* lateral to the lower border of the spinous process L4.
- EX114 (Yaoyi): In the depression, 3 *cun* lateral to the lower border of the spinous process L4.
- EX115 (Tunshang) ***: 1~2 *cun* inferior to EX113 at the buttock.
- EX116 (Weishu): 4.5 *cun* lateral to the spinous process L4.
- EX117 (Kuiyangxue): 2 *cun* lateral to BL50.

Upper Limbs

- EX118 (Jianqian): On the midway between the anterior end of the axillary fold and LI15.
- EX119 (Naoshang): At the center of the deltoid muscle.
- EX120 (Gongzhong): 2.5 *cun* inferior to PC2.
- EX121 (Jianming): At the point posterior and superior to LI14.
- EX122 (Hougan): 2 *cun* inferior to PC3.
- EX123 (Yingxia): 2 *cun* superior to TE9.
- EX124 (Cuoshan) **: At the junction of the upper 1/4 and lower 1/4 of the line connecting TE4 and LI12.
- EX125 (Luoshang): 1 *cun* superior to TE8.
- EX126 (Xinyangxi): At the point posterior and superior to LI5.
- EX127 (Shanghegu): 1 *cun* superior to LI4.
- EX128 (Shixuan): At the tip of each finger, about 0.1 *cun* behind the nail. There are 10 points at both hands.
- EX129 (Shanghouxi): At the midpoint between SI3 and SI4.
- EX130 (Mugen) **: A tender spot at the root of the thumb and the dorsal side of the metacarpophalangeal joint.

- EX131 (Hubian) **: At the midpoint of the web margin between the thumb and the index finger, lying on the red and white flesh.
- EX132 (Baxie): 0.5 *cun* proximal to the web margin, between the fingers from 1st to 5th, on the dorsum of the hand, there are 8 points at both hands.
- EX133 (Laozhen): At the dorsum of the hand, between the 2nd and 3rd metacarpal bones, a bout 0.5 *cun* posterior to the metacarpo-phalangeal joint.
- EX134 (Yaotongdian): At the dorsum of the hand, on the radial side and ulnar side of the tendon of the extensor digitorum communis muscle 1 *cun* before the transverse crease of the wrist, there are two points of each hand.
- EX135 (Bichuxuedian): At the midpoint of the web margin between the thumb and the index finger.
- EX136 (Yanhoudian): At the ulnar and dorsal side of the metacarpo-phalangeal joint of the middle finger when the fist is slightly clenched.

Lower Limbs

- EX137 (Weibao): 1 *cun* medial and inferior to GB28.
- EX138 (Eryang) **: Total two points, 1 *cun* superior to or inferior to the point behind the midpoint between GB31 and GB30, respectively, between the GB and BL meridians.
- EX139 (Daqie): 1 *cun* lateral to BL37.
- EX140 (Fengshishang): 5 *cun* superior to GB31.
- EX141 (Qianjin): 2.5 *cun* superior to GB31.
- EX142 (Shangfengshi): 2 *cun* superior to GB31.
- EX143 (Qianfengshi): 2 *cun* anterior to GB31.
- EX144 (Binshang): 2 *cun* superior to middle of the upper margin of the patella.
- EX145 (Heding): In the depression of the middle of the upper margin of the patella.
- EX146 (Xiyang): In the depression of the bilateral patella ligament, when the knee is bent. Each knee has 2 points.
- EX147 (Bindi) **: In the depression of the middle of the lower margin of the patella. Find it through a heavy finger pressure when the knee is slightly bent.
- EX148 (Erlihan): 0.5 *cun* superior to ST36.
- EX149 (Wanli): 0.5 *cun* inferior to ST36.
- EX150 (Appendix Point): 1 ~ 2 *cun* inferior to ST36.
- EX151 (Jianwei): 2 *cun* inferior to ST36.
- EX152 (Gallbladder Point): 1 ~ 2 *cun* inferior to GB34.
- EX153 (Feilong): 1 *cun* inferior to the capitulum of the fibula. Close to the lateral margin of the fibula.
- EX154 (Shangyangling) **: Just superior to GB34 and in the depression antero-superior to the lateral end of knee crease when the knee is bent.
- EX155 (Shangyinling) **: Just superior to SP9 and in the depression antero-superior to the medial end of

	knee crease when the knee is bent.
EX156 (Lingxia):	2 <i>cun</i> inferior to GB34.
EX157 (Houling):	0.5 <i>cun</i> posteroinferior to the capitulum of the fibula.
EX158 (Feitouxia):	3 <i>cun</i> inferior to the capitulum of the fibula and at the anterior margin of the fibula.
EX159 (Zuyicong):	3 <i>cun</i> inferior to GB34 and at the posterior margin of the fibula.
EX160 (Tiaokoupang) **:	0.5 <i>cun</i> lateral to ST38.
EX161 (Jiaoyi):	5 <i>cun</i> superior to apex of the medial malleolus.
EX162 (Ganyan):	1~2 <i>cun</i> superior to medial malleolus.
EX163 (Bafeng):	0.5 <i>cun</i> proximal to the web margin between the five toes, on the dorsum of the foot, there are eight points at both feet, including LR2, ST44 and GB43.
EX164 (Shangbafeng):	On the distal margin of the 1st~5th metatarsophalangeal joints, and between the every two metatarsal bones. There are 8 points at both feet, including LR3, ST43, and GB42.
EX165 (Zu19):	In the depression superior to prominence of the navicular bone on the tibial side.
EX166 (Zu20):	On the dorsum of the foot, the midpoint from the middle between the roots of the 1st and 2nd toes to the middle of the anterior transverse crease of ankle.
EX167 (Zu21):	On the dorsum of the foot, 1.2 <i>cun</i> superior to distal border of the 4th ~5th metatarsophalangeal joints.
EX168 (Zu27):	On the dorsum of the 1st metatarsophalangeal joint, the margin of the tibial side of the extensor hallucis longus.
EX169 (Zu28):	On the dorsum of the foot, the midpoint from the middle between the 1st and 2nd metatarsal bones to the depression distal to the 1st and 2nd metatarsophalangeal joints.
EX170 (Zu46):	On the distal interphalangeal joint of the second toe, the dorsal and tibial side.

