

Textbook of Traditional Japanese Medicine

Part 2 : Acupuncture and Moxibustion

Health and Labour Sciences Research Grant

Research on the standardization of traditional Japanese medicine
promoting integrated medicine

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Foreword

In September 1978, a declaration on primary health care (PHC) was adopted in Alma-Ata in Kazakhstan (then part of the Soviet Union) under the guidance of the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF). This is known as the Alma-Ata Declaration. PHC is defined as 'essential health care based on practical, scientifically sound and socially acceptable methods and technology.' Article VII of the Declaration states that PHC relies 'at local and referral levels, on health workers, including physicians, nurses, midwives, auxiliaries and community workers as applicable, as well as traditional practitioners as needed, suitably trained socially and technically to work as a health team and to respond to the expressed health needs of the community.' Roughly three decades later at the 56th World Health Assembly held in Geneva in 2003, the 192 participating countries and regions recommended that traditional methods of healthcare should be integrated into governmental public health systems and its harmonization with contemporary Western Medicine should be promoted. Thanks to this, Traditional Medicine spread rapidly over recent decades and its presence has become recognized. The significance of this change is important. Traditional Medicine is a comprehensive system of healthcare with its own theoretical basis and practical experience as determined by specific regional circumstances (indigenous culture, climate, natural resources, etc.). It includes Herbal Medicine, Acupuncture, and other non-drug therapies.

In this context, the profile of Traditional Medicine is rapidly rising globally and attracting interest and demand as a form of medicine that is useful and free of adverse effects. The standardization of the theoretical framework, terminology, and other aspects of Traditional Medicine has become a matter of urgency. It was 1965 when WHO took the lead in proposing the standardization of the locations and names of acupuncture points. In 1991, Standard International Acupuncture Nomenclature was adopted by the WHO in Geneva. Work on the standardization of Traditional Medicine has since spread globally. Japan, on its part, has embarked on several projects starting in 2004 in cooperation with the WHO West Pacific Regional Office. Our focus is on "standardization based on an evidence-based approach" and our aim is to promote the appropriate utilization of Traditional Medicine.

Because standards in Traditional Medicine are diverse (i.e., the position of acupuncture points, information about them, and actual clinical practice vary), the development of an internationally standardized system of terminology was the first step towards the overall standardization of Traditional Medicine. The Japanese Traditional Medicine community cooperated in the publication of WHO/WPRO's "*WHO International Standard Terminologies on Traditional Medicine in the Western Pacific Region (IST)*" in 2007 and of the "*Standard Acupuncture Point Locations in the Western Pacific Region*" in 2008. Based on the experience gained from such international collaboration, we have learned that the terminology of Traditional Medicine belonging to other nations should be derived from reference documents of the respective nations: it

is not for us to judge or refute. The Japanese healthcare system was overhauled in the Meiji Era, when all physicians were made to learn Western medicine and pass national examinations in order to qualify as practitioners. To practice Traditional Medicine, would-be practitioners were required to study Western Medicine before Kampo Medicine. The result was that Japan became unique among developed nations in being the only country to practice Western Medicine and Traditional Medicine simultaneously within the same healthcare system. What sets medicine in Japan apart from Traditional Chinese Medicine or Traditional Korean Medicine is that practitioners of Western Medicine in Japan, which meets the world's highest standards, also practice Kampo Medicine.

Since 1976, many Kampo formulations have been added to the government health insurance reimbursement list in Japan. About 80% of physicians are said to be using Kampo medicines. Kampo Medicine, which forms the core of Traditional Japanese Medicine, has been put to use and has contributed greatly to the health of the nation. Japan is the only county that can investigate Kampo Medicine from the vantage points of both Kampo Medicine and contemporary Western Medicine, in other words from the perspective of both Western Medicine and Oriental Medicine, and that can disseminate information not only within Japan but to the the outside world while upholding the uniqueness, usefulness, and diversity of Kampo Medicine.

The standardization of Kampo terminology is an important task that encompasses all aspects of education, research, and clinical practice. What is more, one of its significant roles is to upgrade the quality, safety, reliability, efficiency, and compatibility, which are the most important aspects of medicine and needless to say, of Traditional Medicine also. We believe we can make great contributions internationally by forming a Standard Textbook Committee to implement and complete the actions listed below and fulfill the purpose of our research project, which is the compilation of a standard textbook on Traditional Japanese Medicine. These actions are: 1. Writing standard textbooks on Traditional Japanese Medicine, including Acupuncture, and Kampo medicines and crude drugs; 2. Fact-finding with a focus on local community healthcare; 3. Standardization of Traditional Medicine internationally. There will also be benefits within Japan. Kampo will be given a sound footing within the medical school curriculum. We may expect to see questions about Kampo on the National Medical Licensing Examination. For this to happen, efforts to standardize Traditional Japanese Medicine is of great import, including the compilation of standard textbooks, textbooks for medical students, and guidelines for the training of pedagogical staff.

The Japan Society for Oriental Medicine (JSOM) was founded in 1950 to support education, research, and the clinical practice of traditional medicine. It has engaged in many activities resulting in many publications. JSOM has published handbooks on the terminology of traditional medicine including “*Toyo Igaku Yogoshu I (Glossary of Oriental Medicine I)*” in 1969, “*Toyo Igaku Yogoshu II (Glossary of Oriental Medicine II)*” in 1980, and “*Toyo Igaku Yogoshu (Glossary of Oriental Medicine)*” in 1999. For clinical practitioners, JSOM published “*Kampo Hoken Shinryo Shishin (Guidelines for Kampo Treatment under the National Health Insurance System)*” in 1986 and “*Kampo Hoken Shinryo Handobukku (Handbook on Kampo Treatment under the National Health Insurance System)*” in 1994. JSOM published the following standard textbooks: “*Nyumon Kampo Igaku*” in 2002 and its English version “*Introduction to KAMPO Japanese Traditional Medicine*” in 2005, “*Gakusei no tameno Kampo Igaku Tekisuto (Student Textbook on Kampo Medicine)*” in 2007, and “*Senmon-I no tameno Kampo Igaku Tekisuto: Senmon-I Kenshu Curriculum Junkyo*”

(*Kampo Medicine Textbook for Specialists: Specialist Training Curriculum Reference*)” in 2010.

What was essential for our standardization project on Traditional Medicine was that not only JSOM, but many other organizations concerned with the project had to cooperate and participate by setting up working groups and liaison councils to deal appropriately with the status of Traditional Medicine in Japan and internationally. The members naturally have to be representatives of all participating organizations. Because of this, the standardization of Traditional Japanese Medicine will require creation of an academic platform. The working groups focusing on three domains (Kampo, Acupuncture/Moxibustion, and Pharmacy) will need to work together. The terminology will be from the Kampo publications of the JSOM mentioned above. For Acupuncture and Moxibustion, terminology from the Japan College Association of Oriental Medicine’s “*Shinkyu Riron (Theory of Acupuncture and Moxibustion)*” and “*Toyo Igaku Gairon (Outline of Oriental Medicine)*” will provide the backbone. We need to ensure that terms used in both the Kampo and Acupuncture/Moxibustion domains are consistent.

Surveying the trends in traditional medicine around the world has alerted us to the threat of chaos in the healthcare system in Japan and its attendant threat to the health of the nation. We must prevent and circumvent such chaos. Also, in the context of the re-evaluation of integrative medicine by the West, Japan must dedicate its energy to safeguarding its own independent Traditional Medicine.

What lies at the heart of Traditional Medicine will not be changed by time or schools of practice. However, medicine and medical care must develop in line with advances in science and technology. Only then can the tradition be kept alive. More than thirty years have passed since the introduction of Kampo formulations for medical use into our world-class national health insurance system. At this juncture, it is meaningful internationally to standardize the terminology of Traditional Medicine so that it can be comprehended from the standpoints of Oriental and Western Medicine. This is truly what the Kampo community in Japan had long desired and attempted to achieve. In terms of education in Traditional Medicine, teaching now begins at the undergraduate level ‘to be able to outline Wakan-yaku (Kampo medicine)’ and ‘to study chemistry-based pharmacy: naturally produced medicines’ (i.e., the Medical and Pharmacy Education Model Core Curriculum). In the medical specialist system, the Kampo specialist is now an established category. Training in acupuncture/moxibustion is improving in colleges and universities. Various organizations have been actively pursuing education and research. These are all achievements that we must recognize and endorse.

The Traditional Medicine community in Japan has overcome numerous obstacles in its path. We look to the future with the publication of this textbook, which we hope will assist in serving the health of the Japanese people.

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Chapter 1

History of Acupuncture and Moxibustion in Japan

Ancient to Edo period

Toshihiro Togo

Introduction

This chapter deals with the history of acupuncture and moxibustion in Japan spanning thirteen centuries from its introduction in the mid sixth century to the end of the Edo period (1603–1868). Research into the history of traditional medicine in Japan has largely relied on historical overviews by researchers such as Yu Fujikawa (1865-1940) and Toshiro Hattori (1906-1992), but since the 1980s newly discovered material have provided a large amount of subject matter for further research, which in turn prompted the rewriting of the history of acupuncture and moxibustion. This chapter gives an overview of this history (up to recent times and revised based on current research) and suggests topics for future research.

Introduction of acupuncture and moxibustion and institutionalization under the Ritsuryo legal code system

Advanced cultural practices, including medical practices, were introduced from the continent to Japan via the Korean peninsula in the fifth and sixth centuries. The Yamato court brought noted physicians from the Korean kingdoms of Silla and Paekche to Japan to apply their advanced medical knowledge to the treatment of the Emperor. We know that in the third year of the reign of Emperor Ingyo (446), the Yamato court received the physician *Kim Moo* (金武) from Silla and in the reign of Emperor Yuryaku, the Yamato court received the physician *De Lai* (德来), who was originally from Goguryeo but was a citizen of Paekche. Official teachers of the five Confucian classics came to Japan in the seventh year of the reign of Emperor Keitai (513). From then on, experts in almanacs, medicines, and Li studies (morals and rites) regularly came from Paekche. According to the literature, texts on acupuncture and moxibustion were introduced in the second half of the sixth century. Records also show that the monk *Zhi Cong*, from the kingdom of Wu (China), brought some 164 texts to Japan during the reign of the Emperor Kimmei (in the year Kimmei 23, or 562) whose reign was marked by the introduction of Buddhism in Japan, including *Yakusho* (薬書, texts on medicines), acupuncture, and moxibustion, most notably *Meidozu* (明堂図, chart of meridian points).

Zhi Cong (智聰), who was granted citizenship in Japan, and other physicians who had come to Japan from Silla and Paekche before him, gave instruction in acupuncture and moxibustion, however, we do not know exactly what their practices involved. Yet, in the fifteenth year of the reign of Empress Suiko (607), Prince Shotoku dispatched Imoko Ono to the Sui dynasty court (China) marking the beginning of formal diplomatic relations between China and Japan. With that, medical knowledge as well as a system of medicine based on continental legal codes came to be introduced to Japan in earnest by envoys to the Sui and Tang courts.

Medical officers under the Ritsuryo legal code system

The structure of the Yamato court's political system was greatly influenced by the Ritsuryo system which envoys brought back to Japan from the continent during the Sui and Tang dynasties. In 701, the Yamato court established the Taiho code (大宝律令), following the model of the Tang legal code. It was amended in 718 with the establishment of the Yoro code (養老律令), which contained regulations governing a system of medical treatment, *Ishitsuryo* (医疾令). This system specified a range of medical occupations and set certain standards for the education and training system.

Specifically, the Yamato court established the Ten'yakuryo (Bureau of Medicine) modeled on the *TaiChangSi TaiYiShu* (太常寺太医署) system of the Tang dynasty. The Ten'yakuryo had jurisdiction over medical administration, medical education, and medical practice. It established government officer posts including Kami (equivalent to Junior Fifth Rank, Lower Grade), Suke (Junior Sixth Rank, Upper Grade), and Jo (Junior Seventh Rank, Upper Grade), in addition to posts such as a doctor of Medicine and a doctor of Acupuncture, who taught treatment methods. Records suggest they taught 40 and 20 students, respectively. The records also mention the posts of a doctor of Anma and Anma practitioner, however, no evidence of any actual appointment has been found.

The Ten'yakuryo was responsible for training medical officers, but the shishokusei students generally came from certain clans who counted naturalized citizens among their ancestors, or clans with a history of three consecutive generations in medicine.

Medical texts

The medical regulations *Ishitsuryo* stipulated that medical officers (medical students and acupuncture students) were to study texts on medicinal herbs ("*BenCaoJingJiZhu*, [本草經集注]"), meridians ("*HuangDiMingTangJing* [黃帝明堂經]"), and pulses ("*MaiJue* [脈訣]"). Officers then had to study medicines, acupuncture points, and pulse diagnosis before learning "*HuangDiNeiJing SuWen* (黃帝內經素問)" (commented edition by *Quan Yuanqi*), "*HuangDiZhenJing* (黃帝針經)," "*HuangDiJiaYiJing* (黃帝甲乙經)," and "*MaiJing* (脈經)." Acupuncture students had to learn additional texts, including the "*LiuZhuTu* (流注圖)," "*YanCeTu* (偃側圖)," and "*ChiWuShenZhenJing* (赤烏神針經)."

The first text "*HuangDiNeiJing SuWen*," introduced into Japan was a commented edition by *Quan Yuanqi*, while "*HuangDiNeiJing TaiSu* (黃帝內經太素)," an early Tang commentary by *Yang Shangshan*, was brought from China during the period between the Taiho code promulgation and the first year of the Tempyo Ho era (757). The governmental regulations called '*Engisiki* (延喜式),' presented to the throne in the fifth year of the Encho era (927), do not include the medical education texts, "*HuangDiNeiJing SuWen*," "*ZhenJing*," or "*MaiJing*." "*HuangDiNeiJingTaiSu*" was the foremost text, which suggests that gradually "*SuWen*" with *Quan Yuanqi*'s annotation had been replaced by "*HuanDiNeiJing TaiSu*" which contained *Yang Shangshan*'s comment.

The emergence of *Ishimpo*

As the Tang dynasty weakened toward the end of the ninth century, the Imperial court took the advice of senior minister Michizane Sugawara and discontinued missions to the Tang dynasty court (894). Formal exchange with China ceased and the influx of medical texts was interrupted until the end of the Heian period (794–1192), but a great number of medical texts had already been brought to Japan. These texts were freely used by a doctor of Acupuncture, Yasuyori Tamba, whose ancestor had been granted citizenship, and adopted his own approach to compiling a Japanese text, the “*Ishimpo* (医心方).” Yasuyori produced a total of 30 volumes, rewritten with reference to the Chinese medical texts that had been brought into Japan up to that point, and based on the disease categorization in the “*ZhuBingYuangHouLun* (諸病源候論),” edited by *Chao Yuanfang* in the Sui dynasty. The *Ishimpo* preserves many medical texts that had been lost to medical text revision in China in the Song dynasty. It is now considered an important work in the literary world.

Volume two focuses on acupuncture and moxibustion but makes no mention at all of pulse diagnosis, a fundamental diagnostic technique in Chinese medicine: it makes no reference to theories based on the Yin-Yang and five-element doctrines (陰陽五行説). This peculiarity is one of the factors that suggest the work largely summarizes speculative elements.

After the *Ishimpo* was presented to Emperor Enyu in 984, the manuscript was handed down to Zuisaku Nakarai by Emperor Ogimachi in the late sixteenth century and this Nakarai-ke-bon was preserved in Nakarai’s family subsequently through the generations until in 1984 when it was designated a national treasure and is currently in the Tokyo National Museum collection.

Acupuncture and moxibustion in Japan during the Middle Ages

There are few historical records of actual medical treatment by physicians in Japan, not only from the Middle Ages, so it is difficult to gain a clear understanding of medical practices during this period. However, the nobility’s viewpoints on medical practices and the body can be glimpsed in literary works, including diaries and writings such as “*Gyokuyo* (玉葉)” by Kanezane Kujo (1149–1207) and “*Meigetsuki* (明月記)” by Teika Fujiwara (1162–1241). Such works relating to acupuncture and moxibustion in the Middle Ages pay far more attention to moxibustion. Mentions of acupuncture are mostly limited to cases where needles are used as instruments for surgery-like procedures, such as discharging pus or impure blood by lancing a boil (section on eye disease in “*Yamaino Soshi* [病草紙]”). The writings on moxibustion tell us that the nobility of that period strictly observed the taboos around the treatment: auspicious days were chosen from the almanac to receive treatment; the almanac determined which parts of the body could be treated on which days; and they refrained from attending Shinto or Buddhist rites after receiving treatment.

Moxibustion was a widely used means of life nurturing in the Middle Ages, even among the general

populace. Moxibustion at the ST36 (足三里) point appears to have been the most widely used curative treatment. Kenko Yoshida (1283–1350) writes in paragraph 148 of his “*Tsurezuregusa* (徒然草),” ‘Once past the age of 40, one becomes prone to qi counterflow. This must be prevented by applying moxa to Sanli.’ In the Edo period, Basho Matsuo (1644–1694) wrote in the opening to “*Oku no Hosomichi* (奥の細道),” ‘I patched my torn trousers and changed the cord on my bamboo hat. To strengthen my legs for the journey I had moxa burned on my shins. By then I could think of nothing but the moon at Matsushima. (“The Narrow Road to Oku” translated by Donald Keene [Tokyo: Kodansha International, 1996])’ Travellers burned moxa at the Sanli (ST36) point as a matter of course before embarking. Ekken Kaibara (1630–1714) also mentions moxibustion at the Sanli acupuncture points (ST36) in “*Yojokun* (養生訓),” showing just how widespread the practice was among the general populace.

Medical texts in the Middle Ages

Trade between Japan and the Song dynasty from the end of the Heian period allowed once again the importation of medical texts. The influx of Song texts became well established from the beginning of the Kamakura shogunate (1192–1338). From then on up until the Nanbokucho period (1338–1392), older medical texts in scroll form were used alongside newly updated Song and Yuan dynasty texts.

Responsibility for medicine moved from the nobility to the Buddhist priests and their profound scholarship. Among the priest-doctors were some who compiled medical texts, such as Shozen Kajiwara and Yurin. Shozen Kajiwara wrote two texts, “*Ton’isho* (頓医抄)” (1303 in Japanese) and “*Man’ampo* (万安方)” (1315 in Chinese) based on the “*HuangDiNeiJing TaiSu*” and the revised “*HuangDiNeiJing SuWen*,” which was the most up-to-date annotated text of the time. Yurin produced “*Fukudempo* (福田方)” (1363), based on the revised “*HuangDiNeiJing SuWen*.”

Emergence of acupuncture and moxibustion schools in early modern Japan

Many acupuncture and moxibustion schools emerged from the late Muromachi period (1392–1575) to the early Edo period. Scholarly study flourished during this period as printing technology developed and medical texts became far more widespread (“*LeiJing* [類経],” “*ShiSiJingFaHui* [十四経發揮]”). Many questions remain about what was happening in acupuncture and moxibustion medicine in Japan at this time. Steady work by researchers such as Nagano Hitoshi and Oura Jikan using new materials discovered in recent times is shining light on the details and traditions of diagnosis and treatment techniques, as well as the origins and interrelationships of the various schools.

An overview of the acupuncture and moxibustion schools formed in modern times reveals a number of important facts. 1) The Buddhist viewpoint on the body formed in the Middle Ages (the viewpoint on origins discernible in the Buddhism charts known as “*Gozo Emaki* (五蔵絵巻)” and the importance placed on the abdomen where the five viscera [internal organs] located) remains strong and affected both diagnosis and treatment. 2) The Hideyoshi’s invasion of Korea resulted in many doctors coming to Japan from Ming China and Korea, which influenced Japanese medicine. 3) Printing, publishing, and distribution advanced dramatically from the Keicho era (1596–1615), which facilitated the diffusion of medical knowledge, whether it was medical texts from overseas or texts published in Japan. 4) The early Edo period saw the invention and development of the guide tube method (鍼管) and various techniques using guide tubes, which became widespread. Above all (1) meant that the abdominal examination was the most important of the palpation techniques for diagnosis, and the needle hammering technique came into existence; the invention of the guide tube method (4) made for a diverse array of techniques after needle insertion; and the revolution affecting all treatment techniques provided the solid foundation on which Japanese acupuncture and moxibustion developed in its unique way.

The schools that emerged in this period include the Irie, Yoshida, Hikichi, Unkaishi, Tanza, Isai, and Sugiyama. A simple overview of the main schools follows.

Acupuncture and moxibustion schools in early modern Japan

1. Yoshida school

Ikyu Yoshida, Shinto priest at Izumo Taisha shrine and founder of the school, is said to have travelled to Ming China in 1558 and studied acupuncture technique for seven years under *Cui Linxing*. He was succeeded by his son Yoshiyasu, and grandson Kazusada. Kazusada became the physician to the Echizen domain, and like Waichi Sugiyama, was granted an audience with shogun Tsunayoshi Tokugawa in 1680. The school’s chief text was “*Shishinkakanshu* (刺鍼家鑑集)” (1661). A feature of the school’s thinking was the hypothesized existence of 11 kinds of “bugs” that cause physical illness. The goal was to cure patients by eliminating these bugs with acupuncture.

2. Hikichi school

The school’s founder was Kian Hikichi, who is said to have received direct instruction in acupuncture technique from the Ming physician *Zuo Zhuo*, who came to Japan during the Keicho era. Hikichi’s grandson, Michiori Fukuda, systematized the school’s teachings. The distinguishing characteristics of this school include the use of round-sharp needles, as handed down by *Zuo Zhuo*, and the partial use of the Yoshida school name as an alias for writings on acupuncture points, while mainly using titles found in *ShiSiJingFaHui* to describe the acupuncture points for each meridian vessel.

3. Henjakushin school

Founded by Jukan Etsusai from *Oshu Kunohe* (奥州九部, *Nukanobu* county in northeast Japan), the school sprang up after Etsusai Jukan received instruction from *Murai Shiro Uemon-no-Jo* around 1607 in his *myoshin* acupuncture (妙鍼). The school is distinguished by a number of features. It took over the Konshin school, which had been built up by Gengyo Ibaraki in Osaka during the Eiroku era (1558–1570), and gradually changed from the old acupuncture points names in “*Giba Gozokyo* (耆婆五臟經)” to the acupuncture points described in “*MingTangJing*.” The school determined that the main points for treatment were acupuncture points on the back and abdomen. It skillfully used points on the leg and arm as ‘*hikishin*,’ and inserted small and large filiform needles into the back and abdomen mainly to a depth of 36 mm (1.2 cun) and into the limbs to a depth of from 6 or 9 mm to 21 mm (2 or 3 to 7 fen). The school’s chief texts were “*Henjaku Shinryu Shinsho* (扁鵲新流鍼書),” “*Hari no Gokui Kirigami* (鍼之極意切紙),” “*Shinsen Shodojin Ryakuzu* (真撰小銅人略図),” “*Shinkyu Utanoshō* (鍼灸歌之書),” “*Junikeiraku Narabini Zofunozu* (十二經絡并臟腑之図).”

4. Irie school

The founder was Yoriaki Irie. Yoriaki practiced in Kyoto after initially studying acupuncture technique under Michiyasu Sonoda, medical officer to Hideyoshi Toyotomi, then under the Ming teacher *Wu Linda*, who had been taken prisoner during the invasion of Korea. Yoriaki’s descendants were his son Yoshiaki and grandson Toyoaki. Waichi Sugiyama first studied under Takuichi Yamase, who in turn studied under Yoshiaki. Subsequently, Waichi studied under Toyoaki, after being expelled by Yamase. The school’s chief text is “*Irie Nakatsukasa Sunaisuke Onsoden Harinosho* (入江中務少輔御相伝針之書),” which was discovered in recent years and is currently being studied. The features of this school include its reliance on “*Gotai Miwakeshu*” and “*Kiba Gozokyo*” for acupuncture points and disease patterns and its adherence to many aspects of the medieval view of the body, yet on the other hand, using 22 qi (Ki) hastening methods with needle twisting. The school also systematized needle manipulation techniques, including twisting, sparrow pecking, and shaking, as the fifteen needle technique (十五勢), and differentiated 14 pressing-hand techniques (*Juyontsu no Oshite*). Their various writings on acupuncture urge scholars to reassess the course of events leading to guide tube techniques, the development of which (until now) has been attributed to Waichi Sugiyama. Further research is required to elucidate the relationship between the Irie, Sugiyama schools, and Sugiyama Shinden-ryu.

5. Myoshin school

This school was founded by Joshitsu Matsuzawa. According to the Genealogy of Myosin school (妙鍼流系図), by Yukan Miyata, who studied acupuncture for 15 years under Joshitsu, the founder’s acupuncture techniques descended from Rakuyo no Soshin, one of the seven lines that led to the acupuncture techniques taught to the Takeda clan by the Kumano Sansho Daigongen. It is said that the Myoshin school emerged in about 1650 and attracted many followers. Its chief texts include “*Myoshinryu Yukei Gujinzu* (妙鍼流兪經偶人図),” “*Shinkyu Gounsho* (鍼灸五蘊抄),” and “*Myoshinryu Hiden* (妙鍼流秘伝).” The school is distinguished by being founded on “*ShiSiJingFaHui*,” using all acupuncture points of the body (whether on

the torso or limbs), and using many varied techniques such as inserting needles deeply and changing the direction of needling (刺鍼轉向). The school also used three-edged needles for bloodletting.