Frequent Asked Questions (FAQs)

(1) Why it is relevant to establish and develop contemporary medical acupuncture?

To date, though the therapeutic effectiveness of acupuncture has been extensively recognized, for the most part, its mechanisms remain unclear. Moreover, its theoretical basis – the meridian theory is primitive, and techniques such as point selection and needle-manipulation are not yet standardized. These factors of classical acupuncture greatly lower the reproducibility of its efficacies. Thus, it is relevant to establish and develop contemporary medical acupuncture. Reproducibility is one of the most striking features of science. The current state of acupuncture therapy is that there is much less proportion of science component (the certainty of effectiveness) than art component (the randomness of techniques). In order to integrate classical acupuncture into contemporary medicine, the key is to raise the certainty of therapeutic effectiveness and reduce the randomness of techniques, i.e., enlarge the proportions of science. (refer to Section 1.1)

(2) What is the scope of contemporary medical acupuncture?

Contemporary medical acupuncture may be defined as “the theory and practice of acupuncture directed by modern science” and are generally categorized into two main aspects. First, apply the knowledge

of contemporary medicine and perspectives of scientific methodology to validate, simplify, and refresh the meridian theory, as well as to clarify the primary efficacies of acupuncture. Second, control the randomness throughout the entire process of acupuncture therapy and raise the reproducibility of its therapeutic effectiveness. (refer to Section 1.4)

(3) What is the definition and scope of acu-reflexology?

Acu-reflexology is best defined as the theory and techniques of acupuncture directed by reflex theory, which is the core of contemporary medical acupuncture.

For many years, the term *reflexology* has been used to describe a zone therapy by finger pressure techniques at the feet and hands. Actually, it is one kind of massage therapy based on the premise that there are reciprocal reflexes on different parts of the body, such as certain reflex zones emerging on the feet and hands corresponded to other parts, glands, and organs of the body. The reason we coined a new term “acu-reflexology” from the integration of terms “reflexology” and “acupuncture” is because both acupuncture and reflexology have the same rational core: reflex. The theory and techniques of acupuncture can be considered as a generalized reflexology. Nevertheless, stimulation means of acupuncture is not limited on the finger pressure, and stimulation

locations of acupuncture are not only at the feet and hands. Instead, acupuncture including needling and moxibustion can be applied on the entire body surface where the meridian system or whole body reflex zones (WBRZ) lodge. Thus, the contents of acu-reflexology are much broader and deeper than that of classical reflexology. (refer to Section 1.4)

(4) Why does the meridian theory need to be developed?

The meridian theory was gradually formed based on the discovery and applications of acupuncture points. With increasingly newly discovered points and their extensive clinical applications, as well as the recent recognition about the essence of meridians, the following limitations in applying the meridian theory have been explored. First, the meridian system is insufficient to encompass substantial newly discovered acupuncture points. Second, classical descriptions about efficacies of acupoints are primitive and the categorization appears preliminary. Third, the naming scheme of some meridians or the description about their traveling courses is improper. For example, the classical recognition that parts of SI and LI courses are distributed on the upper limb is incorrect, in other words, those meridians should not named SI and LI. In short, classical theory of the meridians is facing a series of challenges, and it is committed to develop from art to science. (refer to Section 3.4)

(5) From the perspective of acu-reflexology, what is the essence of meridians?

The essence of meridians is the reflex connections between specific stimulation locations on the body surface and various parts of the body. The meridians can also be considered as one kind of physiological and pathological reflex systems of the body. (refer

to Section 3.5)

(6) How did the traveling courses of classical meridians come about?

From classical TCM literatures and the authors' own understandings, the traveling courses of classical meridians seem to be strongly correlated with the following experiences or observations of ancestral Chinese:

- a. Phenomena of propagating sensations induced by stimulation of needling, moxibustion, or other primitive tools, such as *bianzhen* (flint needle) on the body surface;
- b. Subjective sensations when practicing *qigong*;
- c. Spontaneous meridian phenomena, such as papuloid zones or red lines on the body surface;
- d. Radiating pain, propagating pain, and phenomena of body surface-body surface correlation during the occurrence of somatic diseases;
- e. Various referred pain and phenomena of viscera-body surface correlation during the occurrence of visceral diseases.

Among these factors, observations on the somatic radiating or propagating pain might be relevant in determining the traveling courses of meridians, particularly for courses of certain *yang* meridians, such as BL, GB, and TE on the limbs. Observation on the visceral referred pain might play a major role in determining visceral correspondence and the names of meridians, particularly certain *yin* meridians, such as HT and PC. (refer to Section 3.3)

(7) Why reflex is the basis of treating illnesses using acupuncture?

Until now, many studies on the essence of meridians have been done via modern anatomical or chemical tracing methods. However, no particular structures other than those recognized in anatomy have yet been found within acupoints or along the traveling

courses of the meridians. Moreover, numerous practices have demonstrated that the effects of acupuncture depend on intact neural reflex arcs. When any part of the reflex arc is disconnected, such as the blockage of sensory afferent or motor efferent nerves by local anesthesia or pressure interventions, or lesion of the reflex centers, all needling sensations and acupuncture effects will be lost. (refer to Sections 2.7 and 3.1)

(8) What are reflex zones?

Those regions of the body surface, where reflex points or acupoints with similar efficacies lodge, or where referred pains and other reflex phenomena appear frequently, are named as reflex zones. Those acupoints or reflex points, which make up the reflex zones, are the locations of either outputting internal information from the body or inputting therapeutic information of acupuncture into the body. (refer to Section 3.5)

(9) What are whole body reflex zones? How are they categorized? How are they different from micro reflex zones?

Whole body reflex zones (or macro reflex zones) are proposed to describe reflex zones distributed on the entire body surface. They are categorized into three main types of reflex zones: visceral, somatic, and central. They contain all acupoints of classical 14 meridians, extraordinary points, and most newly discovered points, but do not include micro reflex zones or points used by various micro acupuncture therapies, such as auricular acupuncture, hand acupuncture, foot acupuncture, facial acupuncture, nose acupuncture, eye acupuncture, scalp acupuncture, tongue acupuncture, and wrist-ankle acupuncture. These two types of reflex zones, micro and macro reflex zones complement each other from certain parts of the body to the whole body surface. Thus, do not confuse the concept of whole body reflex

zones proposed in this book with the concept of micro reflex zones proposed by other texts, where those zones only lodge at certain regions of the body, such as the hands, feet, and ears. (refer to Section 3.5)

(10) How did the whole body reflex zones come about?

During past few decades, a series of new terms have been proposed to describe the zoning characteristics of acupoint distribution. One of the most influential is the concept of point zoning proposed by researchers at Shanxi Medical University of China, in 1974. Through investigating pathological sensitive spots on the body surface and analyzing efficacies of acupuncture points, thirty-five point zonings, which are distributed across the entire body, were summarized. They were used to direct clinical acupuncture successfully, and made great contributions to the modernization of acupuncture therapy. However, the proposal of point zonings has distinct weaknesses. The classification of point zonings is not superior to that of the meridian system because it does not discover ultimate distribution rules in sorting efficacies of acupoints or new points. Moreover, the concept of point zonings only describes the property of the meridians being band-shaped, but does not reveal any essence of the meridians, and it is disassociated with the meridian theory. Therefore, it is merely a summary of practical experience at best, but unable to be advanced into a new theory to inherit and develop the meridian theory completely. Because acupoint or reflex point is actually the location on the body surface outputting internal information and inputting treatment information from acupuncture, in 1976, we proposed the concept of information zones to substitute the meridians by creating a simplified model, and illustrated an atlas about three main types of information zones. For the past three decades, the

concept of information zones has been developed to a complete theory about the distribution rules of acupuncture points that has extensive clinical applications. However, in order to comply with the international standard and easily to integrate it into the mainstream of contemporary medicine, since 1998, we have further adopted the term of reflex, which is commonly recognized and applied in physiology, to rename the information zone as reflex zone or whole body reflex zones. Meanwhile, a color atlas of the whole body reflex zones has replaced the preliminary atlas of information zones. (refer to Section 3.5)

(11) What are the distribution patterns of three main reflex zones?

Somatic reflex zones are distributed continuously on the entire body surface besides those reciprocal reflexes of corresponding areas between the bilateral sides, between the upper and lower parts, and between the chest and back on the body surface. They may be longitudinally divided into three subzones: the anterior, lateral, and posterior zones.

There are three distribution rules for visceral reflex zones. First, they lodge on the dorsal and ventral aspects of the trunk next to viscera. Second, they are mainly at the *yin* side of the extremities, i.e., the medial side of the upper arm and the anteromedial side of the lower limb. Third, reflex zones for those viscera above diaphragm (lung, heart and small parts of the stomach) are at the medial side of the upper limb, while that for those viscera below the diaphragm (large parts of the stomach, intestine, liver, spleen, gallbladder, kidney, urinary bladder, and genitalia) are at the anteromedial side of the lower limb. Visceral reflex zones can be further classified into six subzones: lungs, intestine, heart, urogenital system, stomach, and liver/gallbladder/spleen/and pancreas.

There are two distribution rules for central reflex zones. First, they are distributed at the nearest locations to the brain and spinal cord, mainly on the head, midlines of the dorsal and ventral sides of trunk. Second, central reflex zones are located at the boundaries (called border zones) of the dorsal and ventral sides of trunk and *yin-yang* sides of the extremities, especially those portions below the elbows and knees. (refer to Section 3.7)

(12) What is the relationship between whole body reflex zones and the meridian system?

The notion of whole body reflex zones has vividly presented the essence of meridians, namely, as a reflective functional connection of the body. The meridian system is a primitive description about the reflective system, while the traveling courses of the meridians on the body surface are merely a close resemblance of whole body reflex zones. Whole body reflex zones are constructed with a series of pathological and physiological reflex points, which can be just at the locations of acupoints or extraordinary points, or out of the meridians completely. Their territories may vary depending on changes of diseased conditions or individual differences of patients. Whole body reflex zones not only have fully inherited the core of classical meridian system, but also have made a series of innovations. As for the similarities and differences between three main types of whole body reflex zones and the meridian system, refer to Section 3.8.

(13) How did the meridians or reflex zones were formed?

The meridians or reflex zones are formed within the period of evolution of animals. It has been observed that not only in humans, but also in many other mammals, such as dogs, cats, horse, ox, and monkeys, similar meridian phenomena can occur, and

reflex zones are distributed at their body surface.