6. Unkaishi school

The founder of this school was Shogen Kuwana. The afterword in “*Riketsushu* (理穴集)” posits that Shogen was instructed in the secrets of acupuncture by Kin Tokuhai (金得拜), a renowned Korean acupuncturist, ventured into the Bunroku campaign (1592) as a vassal to Motochika Chosokabe, and was taken prisoner. Unkaishi (雲海士) is the name of Kin Tokuhai’s teacher. In 1608, Kuwana achieved a reputation in Hiroshima under the name Choseian Ichishisoryomi (whether Shogen and Choseianryomi are the same person is disputed). Shogen’s grandson, Gentoku, was apprenticed to Kin Tokuhai as a student and later adopted the name Ichishiso (一指叟). The Unkaishi school’s chief texts were “*Shinno Zoshinmaki* (鍼法藏心卷)” (1611), “*Kokyo Shingushu* (広狭神俱集)” (1612), and “*Riketsushu* (1612)”. The school, while it used “*ShiSiJingFaHui*” for locating treating points, has unique perspective on the relation between time and meridian and advocated the kanjishin needling method (觀時鍼法 Time-based supplementation and draining method). It argued that treatment should be applied to a meridian which is most active at the hour when treatment is performed; for example, if the treatment is performed at noon, heart meridian should be selected as the subject of needling. And then, well point (井穴) of the meridian is used for supplementation and stream point (兪穴) of the same meridian is used for draining.

7. Sugiyama school (*Sugiyama Shinden-ryu*)

Waichi Sugiyama (1610–1694) is well known for being the originator of the guide tube method in Japan. He was born in 1610 as the heir to *Sugiyama Gon’emon Shigemasa*, vassal to *Todo Izuminokami Takatora* in Anotsu, Ise province. Having lost his eyesight due to smallpox as a child, he learned acupuncture under the blind acupuncturist Takuichi Yamase in Edo (the present Tokyo). However he did not succeed in his studies and was expelled. Legend has it that in his despair he went to Enoshima Island to fast. The idea for the guide tube was sparked when he tripped on a stone in the shape of a cow lying down, and grasped a piece of bamboo with pine needles in it. He later studied under Toyoaki Irie in Kyoto. Waichi, who had studied in the Irie school, earned a reputation in Edo and in 1680 was granted an audience with the fourth Tokugawa shogun, Ietsuna. Five years later, he successfully treated the fifth shogun, Tsunayoshi, for a chronic disease and was subsequently appointed physician to the shogun. In 1692 he was appointed sokengyo. Having earned the trust of the shogun, Waichi established schools for acupuncture studies, devoted himself to acupuncture education for blind people, and to fostering the next generation of acupuncturists (by Yasuichi Mishima’s time, 45 schools had been established).

Waichi’s own texts include the three well-known school texts, “*Sugiyama-ryu Sambusho* (杉山流三部書)”; “*Ryoji Taigaishu* (療治大概集),” “*Senshin Sanyoshu* (選鍼三要集),” and “*Igaku Setsuyoshu* (医学節用集).” These texts set out fundamental theories of acupuncture but do not go so far as to explain the guide tube method he is thought to have originated, or the school’s esoterica. It was his pupils, the second-generation

sokengyo Yasuichi Mishima and third-generation sokengyo Wadaichi Shimauro who systematized these in the form of the Sugiyama Shinden school. Shimauro successfully completed the compilation of Waichi's scholarly work in "*Sugiyama Shinden-ryu* (杉山真伝流)," the preface of which was written in 1693 (volume 'Omote (preface)', volume 'Naka (middle)', and volume 'Ryoko (dragon and tiger)'), and contributed to educating subsequent generations.

"*Sugiyama Shinden-ryu*" firstly pointed to the importance of acupuncturists obtaining a deep understanding of the meaning of "qi (Ki)." This text held that needles are 'tools for manipulating qi (Ki)' and it introduced many needling techniques. The basis for this was the 18 techniques (Juhachijutsu) explained in "volume 'Omote' (the source for basic needling techniques such as sparrow pecking (雀啄), *zuishin* (随鍼), *ranshin* (乱鍼), *Kansan* (管散), leaking roof (屋漏), *saishi* (細指), and *naicho* (内調), which even appear in school textbooks)." "volume 'Naka'" introduces and explains treatments and needling techniques for diseases using the 96 acupuncture methods (鍼法九十六術), and describes a large number of cases.

"*Sugiyama Shindenryu*" also gives detailed and illustrated explanations of techniques based on the guide tube method, including 14 tube techniques and 14 hand-pressing methods. The text treats guide tubes not simply as implements to assist needling manipulation but as tools to manipulate qi (Ki) and to enhance stimulation after needling. It gives descriptions of manipulation techniques such as, 'after needling, strike and shake the needle handle,' 'after insertion, tap the skin around the needling area,' and 'rub the base of the inserted needle.'

Acupuncture methods established in early modern Japan -The hammering method and guide tube method-

From the late Muromachi period to the early Edo period, Japanese acupuncturists developed original needling techniques such as the hammering method (i.e., the end of the needle handle is tapped with a hammer) and the guide tube method (i.e., a guide tube is used to insert the needle) to add to the well-used needle twirling method. Needling techniques using guide tubes are now standard techniques in Western countries as well as Japan.

The *dashin-ho* (needling with hammer) is thought to have been invented by the Zen monk Mubun (birth and death dates, unknown, and he went by various names). Kondai Utsuki suggests in "*Nihon Ifu* (日本医譜)" that Mubun received instruction from Hoin Taga, however, there are no surviving writings by Mubun himself, so the facts remain unclear. Of his many students it was Isai Misono (1557–1616) who disseminated the *dashin-ho*. Isai's texts ("*Ika Chimpo* [医家珍宝]," "*Shinkyu Zenron* [鍼灸全論]," etc.) have not survived, but the outline of his thinking remains in texts written by later generations of his students, including "*Mubun Shimposho* (無分鍼法鈔)" (1792), "*Shindo Hiketsushu* (鍼道秘訣集)" (1685), and "*Ichu Genoku* (意仲玄奥)" (1696). The *dashin-ho* involves tapping the needle with a hammer. This treatment was intended to eliminate pathogens and to tonify source qi (Ki) in the cinnabar field. The texts also deal with diagnosis, setting out a system of abdominal examination based on the school's original five-viscera system of

abdominal organs. They describe the secrets of ‘*hanare*,’ which differentiate intractable and fatal diseases. In the early stages it was solely the abdomen that was subject to the hammering method, but from the mid Edo period more variation was introduced with the method being applied to the back and the limbs.

The origin of the guide tube and guide tube treatment technique, perhaps the most significant feature of Japanese acupuncture and moxibustion, are described in legend as an idea that came to Waichi Sugiyama during ascetic practice at Enoshima Island after he was expelled by his first teacher. However, there are various versions of the legend, so the matter remains inconclusive. The literature on this subject reveals that the twirling method and the hammering method were explained in addition to the guide tube method in illustrated detail in “*Shinkyu Bassui* (鍼灸拔粹),” which was published in 1676 and widely distributed. “*Daimin Takushu Shimposho* (大明琢周鍼法鈔),” published in 1679, also mentions these three methods. The earliest mention of a method using a guide tube was in the writings of the Irie school (Kyoto) in the 1640s to 1650s. It also appears in the chief texts of the Tanaka Chishin school (Kyoto), which was contemporaneous to the Sugiyama school (Edo). On that basis, Oura proposes that the use of guide tubes began in Kyoto in the 1640s to 1650s and spread throughout the country regardless of the school.

Acupuncture and moxibustion education and academic study in the Edo period

The development of printing technology and the revolution in medical text distribution greatly altered the dissemination of medical knowledge in modern times. Ippo Okamoto, younger brother of Monzaemon Chikamatsu and active in the Genroku era (1688–1703), wrote many texts in Japanese explaining abstruse Chinese medical texts and gave lectures for large numbers of pupils. People such as Okamoto, who use medical texts to impart medical knowledge to pupils, were called interpreters of medical texts.

Attention must also be given to research into meridians and collaterals during the Edo period. The early Edo period saw regular reprints of “*ShiSiJingFaHui*” (by *Hua Shou* from the Yuan Dynasty), which elucidated the diseases transmitted by meridians and the diseases produced by viscus, diseases that originate in the ebb and flow of the fourteen meridians (including the twelve meridians, the governing vessel, and the conception vessel) as well as fluctuations of those meridian vessels. It was the model for the many monographs on acupuncture point research published at the time, starting with Toan Aeba’s “*Keimyaku Hakki* (經脈發揮)” (and including Genko Hori’s “*Suiyu Tsuko* [隧輪通攷]” and Nanyo Hara’s “*Keiketsu Ikai* [經穴彙解]”).

Moxibustion in early modern times

Konzan Goto (1659–1733) was an Edo-period physician who incorporated a variety of folk remedies into his

medical practice, starting with moxibustion and balneotherapy, while focusing on treatment with decoctions. Konzan held that (in all cases) illness originates in an enlarged mass (*sekkai*) and qi (Ki) disorder (stagnation of qi [Ki] theory [一氣留滯説]). He considered moxibustion (like hot spa treatment or bear's gall) to be a means of eliminating qi (Ki) congestion and used it widely, particularly where blood is congealed near the spine, and at locations showing signs of tenderness or retraction. A feature of his moxibustion practice was the use of many, but small, moxa cones.

Outsiders' perspectives on Japanese acupuncture and moxibustion

1. Acupuncture and moxibustion terms in *Nippo Jisho* (日葡辞書, Japanese – Portuguese Dictionary)

Contrary to expectation, very few records of the medical terms used in everyday life by the Japanese populace have survived into more recent times. The Jesuits who came to Japan in the Shokuho period (1568–1598), however, recorded many acupuncture and moxibustion-related terms in their “*Nippo Jisho* (Japanese – Portuguese Dictionary, published about 1600)” as part of their missionary work. This dictionary tells us that terms such as ‘*haritate*’ (transcribed as ‘*Faritate*’ in the dictionary, or acupuncturist), ‘*mogusa*’ (‘*Mogusa*,’ or moxa), ‘*kyuji*’ (‘*Qiugi*,’ or treatment with moxa), and ‘*yaito*’ (‘*Yaito*,’ moxibustion) were used in everyday language. The term ‘*harisuri*’ (‘*Farisuri*,’ or needle maker) appears in the dictionary, suggesting there were specialist artisans in Japan at the time who made acupuncture needles for therapeutic purposes.

2. Japanese acupuncture and moxibustion from the perspective of the Dutch trading post medical officers

The Edo shogunate's policy of isolation was fully realized with expulsion of the Portuguese in 1639. From that point to the end of the Edo period, the only Western country to maintain trade with Japan was Holland. Among the physicians stationed at the Dutch trading post on Dejima island in Nagasaki were some who studied natural history, which was popular in Europe at the time. In addition to carrying out their medical duties at the trading post, they collected botanical, animal, and mineral specimens in their pursuit of study of natural history, and they gathered information about all aspects of Japanese culture and customs, as well as medicine. These records survive in the itinerary written by physicians such as Willem ten Rhijne, Engelbert Kaempfer, Carl Peter Thunberg, and Philipp Franz von Siebold after leaving Japan.

Ten Rhijne arrived in Japan early in the seventeenth century and later wrote a treatise, [Dissertaio de Arthritide, de Mantiffa Schematica, de Acupunctura], on acupuncture and moxibustion practices in Japan, with illustrated annotations on the meridian vessels of acupuncture and moxibustion treatment. This treatise is thought to be the first text to contain a term for acupuncture, ‘*acupunctura*.’

Kaempfer, who had travelled to Persia as a Swedish envoy before moving on to Japan where he was granted an audience with shogun Tsunayoshi Tokugawa, included diagrams of ‘*kyushokan*’ (‘typical moxibustion points’) in his work “*Amoenitates Exoticae* (廻国奇観)” (1712), which he wrote after returning

to Lemgo, Germany. He also discusses Japanese moxibustion therapy in his posthumously published “*Nihonshi* (日本誌, *The History of Japan*, English edition 1727).” Comparing it with a similar therapy he observed in Persia, he noted, ‘the Japanese therapy gave me no sense of dread whatsoever.’ He also expressed his interest in the preference among Japanese practitioners of moxibustion for sites distant from the affected part, when selecting locations to burn moxa: ‘Our European manner of thinking predisposes us to select locations close to the affected part..., however, the Japanese practitioner of moxibustion often selects points to burn moxa that are entirely dislocated from the site of the disease.’

Thunberg, a pupil of the plant taxonomist Carl von Linné, focused his attention on collecting plant and animal specimens while in Japan. He mentions acupuncture and moxibustion in his journals, and his botanical work included the gathering of mugwort, the raw material for moxa, which he made the subject of a treatise he wrote after returning to Sweden.

The Dutch translation of “*Shinkyu Chiyo Ichigon* (鍼灸治要一言)” by Junzo Mima attracted von Siebold’s interest after arriving in Japan in the late Edo period, which led him to exchanges with Sotetsu Ishizaka.

Most of the materials and specimens collected by Kaempfer, Thunberg, and von Siebold, as well as their posthumous manuscripts, are now in the collections of the British Library, Uppsala University, and Leiden University, respectively.

3. Western medicine and acupuncture and moxibustion – Traditional medical theory and changes in the concept of the body in the late Edo period

There was regular exchange between the Dutch trading-post physicians and the Japanese physicians and interpreters keen to learn advanced Western science. The popularity of bloodletting (刺絡) in the late Edo period is due in part to the knowledge of Western bloodletting they acquired from the physicians at the Dutch trading post.

The Kyoho Reforms of the eighth Tokugawa shogun Yoshimune allowed the importation of Dutch books on the practical sciences only (astronomy, medicine, agriculture, etc.), which meant even the general public could obtain books on such subjects as anatomy and physiology. The expansion of this Western medical knowledge into Japan stimulated interchanges between the trading post physicians mentioned above and the Japanese doctors or scholars interested in Western knowledge, and is probably what paved the way for the introduction of modern medicine into Japan.

The second half of the eighteenth century was a period of great interest in anatomy in particular, starting with a government-approved dissection by Toyo Yamawaki in 1751 that led to a boom in dissections during the Horeki era (1751–1763).

With these dissections it became evident that Western medical texts were more accurate on the structure of the human body than the traditional Chinese medical texts, which were the basis for viscera-meridian theory. Although this did not lead to a complete loss of faith in traditional medicine as the basis for medical practices, it certainly provided critics of that theory with grounds for calling it unenlightened. At the same time, new decoctions were developed. Todo Yoshimasu (1702–1773), advocating the theory that all diseases

are derived from one poison, completely repudiated the Manase school's theories, which rested on the Yin-Yang and five-element doctrines, thereby signaling the start of a battle with the Koho school. In acupuncture and moxibustion, Shukei Sukanuma (1706–1764) placed importance on direct trial experiment (*Shinshi Jikken*, 親試実験); he repudiated the viscera-meridian theory, set the number of acupuncture points needed for treatment at only 70, and rejected the significance formerly given to the five phase points, and supplementation and draining. (Sukanuma's work, "*Shinkyusoku* (鍼灸則)," posthumously published in 1767, does not differ greatly from the traditional medical texts regarding the selection of points for treatment, even though it says pricking bloodletting method was commonly used as part of a combined treatment, which suggests that his criticisms of traditional medical theories were conceptual.)

Sotetsu Ishizaka (1770–1841) attempted to reconstruct the theoretical system supporting acupuncture and moxibustion medicine with reference to his knowledge of Western medicine. At the age of 27, Sotetsu established the Kofu Medical School (甲府医学所, *Kofu Igakusho*) on orders from the shogunate. In 1812, the title of Hogen was conferred on him and he was appointed court physician to Tokugawa shogun Ienari. Sotetsu's writings include "*Shinkyu Setsuyaku* (鍼灸説約)" (1812), "*Shinkyu Chiyo Ichigon* (1826)," "*Shinkyu Kokyo Shingushu* (鍼灸広狭神俱集)" (1819), and "*Ishizakaryu Shinji Junijo Teiyo* (石坂流鍼治十二条提要)" (1826). After meeting von Siebold, a Dutch trading post physician in Japan at the time, Sotetsu sought to reconstruct the viscera-meridian theory from the viewpoint of anatomy learned through his study of Dutch medicine. In other words, he repudiated traditional concepts such as five viscera and six bowels, nutrients and defenses (榮氣), and defenses (衛氣) and ancestral qi (宋氣). He substituted nutrients and defenses with arteries, defenses with veins, and ancestral qi with nerves. (However, a feature of his acupuncture practice was his acceptance of the Sugiyama school and his use of the Sugiyama Shinden-ryu *saishi* (細指) technique for *yudoshi* (誘導刺), *shuishin* (周圍鍼) for *renkanshi* (連環刺), and *yokoshi* (橫刺) for *senjashi* (穿蛇刺) under the *katei sanshinho* (家定三刺法).

It is unclear how much impact Sotetsu's restructuring of acupuncture and moxibustion medical theory had at the time. Yet, both Sukanuma and Sotetsu undoubtedly felt the need to replace the traditional viscera-meridian system, even while they kept the traditional treatments alive and unchanged. This suggests they had anticipated the search for a theoretical framework to underpin a new system of acupuncture and moxibustion medicine in a setting of education and research in Japan after the Meiji Restoration (around 1868), while at the same time preserving the long-established methods.

The pricking bloodletting boom

As mentioned above, the Dutch trading post physicians introduced knowledge of pricking bloodletting into Japan. Many references to it appear in Shukei Sukanuma's "*Shinkyusoku*." Shingen Kakimoto pioneered the use of '*niraha* (chive leaf) needles,' as well as big and small needles. In addition to acupuncturists, many decoctions practitioners also practiced pricking bloodletting. Although Gengai Ogino was a specialist in decoctions, in 1771 he wrote "*Shirakuhen* (刺絡篇)." And we know from the writings of a contemporary physician Kinkei Nakagami that he too practiced pricking bloodletting.

Meiji restoration and modern ere

Shuichi Katai

Japanese acupuncture and moxibustion during the Meiji, Taisho, and middle Showa periods

(1) Major changes in government policy

Following the Meiji Restoration (around 1868), the new Meiji government changed existing systems dramatically in Japan. Throughout the Edo period (1603–1868), Japan had a policy of ‘locking the country with limited-scale trade’ (trading only with China, Korea, and Holland), but changed course with the aim of establishing new systems based on Western models and adopting the advanced civilization of certain Western nations. It was arguably the same method employed when national systems were inaugurated in Japan with the enactment of the Taiho Code (大宝律令) in 701, which emulated China’s system of laws and ordinances (Ritsuryo legal code system). During the Meiji period (1868–1912), reforms in all fields, particularly government, finance, distribution, industry, economy, education, diplomacy, and religion, were implemented under the slogans ‘*Fukoku Kyohei* (富国強兵, rich country, strong army)’ and ‘*Shokusan Kogyo* (殖産興業, encouragement of new industry).’ Japan was transformed into the most rapidly modernized nation in Asia.

(2) Introduction and institutionalization of Western medicine

Medicine was reformed under a brand new system. Until the Edo period, the nation’s medicine had been Oriental medicine and physicians were trained under an apprenticeship system and conferred full mastership before practicing. In 1874, education and licensing systems were established for physicians and pharmacists by the Dajokan proclamation (the ‘*Isei*’ 76 articles of system enacted in 1874) in Tokyo, Kyoto, and Osaka, so that only those students who passed the national examination were permitted to practice medicine. Transitional measures included the granting of permits to existing physicians to continue practicing without examination. However, the *Yakuhoshu* (薬舗主, chemist-store owners) of the time (pharmacists in later years) received temporary permits until they passed the examination and received a full permit, which meant their vested rights were not protected.

Thus, the vested interests of Kampo medicine practitioners were acknowledged, but the new national examination did not cover Oriental medicine. In practical terms, German medicine became Japan’s new medicine. This inevitably meant that Oriental medicine could only continue as a folk medicine. It is possible that the government had intended Kampo medicine to eventually die out. The new system provided for the separation of medicine and pharmacy, although officially, physicians were permitted to carry on their past practice of dispensing medications. The reason for this may be that customarily, medical examination and treatment in Japan had long involved determining the patient’s pattern (証) and then dispensing Kampo medicines.

(3) Acupuncture and moxibustion in the Meiji period

Although the *Isei* relegated the status of acupuncture and moxibustion to that of a folk medicine, since 1880, young people with visual impairment continued to be trained in acupuncture, moxibustion, and anma in preparation for vocational independence (a private organization, *Rakuzenkai Kunmoin* [樂善会訓盲院]). Education for visually impaired people (schooling for the blind) was initially provided through private tuition and eventually through public funding, elevating the status of acupuncture, moxibustion, and anma training within the system of schooling for the blind. This is one of the reasons that acupuncture, moxibustion, and anma survived the Meiji period and persists to this day.

Yet, in 1885, the *Rakuzenkai Kunmoin* became a government school and the Ministry of Education, Science and Culture issued a directive that acupuncture education cease. In 1886, this prompted the school's principal, Ryokichi Yatabe, to commission Hiizu Miyake, Professor in the Faculty of Medicine at the University of Tokyo, to investigate the question 'Is it appropriate for people with visual impairment to practice acupuncture?' And in 1887, assistant Professor Horin Katayama from Miyake's office reported their findings. Katayama submitted their report entitled "*Shinji Saiyo Ikensho* (鍼治採用意見書)", concluding that '...having studied blind people practice needling...in the same way as the acupuncture schools that use...the finest gold and silver needles... they shall do no harm' (1). This approval for allowing visually impaired people to practice acupuncture put acupuncture and massage studies back into the schooling of visual impaired students in 1887 (restoration of departments of acupuncture and anma [針按科]).

Then in 1906, Kinnosuke Miura (Professor at the University of Tokyo and Miyake's adopted son-in-law) presented "*Shinjiho ni Tsuite* (鍼治法ニ就テ)" (2) a general literature review of research conducted during the Meiji period into the fields of history (Yu Fujikawa), anatomy (Koganei, Aoyagi), pathology (Yoshimura), and acupuncture (Sansaku Okumura) at the Second Japan United Medical Conference, thereby acquainting practitioners of Western medicine with the effects of acupuncture. And, in the early 20th century, Tekisai Okubo conducted research into acupuncture and moxibustion (3), as well as medical research based on human anatomy, proposing that acupuncture and moxibustion stimuli affect the heart through sympathetic nerves (4).

The records do not clearly indicate how many acupuncture and moxibustion practitioners there were in the Meiji period, but accounts put the figures for physicians and acupuncture and moxibustion practitioners in 1887 at 40,000 and 12,000, respectively, and the figures in 1897 at 39,000 and 24,400, respectively (5). The population of Japan in 1897 was approximately 38 million, which means there was approximately one acupuncture and moxibustion practitioner per 1560 people. Now, with a population of 130 million and 120,000 acupuncture and moxibustion practitioner license holders, there is one practitioner per 1000 people. Both sighted and visually impaired acupuncture and moxibustion practitioners would have been included in the figures for the Meiji period, and both would have carried out acupuncture and moxibustion throughout the Meiji period.

(4) Acupuncture and moxibustion from the Taisho to the middle Showa period

Acupuncture and moxibustion studies conducted by researchers in schools of Western medicine from the

Meiji period into the Taisho period (1912–1926) were even more successful. Jujiro Kashida (6), Shimetaro Hara (7), and Joichi Nagatoya (8), among others, presented reports on research into moxibustion. Hideturumaru Ishikawa of Kyoto University verified ‘afferent dual innervation,’ focusing on the relationship between the autonomic nervous system and the treatment efficacy of acupuncture and moxibustion. Various studies by Shin’itsu Ochi from the Kyoto Prefectural University of Medicine also investigated the effects of acupuncture, moxibustion, and massage on kidney function (9, 10), and by Hideji Fujii into pediatric acupuncture (11).

Refinement of the theories of acupuncture and moxibustion treatment efficacy led to use modern approaches and methods to investigate meridian and collateral, and meridian points, the focal points of acupuncture and moxibustion treatment. Michio Goto, for example, presented research into the Head’s zone concept (12); Tachio Ishikawa presented research into electro-dermal points, based on the concept of the organ body wall reflex (13); Yoshio Nakatani studied *Ryodoten* (skin conductance points), considering the possible relationship between points of transdermal resistance and meridian points (14); and Naosuke Onodera presented his research into *asshinten* (pressure diagnosis, trigger points correlating to specific diseases), an application of the trigger point concept (15).

Research into the clinical aspects of acupuncture and moxibustion was actively pursued from the Taisho to the early Showa period (1926–1989) with vigorous efforts being made to apply the findings of that research to treatment. As mentioned above, university professors and Western medical school physicians had been investigating acupuncture and moxibustion since the Meiji period, but acupuncture and moxibustion practice was investigated by practitioners who do not belong with academic institutes or university. They studied the classics and acupuncture and moxibustion practices in keeping with the classical concepts. This stream of endeavor was the mainstay of Japanese acupuncture and moxibustion after World War II.

The work of these practitioners is regarded as a classic of the revival movement. They advocated ‘going back to the classics.’ Sorei Yanagiya (16) led a group of these practitioners including Sodo Okabe (17), Keiri Inoue (18), Shohaku Honma (19), and Shin’ichiro Takeyama (20) to systematize their treatment under the name, meridian therapy.

There were other practitioners such as Ken Sawada (21), the founder of Sawada-school *Taikyoku Ryoho* (*TaiChi* therapy) and his pupil Bunshi Shirota (22). And the clinical practices of Katsunosuke Yagishita from Chiba prefecture, whose work revolved around the concepts in “*Shinkyuchohoki* (鍼灸重宝記)” (23) by Masatoyo Hongo (Edo period), was greatly influenced by the founders of meridian therapy (24).

(5) Acupuncture and moxibustion education from the Taisho to the early Showa period

The Regulation of Acupuncture and Moxibustion Practice (鍼術灸術営業取締規則), ‘Regulations’ below), enacted in 1911, were the first regulations implemented nationwide since the Meiji Restoration. The Regulations required that any person intending to become an acupuncture and moxibustion practitioner either graduate from a college designated by the prefectural governor or pass an examination after acquiring at least four years of practical clinical experience in acupuncture and moxibustion. In either case, a business license was also subsequently required. Acupuncture and moxibustion schools for the sighted had to be established

to provide the schooling stipulated under the Regulations. Kagoshima Acupuncture Cauterization College was the first of the acupuncture and moxibustion colleges established at the time (1911) and survives today.