From the perspective of close kinship, during the long process of evolution into humans, the primitives had to battle dangerous creatures on the earth and become accustomed to the ever-changing external environment. If there were no sets of complete regulatory systems within their bodies to adjust internal functional changes to adapt to the external environment, they simply would not survive. Instead, they would eventually follow the paths of those organisms in nature that have been extinct. Neural and humoral regulations are known to be two of the most important regulatory systems within the body. However, besides these two highly developed mechanisms, there might be the third primitive regulatory mechanism associated with them within the body.

The meridians or reflex zones distributed across the body surface and their pathways connected internal parts of the body may pertain to the third regulatory mechanism, which acts as the a shield against external stimulation. Its regulatory role is achieved mainly through the mechanism of altering thresholds of related pathways, which can minimize the amount of external nociceptive stimulation entering the body. During the process of receiving external stimulation and reflecting internal activities, not every part of the body surface is influenced in the same way. Instead, some regions are easier to receive external hits or other impacts than others. Accordingly, with a long process of evolution, average thresholds of networks connecting to certain regions on the body surface might have increased, while those connecting to other regions might have decreased, which presents certain patterns of changes. This is the formation process of whole body reflex zone with certain distribution patterns, or the 14 meridians. (refer to Section 3.6)

(14) What advantages do reflex zones have in replacing the meridians?

The adoption of the term reflex zones instead of the meridians has many advantages in at least the following aspects.

a. It may rationally categorize and clarify main efficacies of acupoints located on the entire body surface, and simplify the complex meridian system. Distribution of reflex zones is regular and easily identified, as well as corresponds to the anatomical terms in contemporary medicine.

b. It develops concepts that an acupoint is not a spot but an area and that a meridian is not a line but a zone. In addition, it provides an approximate range in locating reflex points quickly.

c. It may demystify the hypothesis of *homotherapy with heteromeridian* and *heterotherapy with homomeridian* and the notion about the meeting points.

d. It discards certain fictions of the meridian theory, such as the notion that LI and SI distributed on the upper limb are obviously mistaken because reflex zones for both large and small intestines are distributed on the lower limb instead of the upper limb. (refer to Section 3.5)

(15) What is the relative specificity in actions of acupoints or reflex points and how are they determined?

Specificity and relativity in actions of acupoints are two opposite aspects. The specificity refers to that there is particularly effective acupuncture points when treating certain diseases, while the relativity refers to that similar effects may be achieved when stimulating either certain non-acupoints or acupoints. The combination of them is called the relative specificity in actions of acupoints.

The specificity in actions of acupoints is determined by two basic characteristics of acupoints. The first is the sensitivity of acupoints. Acupoints often

possess a higher sensitivity than surrounding non-acupoints. The second is the reflectivity of acupoints. Because reflex zones that can reflect physiological or pathological states of the corresponding organs or tissues, acupoints within reflex zones should have a greater functional specificity than other acupoints or non-acupoints outside reflex zones.

However, in the formation of reflex zones, there are dual characteristics of reflexes: the precise localization and vague diffusion. Thus, not only the boundaries of reflex zones are rather unclear, but also several visceral reflex zones can be locally overlapped. Acupoints located at the overlapped area should have effects on multiple visceral functions. In addition, because of continuous distribution of somatic reflex zones on the body surface, they may overlap with coexisting visceral reflex zones that are distributed in segments. When either needling or moxibustion with a greater intensity stimulates any acupoints or sensitive points outside the visceral reflex zones, it is still possible to induce certain levels of effects on the corresponding visceral functions. Moreover, inputs by stimulation of acupoints are merely non-specific intervention after all, which may evoke extensive or diffused effects, especially when humoral factors are activated. All these may explain the relativity in actions of acupoints. (refer to Sections 4.1)

(16) What is diffusible reflex? What importance does it have in applications of acu-reflexology?

Whether reflex zones are in the micro regions or the whole body, their formation possesses both characteristics of precise localization and vague diffusion, which may be resulted from accurate reflex and vague reflex, respectively. The vague reflex is also known as diffusible reflex. Because of the diffusible reflex, be cautious when using micro or whole body reflex zones to diagnose diseases. In

addition, it might be just the reason for the relative specificity in actions of acupoints.

Hinted from the notion of diffusible reflex, it is more important to learn and understand distribution rules of reflex zones rather than memorizing their precise territories. For example, a relatively trustworthy rule for auricular visceral reflex zones are that they may be distributed at the concaved areas, but their exact territory may vary. Remember, those descriptions or atlases about the distribution of auricular points are merely empirical conclusions from some practitioners, thus they often differ in different texts. Until now, no convincing scientific evidences about them have been provided. (refer to Section 3.10)

(17) During clinical acupuncture, what aspects of the body surface information should be gathered?

Briefly, the reflex information on the body surface may be gathered mainly from four aspects by observation and inquisition.

- a. Determine if the body is cold or hot, especially the change of skin temperature on the affected area, which may be lower (cold) or higher (hot) compared with that of other parts of the body.
- b. Assess the states of *qi* (energy flow). Are the tissue structures of the affected area or the reflex zone bulged (excess) or concaved (deficiency)? Is the tissue tension decreased (deficiency) or increased (excess)? Are the reflex points emerging at muscular (excess) or fatty (deficiency) region?
- c. Find the location and the extent of the disease, which are often referred as the exterior or interior in terms of TCM. Is the tender spot caused by visceral (interior) disorders or somatic (exterior) disorders? Are there any regional or referred tenderness? It is also necessary to consider various properties of tender spots, such as degrees and symmetries of tenderness, as well as the body responses upon

pressing. In other words, are those reflex points pathological or physiological?

d. Identify *yin* or *yang* aspect of the disease. Are the signs of disease or reflex points on the body surface mainly located on the *yin* side (the abdomen or the anteromedial side of limbs) or the *yang* side (the back or the posterior and lateral sides of limbs)? In terms of the meridians, which meridian (*yin* or *yang*) has been mostly affected? (Refer to Chapter 7)

(18) What is a reflex point and how is it defined?