The Regulations also stipulated that subjects for examinations: ‘Anatomy, physiology, sterilization, meridian points and forbidden points (禁穴), acupuncture and moxibustion practice’ (1. Structure of the human body; function of the main organs, and the relation between nerve vessels and muscles; 2. Needling and moxibustion methods for all body parts, meridian points, and forbidden points; 3. Sterilization synopsis; and 4. Practice of acupuncture and moxibustion).

Other subjects such as the classics of Oriental medicine, or an introduction to Oriental medicine, were not required which indicates there was no mandate to follow the classical theories of acupuncture and moxibustion. And although there was mention of meridian points and forbidden points, there is no mention of meridian and collateral, so we may assume that meridian points only were important.

Modern medical subjects, such as anatomy and physiology, were integrated into acupuncture and moxibustion. Importance was placed on acupuncture points rather than meridian and collateral (the meaning of acupuncture point in this context is closer to ‘stimulus point’) and their selection for treatment, suggesting a stronger tendency toward trigger point therapy and *ah-shi* point (阿是穴) therapy. This suggestion is supported by the contents of textbooks used at the schools established according to the Regulations. Besides covering acupuncture and moxibustion, almost all textbooks covered subjects stipulated in the Regulations. The material on acupuncture and moxibustion was based on acupuncture/moxibustion findings of research carried out during the Meiji period, as mentioned above (Michio Goto, Hideji Fujii, Kazuo Komai, etc.). The first time classical concepts were dealt with in a text book is thought to be Sorei Yanagiya’s discussion of the significance of the classics in his 1940 book “*Shogaku Yori Gokaku Made Shinkyu Igaku Zensho* (初学より合格までの鍼灸医学全書)” (25). Mitsugu Sakamoto’s 1942 textbook, “*Koto Shinkyu Igaku Kyokasho* (高等鍼灸医学教科書)” (26), refers to the four examinations method (四診法) among other topics (5).

Acupuncture and moxibustion were finally given official recognition in 1911, but it had been necessary to provide acupuncture and moxibustion education substantiated by findings of scientific studies. Opinion regarding acupuncture and moxibustion by practitioners of Western medicine was severe. This can be observed in Katayama’s “*Shinji Saiyo Ikensho*,” mentioned above. Specifically, ‘...Waichi Sugiyama and Sotetsu Ishizaka’s writings rely on Eastern medical concepts. They seek no grounds in anatomy, physiology, or pathology for their arguments. ...so, it goes without saying that Oriental medicine must be scientifically examined to determine its validity...’(1). According to physicians of Western medicine at the time, the effects of acupuncture and moxibustion had not been and needed to be medically validated.

In the Edo period, the classical theoretical foundations of Japanese acupuncture and moxibustion deepened under the influences of Chinese, Korean, and Western medicine, but there were also uniquely Japanese developments in theory, therapeutic equipment, and techniques. Westernization of Japan advanced in the Meiji period, while over the period from the Meiji to Showa period there was a strong impetus to Western medical acupuncture and moxibustion, in line with government policy. It is fair to say that the drive for scientific proof from that time, as same as current acupuncture, was an attempt to demand actual proof to acupuncture and moxibustion

Japanese acupuncture and moxibustion after World War II

Immediately after the war, in 1945, the first challenge encountered by practitioners of acupuncture and moxibustion was the mandate by US General Headquarters / Supreme Commander for the Allied Powers (GHQ/SCAP) to prohibit acupuncture, moxibustion, and anma. In response, Hidetsurumaru Ishikawa, the principal of Mie Prefectural Medical School (三重県立医学専門学校) at the time, submitted a petition to GHQ and the acupuncture, moxibustion, and anma practitioners organized an opposition movement across the country that effectively dissuaded GHQ. In 1947, the precursor to today's laws related to healthcare providers (e.g. Medical Practitioners Act, Dentist Act, etc.), the "Practice of Anma, Acupuncture, Moxibustion, Judo Therapy (Promulgation of Law No. 217 of 1947)" was approved. Then, following approval of the School Education Law (1947), new acupuncture and moxibustion colleges were established in rapid succession so that by the 1950s, acupuncture, moxibustion, and anma were being taught in 22 colleges. The laws governing acupuncture, moxibustion, and anma practitioners were significantly amended in 1988. Acupuncture and moxibustion education now involved a three-year tertiary course of study with national licensing. The education standard for acupuncture, moxibustion, and anma practitioners was brought into line with that for nurses and physiotherapists, with the eligibility requirements for examination being set at 93 units of successfully completed study (or 88 units for the two licences for acupuncturists and moxibustion practitioners). This meant the education standard had been lifted to the same examination eligibility level as that of allied health professionals in Japan. Then in 1998, the so-called Fukuoka decision (Note) (27) allowed for new acupuncture and moxibustion courses to be established and for student numbers to be increased, which opened the floodgates to a deluge of new acupuncture and moxibustion colleges and expansions in the first decade of the new century. In 2010, there were 4500 successful national examinees. In 2011, there were 92 colleges. This in turn created the problem of acupuncture and moxibustion practitioner quantity over quality, leading to fresh calls for improvement in the quality of acupuncture and moxibustion practices.

Thus, beginning soon after the war, both kinds of practitioners, those oriented toward Western medicine and those oriented toward classical Oriental medicine, flourished. But when in 1972 Sino-Japanese diplomatic relations were re-established, modern Chinese medicine (TCM) was introduced directly into Japan, and it started influencing Japanese practitioners again. So, in addition to the two older streams of medical practice, this new stream of modern Chinese medicine meant that three main streams had been introduced since about 1970.

There have therefore been several influences on theory and practice in Japanese acupuncture and moxibustion since the war. One influence is modern medical concepts and theory. This influence can be traced directly back to the *Isei*, the new medical system advocated by the Meiji government, which was discussed previously. The second influence is the concepts in '*keiraku (teki) chiryo*' (meridian-focused therapy) formulated in 1939–40, which are based on classic texts such as "*SuWen* (素問)," "*LingShu* (靈樞)," and "*NanJing* (難經)." The third influence is from modern Chinese medicine after interchange between the

two countries was re-established in the 1970s. There is also an eclectic influence in Japan, a distinct product of Japanese acupuncture and moxibustion, drawing on both Western and Eastern medical thinking, as well as Japanese and Chinese acupuncture and moxibustion. Beyond those, new developments deserve attention. While it is possible to incorporate the differing philosophies of acupuncture and moxibustion in Japan into a broad framework, a considerable number of practitioners will ignore such a framework. Rather, not few practitioners attend to their practice with the perspective of how they should engage with ill patients through therapy is their main concern. Acupuncture and moxibustion is becoming specialized. We can now find acupuncture and moxibustion treatment for aesthetic reasons (the term ‘cosmetic acupuncture and moxibustion’ is being used), sports acupuncture and moxibustion, ladies acupuncture and moxibustion, and so on. Academic research into each of these specialty areas is progressing.

An examination of these specialty areas follows.

(1) Western medical acupuncture and moxibustion

As mentioned above, there has been demand for the conduct of Western medical research into the fields of acupuncture and moxibustion from the Meiji period onward. Attempts have been made to Westernize it, to make it scientific, with Western physicians advancing the research into acupuncture and moxibustion. Anatomical and physiological research has been carried out and meridian points have been studied as well. Western medical acupuncture and moxibustion means the practice of acupuncture and moxibustion based on the Western medical approach, using Western medical theories and technology. In other words, in theoretical terms, pathological conditions and treatment site selection are understood from the perspective of Western anatomy and physiology. In technological terms, it means therapy using instruments devised by modern science, for example, running low frequency waves through inserted needles, or electro-moxibustion, a moxibustion therapy using electric heat. Arguably, this experiment with Westernization began in the late Edo period, when Sotetsu Ishizaka advocated the replacement of acupuncture and moxibustion terminology with Western medical terminology (28).

Furthermore, a movement to simplify acupuncture and moxibustion became apparent from the late Edo period. Shukei Suganuma (1706–1764) asserted in “*Shinkyusoku* (鍼灸則)” that only 70 points were required for acupuncture and moxibustion treatment. In the Taisho period (1918), the Report by the Research Committee on Meridian Point (經穴調査委員会報告書) (the so-called ‘*kaisei koketsu* [revised meridian points]’ [29]) recommended 120 points to the Ministry of Education.

Those espousing Western medical acupuncture and moxibustion rather than classical acupuncture and moxibustion also faced up to the criticism that ‘acupuncture and moxibustion were non-scientific therapies’ (used by GHQ after the Second World War to justify prohibiting acupuncture and moxibustion), and they took the view that the effectiveness of acupuncture and moxibustion ought to be scientifically validated.

After the war, this perspective was further developed to some extent by Katsusuke Serizawa, past director of the Acupuncture and Physical Therapy Teacher Training School at Tokyo University of Education (now University of Tsukuba). Serizawa was the first of 50 acupuncturists who (up to the year 2005) obtained a Ph.D. in medicine. Most of these were acupuncturists who do not belong with academic institutes or

university (30).

Other researchers to study acupuncture and moxibustion using modern methods include the following. Chifuyu Takeshige (School of Medicine at Showa University) attempted to elucidate the mechanisms of acupuncture analgesia (31). Masayoshi Hyodo (Professor of Department of Anesthesiology, Osaka Medical College) has been active in the development and dissemination of pain clinics, and has employed Oriental medicine in the treatment of various kinds of intractable pain (32). Chuzo Watari (Department of Anatomy, Nagoya City University) has conducted anatomical research into meridian points (33). The physiologist Takaaki Kumazawa (Nagoya University) has reported a close association between acupuncture analgesic effects and polymodal receptors (34). Akio Sato (Tokyo Metropolitan Institute of Gerontology [東京都老人研]) has studied the mechanisms of the autonomic nerve-mediated effectiveness of acupuncture and moxibustion (35). Ikuko Nishitani (Teikyo University) has investigated the effectiveness of moxa using heat-extracted mugwort constituents (36). Kazushi Nishijo (Tsukuba University of Technology) has investigated the effectiveness of acupuncture, particularly its effects on autonomic nerve function, using polygraph technology and thermography (37).

Other contributions include the measurement of heat sensitivity by Kobei Akabane (38); research into the effects of acupuncture and moxibustion for low back pain by Haruto Kinoshita (39); the dissemination of Sawada-school *Taikyoku Ryoho* (TaiChi therapy) by Bunshi Shirota (21); research into moxibustion therapy and meridian points by the renowned Showa moxibustion practitioner Isaburo Fukaya (40); and the theory of *Ryodo-raku* (Ryodo meridian therapy, Ryodoraku Medicine), which involves the measurement of electrical skin resistance and offers insights into meridian points, by Yoshio Nakatani (13).

Modern medical subjects such as anatomy, physiology, pathology, and hygienics account for 50% of the total curriculum in acupuncture and moxibustion education (see 4 ‘Eclectic acupuncture and moxibustion’ below). This system appears to support Western medical acupuncture and moxibustion. These Western medical theories of acupuncture and moxibustion are indispensable to contemplation of the effectiveness of acupuncture and moxibustion from the standpoint of evidence based medicine (EBM). In Western countries where acupuncture and moxibustion are being adopted or practiced, research on the effectiveness of these therapies in modern medical terms is ongoing.

(Note) Fukuoka Decision (福岡裁判): Stakeholders in the world of ‘judo therapy’ brought legal action against ‘unjust’ restrictions on training facilities for judo therapists, and won. The court’s decision resulted in the removal of restrictions on acupuncture and moxibustion, allowing for new schools and increased student intakes. The decision was made in the Fukuoka District Court, so it has been dubbed the ‘Fukuoka decision.’

(2) Classical therapy (Meridian therapy)

In 1939, a working group of acupuncture and moxibustion practitioners called the *Shinjin Yayoikai* (新人弥生会, New Yayoi Association) was formed. Meridian therapy is a therapeutic system based on theories devised until 1941 by its core members, Shin’ichiro Takeyama (20), Sodo Okabe (17), Keiri Inoue (18), and Shohaku Honma (18, 19). In 1940, the Nihon Keiraku Chiryō Gakkai (日本経絡治療学会, Japanese

Meridian Therapy Society) was established by Sorei Yanagiya, Sodo Okabe, and Keiri Inoue, and the Koten Shinkyu Kenkyukai (古典鍼灸研究会, Classical Acupuncture and Moxibustion Research Association) was established by Keiri Inoue and Shohaku Honma. Then in 1943, Hakko Baba established the Nihon Keiketsu Kenkyukai (日本経穴研究会, Japanese Acupoint Research Association).

Meridian therapy is based on theories set forth in texts such as “*SuWen*,” “*LingShu*,” “*NanJing*,” “*ShiSiJingFaHui* (十四経發揮, *Elucidation of the Fourteen Meridians/Channels*),” and “*Shinkyuchohoki*.” Its practices involve adjusting meridian qi (Ki) and blood by utilizing meridian points located distally to the elbows and knees, in accordance with the five phases, on the 12 meridians, which is based on the theory of the Chapters 69 and 75 in “*NanJing*.”

Japan parted ways with Germany following the start of World War I in 1914 (around the time meridian therapy emerged) and was seeking to free itself from the influence of that country. It was moving to establish its own form of military structure and its own medical practices: Japan was pushing on vigorously to build a country that was second to none. In the medical field, Japan was trying to develop its own system of medicine independent of Germany, even though modern Japanese medicine had followed German medicine. In 1915, pharmaceutical companies such as Tanabe Seiyaku Co., Ltd., Shionogi & Co., Ltd., Sankyo Co., Ltd., and Takeda Pharmaceutical Company Limited began producing pharmaceuticals; in 1922, the Health Insurance Act was passed and largely enforced by the military authorities; and in 1938, the National Health Insurance Act was enacted and the Ministry of Health and Welfare established. It was the time of the Taisho democracy, when the country wanted all things to be Japanese and emphasized Japan’s superior qualities. It was also a time when the nation rushed toward the outbreak of World War II.

Soon after the Meiji Restoration, the government planned to remove acupuncture and moxibustion from the national medical system. But subsequently, it gradually acknowledged the importance of acupuncture, moxibustion, and anma techniques, while broadly adopting Western medical thinking. However, unlike Western medical acupuncture and moxibustion, meridian therapy was based on the classics. The direction of its development appeared to be retrograde to the nationwide move toward Western culture and civilization. Western medical acupuncture and moxibustion shows up clearly in the thinking expressed in *kaisei koketsu* (revised meridian point), mentioned above, and leads to a proliferation of therapists who employ the acupuncture point method, trigger point method, acupuncture and moxibustion methods based on anatomy, physiology and pathology, and the simple selection method based on body cun. In contrast, meridian therapy takes the classical view that meridian and collateral, and meridian points are important and treatment should be founded on classical theory.

Meridian therapy is one of the main pillars that supported the development of acupuncture and moxibustion after the war.

As mentioned before, the acupuncturists who founded meridian therapy included Sorei Yanagiya, Sodo Okabe, Keiri Inoue, Shohaku Honma, and Shinichiro Takeyama. But there were others, including Hakko Baba, who became authority in Fukuoka and wrote “*Hari no Michi wo Tazunete* (鍼の道を尋ねて)” (41); Bunkei Ono, who translated “*Shinkyuchohoki*” into modern Japanese (42); and Kodo Fukushima (43), the visually impaired president of the Kampo Hari Igakkai (漢方はり医学会, Kampo Acupuncture Medical

Society).

(3) Acupuncture and moxibustion influenced by Traditional Chinese Medicine

Richard Nixon's visit to China in 1972 brought acupuncture and acupuncture anesthesia to the world's attention. It is a year that is very familiar to practitioners of Japanese acupuncture and moxibustion. However, many people may have forgotten that diplomatic relations between China and USA, and between China and Japan were re-opened in that year. But for practitioners of acupuncture and moxibustion in Japan, the possibility of direct exchange between China and Japan was even more significant than the media coverage given to acupuncture anesthesia. Those involved with Oriental medicine in Japan believed that attention should be directed to the re-opening of diplomatic relations between the two countries and that subsequent influences ought to be assessed.

It is fair to say that the Traditional Chinese Medicine of the 1970s was the 'modern Chinese medicine' that resulted from reassessment in accordance with *Mao Zedong's* proclamation on the establishment of the People's Republic of China in 1949. The work of *Cheng Danan* (承淡安) and *Luo Zhaoju* (羅兆瑀) from Shanghai had a strong and pioneering influence on the organization of this new Traditional Chinese Medicine. On his trip to Japan between 1934 and 1935, *Cheng Danan* learned that the country was pursuing modern medical research as well as classical research, and brought this knowledge back to China. It has indicated that this knowledge provided a great impetus to the revival of Oriental medicine in China (44), yet modern Chinese acupuncture and moxibustion subsequently developed in its own unique manner, resurrecting the study of acupuncture point actions (穴性学) and formed the study of meridian points, which was influenced by decoction theory. Acupuncture and moxibustion in Traditional Chinese Medicine is founded on decoction theory, while Japanese acupuncture and moxibustion and Japanese Kampo are founded on their own underlying theories, depending on the circumstances.

(4) Eclectic acupuncture and moxibustion

Western medical treatment, classical treatment (meridian therapy, etc.), and Chinese treatment have each been discussed here separately, however, researchers point out that in fact the acupuncture and moxibustion being practiced in Japan today is mostly an eclectic blend of these treatments (45). A survey conducted in 2011 revealed that of all the acupuncture and moxibustion treatments available in Japan, Western treatment accounts for 19.3%, classical for 17.3%, and Chinese for 3.1%, while eclectic treatment accounts for 50.3% (i.e., a mixture of Western and Oriental [East-West medicinal eclecticism] for 43.3% and a mixture of meridian therapy, and Chinese treatments for 7.0%; Figure 1). This important point must be kept in mind when contemplating "Japanese acupuncture and moxibustion."

The Kampo-Dutch eclectic school, a mixture of Dutch medicine and Kampo medicine, representing a blending of schools as well as a mixing of Gosei and Koho schools (Setchu and classicist schools) was already occurring in the Edo period. While on one hand some practitioners are wedded to one or the other of the therapies, the history of Japanese acupuncture and moxibustion is the story of practitioners who successfully adopt the thinking and methods from other schools into their practice. Given that the

Kampo–Dutch eclectic school was already mixing Oriental medicine (Kampo) and Western medicine (Dutch medicine) in the Edo period, it can be argued that East–West eclecticism spans more than 200 years.

Acupuncture and moxibustion based on Western medicine became important from the Meiji period on, as mentioned above. Active study was promoted, and the outcomes of Western medical research were taught as examination subjects under the title ‘Acupuncture and Moxibustion Studies.’ Of the 88 compulsory units currently required for national examination eligibility, about 15% are devoted to general education, about 50% to Western medical specialist subjects (calculated by converting into units the Western medical elements in the Western medical basic subjects and in the specialized acupuncture and moxibustion practice), and 35% to classical acupuncture and moxibustion studies (calculated by converting into units the classical elements in the basic classical acupuncture and moxibustion subjects such as introduction to Oriental medicine, and in the specialized acupuncture and moxibustion practice). This is the most common allocation, but the proportions vary between educational institutions. If we assume that students start practicing upon completion of this kind of education, the outcomes of the 2011 survey may actually reflect current schooling. In other words, Japanese acupuncture and moxibustion education is producing eclectic acupuncture and moxibustion practitioners.

(5) Other trends in acupuncture and moxibustion

Although the approaches to acupuncture and moxibustion treatment have been categorized here as Western medical, classical, Chinese medical, and eclectic, another movement is afoot that explores new possibilities for acupuncture and moxibustion by addressing treatment from the viewpoint of the entire patient, not just diagnosis or symptoms. This includes holistic acupuncture and moxibustion, and specialized forms of acupuncture and moxibustion. These approaches are briefly discussed below.

(1) Holistic treatment

The word holistic comes from the Greek word ‘holos’ (whole), and is derived from the noun ‘holism.’ The words “health” and “heal” are also derived from ‘holos.’ The current meaning of the term ‘holistic medicine’ is ‘medicine that views the person as a whole.’ Accordingly, practitioners who hold to this viewpoint proactively incorporate psychological care into their treatment (including care of aspects of health such as lifestyle and relationships) as well as physical care for pain, tension, induration of the skin, and so on.

So while its foundations may lie in Western philosophy and thought, the term ‘holistic’ refers to the medical practices of most cultures preceding the emergence of modern Western medical science, which placed importance on both the mind and the body. Oriental medicine is most certainly based on the mind-body unity. Therefore, the term ‘*Yojō* (養生, life nurturing)’ in Oriental medicine refers to holistic acupuncture and moxibustion practices. Holism is also recognized by a number of other systems that comprehensively resolve medical problems including: the folk remedies that attracted attention beginning in the middle of the 20th century; primary care medicine based on folk remedies; complementary and alternative medicine (CAM) that emerged in the 1990s; and integrated medicine

that emerged after that. Although holistic acupuncture and moxibustion are comprised of specific therapies 1) to 4) mentioned above, they are whole-person, whole-lifestyle approaches. This perspective is needed to improve treatment of lifestyle diseases

(2) Growth of areas of acupuncture and moxibustion specialization

A number of areas of acupuncture and moxibustion specialization including beauty, sports, ladies, and children have appeared in recent years. These forms of acupuncture and moxibustion are not whole body or ‘*honchiho* (本治法, treating the root)’ but rather have a specific focus. Some practitioners have pointed out that this trend is a deviation from the proper path of acupuncture and moxibustion development, however, from a historical perspective, one cannot be so sure. Oriental medicine differentiates into a large number of signs, for example, women’s diseases, pregnancy, and children’s diseases distinct from qi (Ki), wind, and heat diseases. At the same time, it incorporates branches and fields differentiated by symptoms, categorizing diseases such as spleen-stomach disease (脾胃病), nose, eye, ear, and tooth disease (*ZhuBingYuanHouLun* [諸病源候論, *Treatise on the Pathogenesis and Manifestations of All Diseases*]).

Surgery (*kinsoi* [金創医, surgeons]) was advancing in Japan even in the 15th to 16th centuries (the Muromachi period). Specialist gynecologists (Morisada Aki) began to appear, as did mouth and eye specialists. This system of medicine evolved further in the Edo period.

In that sense, specialization of acupuncture and moxibustion has always been a understandable trend.

(6) Acupuncture and moxibustion education in institutions of higher education (four-year universities and graduate schools)

Acupuncture and moxibustion education in modern Japanese institutions of higher education began in 1978 at Meiji College of Acupuncture and Moxibustion (now Meiji University of Integrative Medicine) after its beginning in China (1956 at present-day Beijing University of Chinese Medicine) and South Korea (1965 at Kyunghee University).

The establishment of acupuncture and moxibustion education at institutions of higher education in Japan was a response to criticism by Western medical schools that acupuncture and moxibustion needs further validation by scientific research (which had already begun in the Meiji period) and was also prompted by GHQ’s prohibition following World War II. However, facilities and operations standards need to be met and professors with excellent research and strong academic achievement records need to be recruited before such institutions can be established.

There were, however, only three Japanese acupuncture and moxibustion practitioners with a Ph.D. in medicine at the time that Meiji College of Acupuncture and Moxibustion was established: Katsusuke Serizawa, his pupil Kazu Mori, and Kazushi Nishijo. Considering the quantity and quality of the research on acupuncture and moxibustion throughout Japan at the time, it would have been very difficult to obtain approval to establish universities/colleges.

The following 11 institutions of higher education that teach acupuncture and moxibustion were established before 2012.

Meiji College of Acupuncture and Moxibustion (now Meiji University of Integrative Medicine, established 1978)

- Kansai College of Oriental Medicine (now Kansai University of Health Sciences, 1985)
- Tsukuba College of Technology (now Tsukuba University of Technology, 1987)
- Suzuka University of Medical Science (2004)
- Teikyo Heisei University (2004)
- Morinomiya University of Medical Sciences (2007)
- Kyushu University of Nursing and Social Welfare (2009)
- Tokyo Ariake University of Medical and Health Sciences (2009)
- Hamamatsu University (2010)
- Kurashiki University of Science and the Arts (2011)
- Takarazuka University of Medical and Health Care (2011)

In addition, four graduate schools were established, one offering a Ph.D. program: Graduate School of Acupuncture and Moxibustion at Meiji University of Integrative Medicine (Ph.D. in acupuncture and moxibustion available, established 1991); Graduate School, Kansai University of Health Sciences (2007); Graduate School, Suzuka University of Medical Science (2009); and Graduate School, Tsukuba University of Technology (2010).

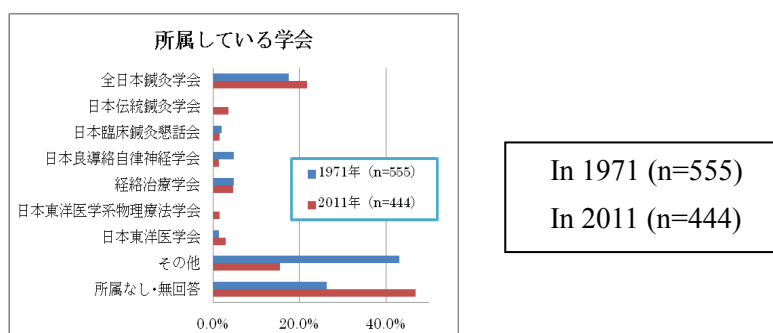
The phrase ‘acupuncture and moxibustion’ was included in the names of the first two universities to be established, but deleted after 2000. And the universities established since 2000 have ‘medical’ (or ‘nursing’ or ‘welfare’) in their names. This is due to a trend among educational institutions to shift from single-faculty acupuncture and moxibustion colleges to multi-faculty universities accommodating nursing, judo therapy, welfare, and so on. This shift springs from circumstances affecting the health occupations as well as the dramatic growth of vocational colleges beginning in 2000 due to the impetus from the so-called Fukuoka decision (see the note above) in 1988. The term ‘acupuncture and moxibustion’ has therefore been replaced by the term ‘medical,’ which can cover a variety of medical care-related departments co-existing with other departments. The name changes between the 1970s to 1980s and the 2000s tells us that the state and the character of Japanese acupuncture and moxibustion has changed a lot. From the 1970s on, Japanese institutions of higher education, led by Meiji College of Acupuncture and Moxibustion and Kansai College of Oriental Medicine, were, at first, home to single departments of acupuncture and moxibustion with doctors as fulltime teachers. But since 2000, multiple departments have been set up alongside the department of acupuncture and moxibustion and their faculty teach acupuncture and moxibustion alongside nursing, judo therapy, welfare, etc.