In modern clinical acupuncture, many alternative names of acupoints are proposed to describe the properties of acupoints or stimulation locations. These include reflex points, reaction points, sensitive points, tender spots, electro-permeable points, as well as trigger points. They often appear in miscellaneous articles, reports, or textbooks, but their definitions are generally vague and may confuse the readers.

Strictly speaking, those locations on the body surface with a detectable response due to reflective mechanisms are simply called reflex points, which can also be referred as reaction points. However, the name of reaction points is overemphasized in the regional responses or reactions and it does not indicate the mechanisms of reflex. Tender spots are used to represent reflex points that mainly have regional tenderness. Regional reactions of reflex points may manifest in other forms, such as low electrical resistance of the skin. Accordingly, reflex points may also be called electro-permeable points. Those with miscellaneous reactions or hypersensitivity are also called sensitive points. Trigger points is widely known in the West. According to the definition, trigger points are located on the hypersensitive regions in soft tissues, especially muscles, where there is tenderness or referred tingling, numbness, burning, or itching sensations upon pressing. In these descriptions, reflex points

are the most appropriate in expressing reflective connections between certain locations on the body surface with corresponding viscera or other tissues. The reflex zone is composed of reflex points that possess similar reflective connections and are closely distributed, even merged into clusters.(refer to Section 12.9)

(19) When treating different kinds of diseases with needling, are there different significance levels in selecting reflex points?

There are different significance levels in selecting reflex points when treating different diseases. For example, when the goal of treatment is analgesic, reflex points are preferred in the selection of local points, but they are not required in the selection of distal points as long as they are sensitive. For visceral diseases, apply corresponding reflex points often have better therapeutic effects, while for the rehabilitation of motor dysfunctions, it is best to stimulate nerve trunk innervating the affected region or local paralyzed muscles directly. It is not required to seek reflex points that might also be difficult to be identified in that case. (refer to Sections 4.2, 4.3, and 4.4)

(20) What is feedback revision of acupuncture treatment plan? Why is it relevant to raise the effects?

In the process of acupuncture treatment, disease information outputted from the patient's black box may change correspondingly with changes of the disease condition inside the black box. The practitioner collects this kind of altered information, and compares it with the original information received before the treatment. The difference between both types of information is considered as the evidence of revising previous treatment plan, and a newly revised method or plan is applied in subsequent sessions of treatment accordingly. Repeat such feedback revisions

until the patient is completely recovered. If there was no such feedback revision, this coupling system between the practitioner and the patient cannot form a closed-loop. In other words, unless the practitioner consciously completes such procedures, acupuncture therapy cannot be administered in an effective and efficient way. Obviously, the more timely feedback revisions are made, the faster and more accurate controls on the patient's black box are applied, which can ensure the optimal therapeutic results regardless of various interferences. (refer to Section 9.6)

(21) What are interference factors during the acupuncture process?

Acupuncture therapy is subject to four types of interferences at least: environmental, subjective, therapeutic, and instrumental.

The environmental interference generally includes the external air temperature, humidity, noise, and lighting condition during the treatment process. The subjective interference can be from either the practitioner or the patient. From the practitioner's side, they may include insufficient clinical experience, misdiagnosis, improper treatment plan or therapeutic habits, and a lack of confidence in the recovery of the patient. From the patient's side, they may include anxiety/nervousness, emotional fluctuations, and a lack of confidence in the practitioner or acupuncture therapy. The therapeutic interference may come from other combined therapies received by the patient, such as medications or surgeries. When collecting disease information from the patient by modern diagnostic devices, these devices sometime may become a source of interferences due to the amplification of certain false signals or incomplete filtration. This is called the instrumental interference. (refer to Section 9.6)

(22) What is the relationship between the stimulation intensity and stimulation duration? How can we control them clinically?

Strictly speaking, for every acupoint or stimulation location, the stimulation amount is the product of intensity and duration of stimulation as below:

$$\text{Amount of Stimulation} = \text{Intensity of Stimulation} \times \text{Duration of Stimulation}$$

The stimulation intensity depends on two aspects. First is the stimulation itself, such as the amplitude and frequency of needle-manipulation (twisting, thrusting, and lifting). Second is the sensitivity of the patient, on either the whole body surface or just the stimulated region. Different patients have individual sensitivities of the body surface toward external stimulation. When the sensitivity is low, even with an intense stimulation, the patient may only have little sensation. Therefore, when assessing the stimulation intensity, such two aspects should be considered altogether.

The stimulation duration required for each type of stimulation or each acupoint may vary along with different stimulation intensities. For needling, the stimulation duration includes the needle-insertion time, needle-manipulation period, and needle-retaining period. The needle-manipulation period consists of required time for instant manipulation including twisting, lifting-thrusting, or scraping needle after needle-insertion, as well as each repeated manipulation (called *jiaozheng*) during and/or after the needle-retaining period.

In general, to achieve the same amount of stimulation, the stimulation duration should be longer if the stimulation intensity is low, and vice versa. (refer to Section 8.3)

(23) What are the benefits of having a needle-retaining period? What actually happens during the needle-retaining period?

During the needle-retaining period, the pain threshold of the punctured region or corresponding distant portions of the body may be raised, while soft tissues with originally higher tension or spasms may be relaxed, and the nervousness or anxiety of the patient may be alleviated. Meanwhile, patients often feel very relaxed with their mind falling into a deep quiescent state, and certain skin redness around the needle, which its diameter is between 1~2 cm, may be observed. The importance of needle-retaining period may be considered as to ensure the input of a certain stimulation amount. Needle-retaining also allows repeated stimulation at the same stimulation location within the same tissue layer to increase the stimulation amount.

The degree of needling sensations generated often may serve as an indicator to determine the length of required needle-retaining period. When needling sensations acquired are sufficiently intense, a needle-retaining period might not be necessary. On the contrary, a needle-training period of 30 min is generally required when there are less needling sensations. (refer to Section 8.3)

(24) What is the definition of pulsating point and the mechanism for pulsating responses?

During needling therapy, local muscle twitching or pulsating responses of the extremities often can be seen with the naked eye. Those acupoints or stimulation locations that show such responses are called pulsating points.

Pulsating responses can be divided into two classes. First is the visible muscle twitching around the needle while the practitioner feel sudden tenseness and dragging sensation around the needle *as if the fish is swallowing the bait*. Simultaneously, the

patient may feel intense needling sensations of soreness and distension, but without evident jerks of the limb. The second is the occurrence of jerks on the limb or joint stimulated. Meanwhile, the patient may have an electric-shock sensation, soreness and distension, or even pain. The second class of pulsating responses may have any of the following three mechanisms: the stretch reflex induced by the stimulation of muscle spindles, the flexor reflex induced by the pain stimulation, and the muscle contraction resulted from direct stimulation of motor nerves. (refer to Section 12.5)

(25) What is stimulation through multiple passages?

From the perspective of systems theory, the essence of point-association is to choose several points with different information passages that can be activated concurrently. This may enable a sufficient amount of acupuncture information to be inputted into the body. Meanwhile, even though not every point or information passage was effective, it would still be possible to have at least one of them available for a smooth transmission of information. Thus, miscellaneous methods of point-association used in clinical acupuncture may be concluded as one principle, namely the stimulation through multiple passages. (refer to Section 11.7)

(26) What are the unique and groundbreaking techniques on clinical acupuncture presented by the authors of this book ?

The author's innovations in the field of acupuncture techniques presented in this book include Jin's painless needle-shooting method (JPNSM), point-probing with EA (PPEA), multiple needles at a single point (MNSP), blood vessel stimulation techniques, and the method of inserting needles from the palmar side of hand joints, and so on. (refer to Sections 10.6, 11.2, 12.3, 12.6, and 13.7)

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A

Activation

peripheral factors, 113

Acu-reflexology, 10, 44, 86, 138, 204

Acupoints, 8, 24, 90, 105, 133

characteristic, 25

classical-, 246

corresponding cross-, 222

non-, 90~93

relativity in actions of-, 93

specificity in actions of-, 92

superficial-, 26, 125

Acupotomy, 215

Acupressure, 254

self-, 254

Acupuncture, 133

analgesia, 96,103

anesthesia, 42, 99, 103, 153

auricular-, 9

body-, 9

contemporary medical-, 8

electro-, 15

hydro-, 16, 216

indications,

information, 17, 32

mechanisms of-, 37

placebo-, 314

real-, 278

scalp-, 9, 71

sham- (mimic, pseudo or mock), 186,

314, 412

therapeutic information of, 17

types of, 18

water-, 16, 216

wrist-ankle-, 20, 68, 155, 209, 479

Acupuncturist, 9

Adaptability, 151

Adaptation, 14

central-, 14

peripheral-, 14

sensory-, 14

Amplifier, 175

Analytical device, 175
 ANEM (Auricular needle-embedding method), 215, 295, 424
 ANS (Autonomic nervous system), 20, 37
 APPM (Auricular pellet-pressuring method), 215
 AQDR (Arrival of *qi* at the diseased region), 112, 124, 148, 197, 245
 Arthromyodynia, 203
As if the fish is swallowing the bait, 159, 199, 235
 Auricular point
 diagnosis, 142

B

Better missing
 acupoints than the meridian, 147, 246
 the meridian than reflex points, 247, 252
Bianzhen, 55
 Black box, 135
 Blocking method, 249
 Blood vessel stimulation, 239

C

Cerebral cortex, 35
 CNS (central nervous system), 12
 Cold arthralgia, 140
 Comparator, 176
 Connective tissue structures, 120
 Contemporary medical acupuncture, 8
 Contrary therapy, 170
 Corpuscles,
 Meissner's-, 20
 Pacinian-, 20, 121
 Correlation
 body surface-body surface, 52
 viscera-body surface, 51
 CQDM (Connecting *qi* and dredging the meridian), 322

Cross

 circulation, 37, 101
 perfused, 101
 Cue, 105
 Cupping, 16
 Cybernetics, 5, 41, 95, 193

D

Deficiency, 142
Deqi, 18, 27, 161, 238
 Dermatomal rules, 50, 90
 Detector
 chemical pain, 139
 pressing pain, 139
 tenderness, 175
 Diagnosis
 auricular point- 142
 meridian-, 142
 Dolorimetry, 144
Duici (head-on needling method), 307

E

EA (Electroacupuncture), 4
 high frequency-, 102
 low frequency-, 102
 Effectors, 13, 32
 Effects
 regulatory-, 93
 upon *deqi*, 47, 162
 Eight principal syndrome differentiations, 138
 cold or hot, 138
 deficiency or excess, 138
 exterior or interior, 138
 Eight-section brocade, 226
 yin or *yang*, 138
 Electrical resistance of the skin, 144
 Electronic point finder, 139

Endorphins, 101
Enkephalins, 101
ENM (encircling needling method), 205, 279

F

Feedback, 13
 circuit, 91
 external-, 13
 internal-, 13
 negative-, 14
 positive-, 14
 principle, 166, 173