Japanese institutions of higher learning have contributed greatly to the advancement of Japanese acupuncture and moxibustion over the last 30 years. The focus of university research has been modern, scientific acupuncture and moxibustion. Moreover, while the various universities determine the content of their acupuncture and moxibustion courses, for all practical purposes, the content is constrained to a certain

extent by the content of the national examination that students are required to pass. In their role as Japanese acupuncture and moxibustion universities, they will probably need to determine their own educational content.

(7) Academic research into acupuncture and moxibustion

Looking back over the years since World War II, acupuncture–moxibustion research and study has tended to shift from individuals and small research groups to national research associations and societies. This shift was detected by the 2011 survey (45). Accordingly, the following is a summary of Japanese academic societies and journals. Academic societies of Japanese acupuncture and moxibustion are divided into ‘societies whose purpose is academic research into acupuncture and moxibustion’ and ‘related associations in the main medical fields, veterinary science, and dentistry and that also pursue academic research into acupuncture and moxibustion’ (46).



Societies that Japanese acupuncture-moxibustion practitioner/researchers belong to

全日本鍼灸学会：The Japan Society of Acupuncture and Moxibustion

日本伝統鍼灸学会：The Japan Traditional Acupuncture and Moxibustion Society

日本臨床鍼灸懇話会：The Japan Conference of Clinical Acupuncture and Moxibustion

日本良導絡自律神経学会：The Japanese Society of Ryodoraku Medicine

経絡治療学会：(The Society of) Traditional Japanese Medicine

日本東洋医学系物理療法学会：Japanese Society of Oriental Physiotherapy

日本東洋医学会：The Japan Society for Oriental Medicine

その他：Others

所属なし・無回答：Not belong to any societies or no answer

Cited from: Ogawa et al. *Current survey of the acupuncture and moxibustion* (in detail) (第5回現代鍼灸業態アンケート集計結果【詳報】). *Jpn J Acupunct Manual Ther.* 70(12):201-44, 2011 (in Japanese)

The acupuncture and moxibustion societies below meet the following criteria: the senior members conduct

research into acupuncture and moxibustion-related topics; they hold annual research conferences that feature presentations by members; and they have a journal or equivalent publication for the presentation of research. The membership figures below are based on the figures published on each society's website and are the latest figures for 2011.

(1) The Japan Society of Acupuncture and Moxibustion ([社] 全日本鍼灸学会, 3100 members)

This is the only acupuncture and moxibustion-related society in Japan that is incorporated (approved by the Ministry of Education, Culture, Sports, Science and Technology). It has the largest membership of all the acupuncture and moxibustion societies in Japan. It has a 60-year history.

The members are university researchers, primarily, as well as acupuncture and moxibustion researchers with classical, modern, and Chinese medical viewpoints. The fields of research are very broad.

Members receive five issues of "*The Journal of the Japan Society of Acupuncture and Moxibustion* (全日本鍼灸学会雑誌)" annually. There is also an English online journal at <http://www.jsam.jp/>.

(2) The Japan Traditional Acupuncture and Moxibustion Society (日本伝統鍼灸学会, 800 members) was established primarily by the Traditional Japanese Medicine (日本経絡治療学会), *Koten Shinkyu Kenkyu Kai and Myaku Gakkai* (古典鍼灸研究会 付脉学会, Classical Acupuncture and Moxibustion Research Association and Myaku Association, 古典鍼灸研究会 付脉学会), and Meishinkai (明鍼会) in 1973. Originally its name was the "the Japan Meridian-Flow Society (日本経絡学会)" but changed in 2001 to its present name. The society focuses on academic and clinical research from a classical Japanese perspective.

Members receive two issues of "*The Journal of Japan Traditional Acupuncture & Moxibustion Society* (伝統鍼灸)" annually. The society does not publish any material in English. <http://jtams.com/>

(3) The Japan Society for Oriental Medicine (日本東洋医学会, 8250 members) was established in 1950. It is one of the special interest groups affiliated with The Japanese Association of Medical Sciences (日本医学会). It contributes to the advancement and dissemination of Oriental medicine by sponsoring symposiums and conferences that present research into Eastern medical topics (Kampo medicine, acupuncture and moxibustion, crude drugs, and Japanese medicine), and it aims to contribute to academic and cultural development.

Members receive six issues of "*Kampo Medicine* (日本東洋医学雑誌)" annually. <http://www.jsom.or.jp/>

(4) (The Society of) Traditional Japanese Medicine (経絡治療学会, 1500 members) was established in 1940 by Sodo Okabe and Keiri Inoue, and has played a leading role in the establishment of meridian therapy studies. The name of Keiraku Chiryō Gakkai was the society of Meridian Therapy at the beginning, and is currently Traditional Japanese Medicine. Meridian therapy counts *SuWen*, *LingShu*,

and *NanJing* as its source texts, and pattern-based therapy using pulse diagnosis as one of its characteristic features. Treatment is based on the selection of points according to the theory of Chapters 69 and 75 in *NanJing*, and to supplementation and draining of deficiency/excess of the 12 meridians. The society sponsors an annual university summer school and regular branch meetings.

“*Keiraku Chiryō* (経絡治療, *Meridian Therapy*)” is provided to members quarterly. The society publishes no materials in English. <http://www.tjmed.com/>

(5) The Japanese Society of Ryodoraku Medicine (日本良導絡自律神経学会, almost 800 members) was established in 1960 under the leadership of Yoshio Nakatani. About half of the members are doctors and half acupuncture and moxibustion practitioners. Member conduct scientific research with the goal of explaining the efficacy of acupuncture and moxibustion in modern medical terms (particularly in neurophysiological terms).

“*The Japanese Journal of Ryodoraku Medicine* (日本良導絡自律神経学会誌)” is published quarterly. The society publishes no materials in English. <http://www.jsrm.gr.jp/>

(6) The Japanese Society of Oriental Physiotherapy (日本東洋医学系物理療法学会) is an offshoot of the Japan Acupuncture and Moxibustion Masseurs Association (全日本鍼灸マッサージ師会) established in 1975. Professor Emeritus Katsusuke Serizawa of the University of Tsukuba was the driving force behind its establishment. Most of the papers published by the society investigate the effectiveness of acupuncture and moxibustion from a physiotherapy perspective.

“*The Journal of the Japanese Society of Oriental Physiotherapy* (日本東洋医学系物理療法学会誌)” is provided to members annually. The society publishes no materials in English. <http://jsop.info/>

(7) The Medical Society of Acupuncture (医師東洋医学研究会) was established in 1973 and became the Japan Eastern Medical Association (日本東方医学会) in 1983. The first president was Yoshio Manaka. It is the first organization to be recognized by the Ministry of Health, Labour, and Welfare. The association’s goal is “to provide opportunities for presentation of academic research that combines the three elements of Traditional Chinese medicine, Japanese Kampo medicine, and modern Western medicine.”

“*Eastern Medicine* (東方医学)” is published quarterly. The society publishes no materials in English.

<http://www.jptoho.or.jp/zaidan/gakkai/index1.html>

(8) The Japan Conference of Clinical Acupuncture and Moxibustion (日本臨床鍼灸懇話会) is the successor to the Japan Acupuncture and Moxibustion Electrodermal Research Association (日本針灸皮電研究会), which was inaugurated in 1960. Its current name was adopted in 1983. The conference’s aim is ‘to contribute to the advancement and dissemination of acupuncture and moxibustion medical care and to improve the qualities of clinical acupuncture and moxibustion practitioners.’

“*Clinical Acupuncture·Moxibustion* (臨床針灸)” is published three times annually. No materials are published in English. <http://konwakai.com/fram8.html>

(9) The Japan Society of Acupuncture & Moxibustion History (日本鍼灸史学会) studies the classical texts from a philological perspective. It was launched in 1993 as the Japan Acupuncture and Moxibustion Clinical Literature Society (日本鍼灸臨床文献学会), but adopted its current name in 2004. The object of the society is to research the classical acupuncture and moxibustion texts.

“*The Japan Society of Acupuncture & Moxibustion History Collected Works* (日本鍼灸史学会論文集)” is provided annually to members. The society publishes no materials in English.

<http://jsamh.org/>

(10) Oriental Medicine and the Pain Clinic (東洋医学とペインクリニック) was established by Masayoshi Hyodo of Osaka Medical College. It focuses on research into the interrelations and reciprocal integration of Western and Oriental medicine, and publishes research and case reports on acupuncture and moxibustion, Kampo, block injection, and so on, for pain disorders.

“*Oriental Medicine and the Pain Clinic* (東洋医学とペインクリニック)” is published annually.

http://www.osaka-med.ac.jp/~ane000/painclinic_05.html

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Meridian and Collateral study and Meridian Point study

Shuichi Katai

Standardization of Meridian Point

Meridian points have been standardized several times in the history of Oriental Medicine. To begin with, the system of meridian point study was formulated during the establishment of “*HuangDiNeiJing*, (黄帝内经),” comprising “*SuWen* (素問)” (1) and “*LingShu* (靈樞)” (2). This can be regarded as the first attempt to standardize meridian points. Later, during the Song Dynasty, the government ordered the publication of a tome on meridian points. Many published books continued to have a lasting impact and probably played a part in promoting standardization. These books are namely, “*MingTangJing* (明堂經)”(3), “*ZhenJiu JiaYiJing* (鍼灸甲乙經)” (4), “*MaiJing* (脈經)” (5), “*TongRenShuXue ZhenJiuTuJing* (銅人腧穴鍼灸圖經)” (6) and “*ShiSiJingFaHui* (十四經發揮)” (7).

The Standardization Effort in Modern Times

1) Before Standardization in Japan

In Japan, state-level standardization of meridian point locations did not take place, strictly speaking, until the Edo Period (1603–1868). In the Edo Period, advances in printing technology led to the publication of various medical texts. The most widely circulated books on acupuncture and moxibustion—“*ShiSiJingFaHui*” were by the Yuan Dynasty’s *Hua Shou* and “*NanJingBenYi* (難經本義)” (8) . The books relating to the practices of Waichi Sugiyama, the supposed inventor of method of needling with a guide tube were also widely read. Since Sugiyama ran an acupuncture training school officially licensed by the Edo government, we can surmise that some of his books intended to standardize the teaching of acupuncture practices. These include “*Sugiyama-ryu Sanbusho* (杉山流三部書)” (9) published by Ryo Akashiya in 1880 and “(*Hiden*) *Sugiyamashindenryu* (秘傳・杉山真傳流)” (10) reprinted in the Heisei period (2009). Other notable books include Ippo Okamoto’s “*Shinkyu Azeyoketsu* (鍼灸阿是要穴)” (11) and “*Jushikeihakki Wagosho* (十四經發揮和語鈔)” (12). These are said to be the most widely circulated publications in Japan as commentary on “*ShiSiJingFaHui*” and, as such, are examples of influential publications, which de facto promoted standardization in Japan.

After the Meiji Restoration (around 1868), acupuncture and moxibustion became a folk remedy. However, acupuncture and moxibustion societies continued to campaign for government recognition. Finally in 1885, the license system for acupuncture and moxibustion practice (鍼術灸術營業取締方) went into effect, recognizing these societies and bringing the practice of acupuncture and moxibustion under local government control. In 1911, the regulation of Acupuncture and Moxibustion Practice (1911) (鍼術灸術營

業取締規則: 'Regulations') were adopted. These recognized acupuncture and moxibustion officially for the first time on a national government level albeit in the form of operational regulations. Meanwhile, the education of visually impaired persons started in around the 1870s. in schools for the blind and deaf in Kyoto (盲啞院, *Moain*) and in the training school for the blind in Tokyo (樂善会訓盲院, *Rakuzenkai Kunmoin*). In 1903, a training facility for teachers of the blind (now the Acupuncture and Physical Therapy Teacher Training School, University of Tsukuba [筑波大学理療科教員養成施設]) was established. The Regulations decreed the establishment of schools for sighted students, and in 1911, the Kagoshima Acupuncture Cauterization College was founded. This is one of the oldest vocational colleges still in existence. A lecturer at the College at the time, Shirobei Matsumoto, wrote "*Shinkyu Keiketsugaku* (鍼灸經穴学)" (13) published in 1911. This book contained the basic elements found in today's Japanese textbook on acupuncture and moxibustion meridian points studies, including point location, anatomy, therapy methods, principal outcomes, and indications.

The training of visually impaired persons in acupuncture and moxibustion was begun around the 1870s. After the promulgation of the 'Regulations,' the twin-track education system of sighted and visually impaired students was created. Generally taught were those subjects that the 'Regulations' stipulated for examination, namely, anatomy, physiology, disinfection, meridian points, forbidden points (禁穴), and acupuncture and moxibustion practice.