Filter, 175

Flight, 102

fMRI, 88, 109, 350

Free nerve endings, 17

FSH (follicle stimulating hormone), 94

G

Gate theory, 97

H

Hard nodule, 120, 141

Head's zones, 51

Herbal dressing, 150

Herbs, 16, 149

Homeostasis, 12

Homomorphic machine, 95

HPM (heat-penetrating moxibustion), 213

HRP (horseradish peroxidase), 51, 128

Humoral

 factors, 36, 94

 neural-, 104

Hypnosis, 188

Hypothalamus, 35

 ventromedial nucleus (VMH), 416

Hypothesis

 convergence, 48

 facilitation, 48

 heterotherapy with homomeridian, 58

 homotherapy with heteromeridian, 58

I

Information, 17

 zones, 6, 61

Infrared thermograph, 46

IRRTM (Infrared radiant tracking along meridians),
46

J

Jiaozheng, 153

JNPNM (Jin's nine points needling method), 341

JPNSM (Jin's painless needle-shooting method),
191, 244, 276

K

Kanamycin-induced auditory impairment, 111

L

LH (Luteinizing hormone), 94

LHA (lateral hypothalamus), 416

M

Mast cells, 127

Mechanisms

 self-healing-, 64

 formation of meridians, 14

Mental states, 192

Meridian, 7, 136

 diagnosis, 142

essence, 47, 120

explorer, 177

formation, 62

phenomena, 45

regions, 68

sanjiao, 59

sensitive subjects, 45, 113

simplified model, 47

theory, 3, 44

Method

auricular needle-embedding-, 215

auricular pellet-pressuring-, 150, 215

blocking-, 248

catgut-embedding-, 215

dredging-, 248, 322

encircling needling-, 205

equal tonification and purgation, 215,
308, 357, 372

excitation, 152

four diagnostic-, 136

head-on needling- (*duici*), 307

inhibition-, 152

Jin's painless needle-shooting-, 191, 244

Jin's nine points needling method-, 341

needling-relay to circulate *qi*, 123, 249

novel needling, 201

opposite needling-, 54, 69, 109

palpation, 136, 141

palpation of acupoints, 141

point-piercing-, 317

point-probing-, 216, 229

pricking blood, 34

puncturing different limbs, 54

repeatedly needle-thrusting, 229

resistance-needling-, 226

single needling, 196

zi-wu-dao-jiu, 230

bangci-, 205

qici-, 205

weici-, 205

yangci-, 205

MNSP (Multiple needles at a single point), 205,
259, 270, 281, 290

MNSZ (Multiple needles at a single zone), 206

Models

effectiveness, 169

meridian, 82

whole body reflex zones, 82

Motoneurons, 27, 35, 122

α -, 27

γ -, 27, 30, 121

Motor unit, 27

Moxa cone, 15

Moxibustion, 15, 149

burnt-, 150

direct-, 15, 150

electro-, 15

fester, 150

ginger-, 15

heat-penetrating- (HPM), 150

indirect-, 15, 150

resistance, 182

scab-, 214

scar-, 213

sparrow-pecking-, 15, 150

substance-separated-, 150

suppuration-, 214

trail-, 214

warming-, 150

with marks, 150

without marks, 150

Muscle

extrafusal fibers, 19, 121

intrafusal fibers, 19, 121

-spindles, 27, 97, 106, 115, 119~125

-tension, 30, 94

-tonus, 27

-twitching, 26, 29

N

Needle-insertion time, 153

Needle-manipulation, 8

Needles

- embedded-, 15

- fear, 188

- filiform-, 18

- lifting, 155

- seven-star-, 18

- three-edged-, 18

- thrusting, 155

- twisting, 156

Needling

- manual-, 154

- red-hot-, 216

- warm-, 216

Needling-resistance, 151, 352

Nerve

- afferent-, 13, 24

- efferent-, 13, 34

- endings, 17

- fibers, 24

- parasympathetic-, 36

- sympathetic-, 36

- trunks or branches, 32

- vagus-, 36

Neural

- networks, 63

- regulation, 63

NIH (National Institutes of Health), 251

Nociceptive 102, 190

- anti-, 103

- signal, 102

Nociceptors, 24

Noise control, 193

Non-nociceptive

- signal, 102

Non-specificity, 105

Norbert Wiener, 5

NRCQ (Needling-relay to circulate *qi*), 123, 249

NSN (Nerve-stimulation by needling), 233, 292

NTNM (Nerve trunk needling method), 34, 274

O

ONM (Opposite needling method), 54, 69, 75,

220, 254, 303

P

Pain

- indicating-, 48

- propagating-, 53

- radiating-, somatic radiating-, 52

- referred-, 48

- threshold, 93

- visceral referred-, 48

Pathogen

- cold-, 177

- damp-, 177

Pathway

- capacity, 104, 193

- information-, 61, 104, 231

PEINC (Propagation of excitation inside nervous centers), 113

Period

- induction-, 100, 153

- needle-manipulation-, 153

- needle-retaining-, 153

Phantom limbs, 129

Picking therapy, 215

PNSAM (Propagation of needling sensations along the meridian), 9, 60, 75, 112

Point, 7

- adjacent-, 219

- Ashi*, 56, 85, 93, 146

- association, 219

- association according to symptoms, 217

auricular-, 142
 body-, 217
 buttock-, 384
 corresponding-, 221
 distal-, 219
 distant-, 219
 electro-permeable, 139
hunger-, 415
 indefinite, 56
 injection, 216
jing (well)-, 79, 113
 local-, 219
 may exist anywhere on the body surface, 93
 meeting-, 59
 motor-, 28
 pulsating-, 30, 183, 317
 reaction-, 246
 reflex-, 8, 44, 61, 84, 91, 142, 246
 selection, 146
 selection along the meridian, 147
 selection within the reflex zone, 147
 sensitive-, 53, 246
shu (stream)-, 222
 specific, 1, 341
tianyingxue, 56
 trigger, 8, 143, 246
yuan (source)-, 113, 149
 zoning, 60
 Postures, 182
 PPEA (Point-probing with EA), 232, 317, 323
 Preexisting states, 37
 Preventive acupuncture regulation, 171
 Propagation
 inside the cerebral cortex, 115
 inside the spinal cord, 114
 inside the thalamus, 115
 muscle tensions, 114, 121
 needling sensations, 112

waves, 121, 125

Proprioceptors, 13, 24

Q

Qi, 56, 138, 231

evil-, 238

grain-, 238

Qigong, 188, 231

frog-, 417

slim-, 417

tiding- (of jade toad), 417

Quiescent state of mind, 188

R

Reaction

emergency-, 102

stress-, 103

Receptors

barosensory-, 24

chemosensory-, 17

mechanosensory-, 15

sensory-, 6, 18, 27, 155

tactile- sensory-, 158

thermosensory-, 15, 20

Reflex, 10

accurate-, 82

arcs, 10, 27, 34, 41

axonal-, 39, 127

centers, 5, 35

conditional-, 129

diffusible-, 82, 93

flexor-, 110

long-, 37

neural-, 94

pathological-, 142

physiological-, 143

reciprocal- 54

short-, 39
 soma-soma-, 54
 stretch-, 26, 29
 supershort-, 39
 tendon-, 27
 vague-, 82
 Reflex zone, 6, 8, 146
 adjacent-, 219
 corresponding-, 221
 layering, 77
 layers, 79
 macro-, 65
 micro-, 65, 80
 overlapping-, 76
 whole body-, 6
 Reflexologist, 81
 Reflexology, 10
 acu-, 10, 44, 87, 90, 204
 Reflexotherapy, 10, 86
 Region
 affected-, 146
 diseased-, 146
 Regulation
 humoral-, 63
 neural-, 63
 Regulatory effects, 35
 Rehabilitation, 108
 Relativity, 88
 in actions of acupoints, 89
 Relaxing music, 193
 Reproducibility, 4, 145

S
 Sanjiao, 59
 Science, 5
 Selecting
 the distension spot as acupoint, 204
 the numbness spot as acupoint, 204

 the soreness spot as acupoint, 204
 the tender spot as acupoint, 204
 Self-control, 173
 Sensations
 electric-shock-, 32, 116
 needling-, 18
 of heaviness, 22
 of numbness, 116, 160, 279
 of soreness, 22, 113, 152
 Senses
 fine-tactile, 25
 pain-pressure-, 240
 pain-temperature-, 23, 145
 tactile-pressure-, 19, 158
 tactile-temperature-, 139
 Sensitivity, 179
Shuxue, 56
 Signal,
 amplification, 139
 filtration, 139
 nociceptive-, 102
 non-nociceptive-, 102
 Skin
 peeling, 141
 redness around the needle, 153, 163,
 172, 173, 224
 SNMP (Single needle through multiple points),
 207
 SNMZ (Single needle through multiple zones),
 209
 Somite, 65
 Specificity
 in actions of acupoints, 82
 non-, 105
 relative-, 85, 105
 Spinal
 cord, 35
 shock, 110

Spots

- hemorrhoid-, 141
- motor-, 160
- pathological tender-, 142
- physiological tender-, 143
- sore-, 144
- tender-, 53, 146

Stimulation

- amount, 107, 152
- duration, 152
- intense-, 152
- intensity, 152
- prolonging-, 215
- weak-, 152

Stress test, 139

Sympathetic sensitive lines, 120

Symptoms, 135

Systems

- biology, 11
- hypophysis-adrenal cortex-, 37
- hypophysis-gonad-, 38
- hypophysis-thyroid-, 38
- hypothalamic-pituitary-adrenal cortex-, 103
- methodology, 7
- nonspecific sensory projection-, 100
- specific sensory projection-, 98
- sympathetic-adrenal medulla-, 38, 103
- theory, 5
- vagus-insular-, 38

T

TCM (Traditional Chinese medicine), 187

TDSAN (Tenseness and dragging sensations around the needle), 21, 135, 158, 189, 230

Technique,

- lifting-thrusting-, 153
- twisting-, 4

Ten fingers are connected to the heart, 149

Tenderness, 25

TENS (Transcutaneous electrical nerve stimulation), 15, 197

Test

- error, 145
- input/output- 146

The scene brings back memories, 130

Theory

- gate-, 97

Therapy

- contrary-, 170
- novel acupuncture-, 153

Threshold, 8, 63, 95

Tissues, 17

- connective-, 17
- epithelial-, 17
- muscle-, 17
- neural-, 17
- subcutaneous-, 17

Transmission among sensory nerve endings, 114, 125, 126

Treatment plan, 174

Tuina, 241, 261, 266

Types of diseases

- central, 138
- somatic, 138, 146
- visceral, 138

U

Using the needle to grind the bone, 17, 147

V

VAS (Visual analogue scale), 168

Viscera-body surface correlation, 39, 52, 115, 132

VMH (Hypothalamic ventromedial nucleus), 416

W

WBRZ (Whole body reflex zones), 6, 44

Whatever exists internally must manifest signs externally, 136

X

Xerostomia, 436

Y

Yin-yang sides, 66, 149

Z

Zangfu, 4, 58

Zi-wu-dao-jiu, 230

Zones

head's-, 48, 51

information-, 61

macro reflex-, 62

micro reflex-, 62

papuloid-, 45

yifeng-, 60, 307

Zoning

characteristics, 60

point, 60