2) Attempts at Standardization of Meridian Point in Japan

As mentioned above, the school system for acupuncture, moxibustion, and massage therapy developed in Japan. In November 1913, the Ministry of Education set up the Research Committee on Meridian Point to study meridian points. The Committee had six members: Kodo Yoshida, Heikichi Tomioka, Yu Fujikawa, Norifumi Machida, Gakutaro Osawa, and Hiizu Miyake. Yoshida devoted his energy to building the Sugiyama Shrine and establishing *Sugiyama Kengyo Itoku Kenshokai* as well as *Onchisha* (温知社) (Note). Tomioka administered massage to patients in the University of Tokyo Hospital and was called Japan's first hospital masseur. He also taught at the Tokyo School for the Blind (東京盲学校: current the Special Needs Education School for the Visually Impaired, University of Tsukuba [筑波大学付属視覚特別支援学校]). Fujikawa (M.D., D. Litt.) had studied medicine at the University of Jena in Germany. After his return from Germany, he wrote a vast number of books relating to diverse fields of medicine. His contribution to the History of Medicine was his great achievement (14). Machida was a specialist in education and not a doctor or a practitioner of acupuncture and moxibustion. He became the first principal of the Tokyo School for the Blind, which was formed after the Tokyo vocational training school for the Visually and Hearing Impaired (東京聾啞学校) split into the School for the Blind and the School for the Deaf (東京聾学校) in 1910. The teaching of massage and acupuncture has been important for the vocational independence of visually impaired people since the Edo Period (1603-1868). Although there was a time in around the 1870s when acupuncture had no official recognition, Machida as the first head of the Tokyo School for the Blind worked tirelessly to reintroduce acupuncture into the educational system for the blind. This was probably the reason why Machida was appointed to the Committee. Teaching at the Tokyo School for the Blind were Sansaku

Okumura (15, 16) and Shoin Hagioka. Later, Tomioka became a full-time teacher of acupuncture, moxibustion, and massage. Okumura wrote a book on acupuncture therapy. Gakutaro Osawa (M.D., D. Sc.) had studied in Germany and was appointed department chair Professor of Anatomy at the University of Tokyo in 1900. Hiizu Miyake was a professor at the University of Tokyo and was the first to be awarded a doctorate of medicine from the University of Tokyo, but was deeply involved in acupuncture and moxibustion practice. When commissioned to investigate whether or not visually impaired people should be allowed to administer acupuncture, he asked his assistant professor Horin Katayama to conduct the research. Katayama's findings appear in his report to the government, “*Shinji Saiyo Ikensho* (鍼治採用意見書) (17).” In this report, Katayama approved of allowing blind people to practice acupuncture. This gave impetus to the reinstatement of acupuncture into the curriculum of students at the Tokyo School for the Blind and other blind schools. Miyake’s son-in-law, Kinnosuke Miura, lectured doctors of Western medicine in academic meetings and elsewhere on the effectiveness of acupuncture and moxibustion (18). Thus, those appointed to the Research Committee on Meridian Point were all holders of public positions relating to acupuncture and moxibustion in and out of the medical circles or academia of the day.

(Note) *Onchisha* (温知社): This organization was established in Tokyo in 1879. It resisted the Meiji government’s policy of promoting Western medicine, advocated the preservation of Kampo, and counted more than 100 acupuncturists in Tokyo alone among its members.

The Committee submitted its report to the Minister of Education Ryohei Okada in April 1918. In December of that year, the Report by the Research Committee on Meridian Point (経穴調査委員会報告書) (19) (see Photo 1 below; “Meridian Point Report [報告書]”) was published. The Preface states that Fujikawa conducted research into historical aspects while Osawa made anatomical observations, and if opinions regarding the name and position of *koketsu* (acupuncture point, 孔穴[kong xue]) differed, Yoshida and Tomioka administered acupuncture on a cadaver and then dissected it to determine the location. As this procedure demonstrates, the investigation of the acupuncture point at the time was very meticulous.

The Meridian Point Report stated in the first of the six sections of its Preface, ‘As the meridian points are plotted along the flow of the meridian, where several points are in proximity to each other, confusion tends to arise,’ and ‘To avoid confusion, the theory that each point is linked to a meridian was discarded, and we renamed '*keiketsu* (meridian point),’ reverting to the older appellation of '*koketsu* (孔穴).’ In sections 2 and 3, the authors indicated that there were discrepancies in the number of meridian points among texts such as the “*MingTangJing*,” “*Ishimpo* (医心方),” and “*ShiSiJingFaHui*.” Saying that ‘In view of the relationship between parts of the body, the *koketsu* that are considered not to be important were eliminated and the *koketsu* that are shown in the figure on the left were chosen,’ the Report designated 120 points as *koketsu* puncture points, after excluding points deemed not to be significant. Dividing the body into seven sections, lateral lines were drawn across the head and the abdomen. The body was divided into 20 parts altogether and the 120 points were positioned simply. Section 4 of the Preface refers to the location of points by bone proportional cun, saying that although this method is in use, there is no uniformity of theory and therefore

‘the anatomical position is shown.’ However, many of the locations of *meridian* points are actually indicated by measurement for locating points. Indeed, this measurement is based on the body cun (finger cun, f-cun, which uses the length of the finger as standard unit of measure) and not the bone standard method. Section 5 recommends that the practitioner’s finger be used in adult patients and the patient’s finger be used in pediatric patients.

Thus, 120 *koketsu* were identified by the Meridian Point Report and came to be known as ‘*kaisei koketsu* (revised *meridian point*).’ However, this revision was not very well received and was not actively promoted or put into practice. Notwithstanding, it is noteworthy that the Ministry of Education attempted to standardize *meridian point* and needling-prohibited point, which were examination subjects according to the Regulations. What is more, the method of locating points by the bone standard was already being refuted by this time, while the method of locating points by anatomical position was being attempted. The finger-cun measurement method was adopted and recommended as the method of measurement and continues to have a huge impact on meridian point location in Japan to this day. To illustrate, even today, practitioners are almost always trained using the finger-cun method when point location is attempted practically by body proportional standard. The origin of this practice would seem to date back to the publication of this Meridian Point Report. On the other hand, the 2006 WPRO Regional Meeting on Development of WHO Standard Acupuncture Point Locations uses four principles to identify 361 points as stated in the ‘Principles for locating acupuncture points on the surface of the body’ The first of these four principles is that ‘priority is given to the anatomical landmark method when it does not conform to body cun measurement (20).’ One could say that the 1918 report by the Research Committee on Meridian Point was nearly a hundred years ahead of its time in this respect and perhaps that its ideas influenced the four principles implemented by the WHO in 2006.

In the early 20th century (the latter half of the Meiji Period), the study of acupuncture, moxibustion, and massage by visually impaired people became established in schools for the blind. The School Education Law enacted in 1947 required one or more schools for the blind to be established in each prefecture in Japan. Thanks to this law, the system of schools for the blind as we know it today was created by the 1950s, and meridian points were taught through public education. Acupuncture and moxibustion training was thus provided through two channels—schools for the blind and specialist colleges.

The law was revised in 1988. The major change was in the length of acupuncture and moxibustion training, which changed from five years following junior high school graduation to three years following senior high school graduation. Textbooks for schools for the blind and for colleges respectively were created as aids for teaching meridian points. The number of meridian points at the time was 354 and the number of meridian vessels was 14 (12 main meridians and 2 extra meridians [the governor vessel and conception vessel]). This can be regarded as an attempt to standardize acupoints in line with the Japanese approach used since the Edo Period, which paid most heed to “*ShiSiJingFaHui*” (7).

3) Activities of the Japanese Acupoint Committee (日本経穴委員会)

Such were the developments in Japan. Meanwhile, the WHO/WPRO (WHO Western Pacific Regional Office) led the effort to standardize acupuncture and moxibustion. Given below is a brief summary of events.

The Japanese Acupoint Committee was established in 1965 and its initial deliberations were on meridian points. The International Committee on Standardization of Meridian and Points (Japan, Australia, the Philippines, and South Korea) met in September 1974. In preparation for this meeting, the Japanese Acupoint Committee (日本經穴委員会) was re-established in Japan in 1973, with eleven organizations relating to acupuncture and moxibustion taking part. Joining this international effort, Japan began to take steps to standardize meridians and points. ‘The Japanese Acupoint Committee’ refers to the committee formed in 1973. In 1978, the Japanese Acupoint Committee examined the references in 55 classic texts on meridian points. This resulted in the “*Keiketsu Shusei* (經穴集成)” (21) that lists 59 classic reference texts for each meridian point on two facing pages.

In May 1981, the first meeting of representatives from Japan and China was held in Tokyo. This meeting confirmed the existence of 361 meridian points, with locations determined anatomically using a body chart and their Chinese names retained. It was also decided that locations were to be identified according to “*SuWen*” and “*LingShu*.”

After this, meetings were held in August and November of the same year and in August 1982 in Beijing. In the fourth meeting held in August 1982, China proposed that pinyin should be chiefly used for notation and Japan proposed that new standard lines other than meridian vessels should be adopted. Both these proposals were to be deliberated further by representatives from each country.

In December 1982 in Manila, where the WPRO office is located, a meeting of the First WHO Working Group for the Standardization of Acupuncture Nomenclature was held. There were nine participating nations, namely Japan, China, South Korea, Hong Kong, Australia, the Philippines, New Zealand, Singapore, and Vietnam. The Group agreed that the meridian vessels should be given English names, alphanumeric codes, pinyins, and Chinese character notations.

The Chinese characters to be used for both meridian and collateral and meridian point (經絡, 經穴) were to be traditional characters (unsimplified Chinese characters, old characters; simplified characters to be Chinese, Japanese, and Korean characters in that order). Thus a meridian was to be described, for example, in the case of the lung meridian, as ‘Lung meridian, LU, Feishu, 肺經.’

The Advisory Council meeting held in Tokyo in 1984 was attended by representatives from eight nations (Japan, China, South Korea, Hong Kong, Australia, the Philippines, New Zealand, and Vietnam). Meeting participants suggested the addition of extra points, basic lines (基本線), meanings of meridian point names, and 14 scalp acupuncture lines (頭鍼線). With regard to extra points, the more frequently used points described in references dated 1900 or earlier were selected. Points that were described in references in or after 1901 and had reliable clinical efficacy were termed new points. However, both sets of points are regarded together as extra points. In May of the same year, the WHO/WPRO published its Standard Acupuncture Nomenclature (22).

In July 1985, the Second WHO Working Group for the Standardization of Acupuncture Nomenclature took place in Hong Kong. The participants were from nine nations (Japan, China, South Korea, Hong Kong, Australia, the Philippines, New Zealand, Singapore, and Vietnam).

The Meeting compiled the English names for extra points and translations into English of the meaning

of characters used for meridian points. Meanwhile, participants from China insisted that the creation of basic lines other than meridian and collateral (經絡) (as proposed by the participants from Japan) were unacceptable.

In June the following year, 1986, the Third WHO Working Group for the Standardization of Acupuncture Nomenclature was held in Seoul. Six nations attended, namely Japan, China, South Korea, the Philippines, Singapore, and Vietnam. Meeting participants agreed on the 48 ear points. Agreement was also reached on standard nomenclature of the 9 classical needles, 4 modern needles, and 6 of 36 bone cuns. However, debate on the Japanese proposal on basic lines was postponed. Meeting participants also agreed that the new standardized terminology should be disseminated and promulgated.

In October 1989, the WHO Scientific Group on International Acupuncture Nomenclature was held in Geneva. A total of 20 nations took part, including Japan, China, and South Korea. This meeting was the end of the series of meetings concerning acupuncture and moxibustion terminology. Although some decisions emanated from the meeting, no decision could be reached on the location of meridian points and each nation was to consider the matter further. It was agreed that the basic principles to follow in so doing were: 1. Use references that are oldest and with clear descriptions of the location. 2. Express locations using modern anatomical terminology. 3. If anatomical expression is difficult, designate an anatomical point of reference and from the point calculate even distances as a proportion of the standard cun measurement of a local body region as described in the classical texts. The effort to standardize acupuncture and moxibustion terminology led by the WHO is very important. Terms that had been diversely used and interpreted by each nation were integrated into a common language. However, the locations of meridian points were not standardized, and this remains an issue.

Subsequently, the “*Hyojun Keiketsugaku* (標準經穴学 (23), Ishiyaku Publishers, 1989)” was published in Japan by the Japanese Acupoint Committee, but terminology and meridian point locations were not yet standardized either in Japan or elsewhere, and its content could not be standardized. Two school textbooks were published: the “*Keiraku Keiketsu Gairon* (經絡經穴概論)” (24) edited by the Japan College Association of Oriental Medicine and “*Kiso Riryogaku II* (基礎理療学II)” (25) edited by the Editorial Committee on Books for Use in Teaching Acupuncture, Moxibustion and Manual Therapies in Schools for the Blind (盲学校理療科用図書編集委員会). In 1989, the same point locations of points were unified by acupuncture and moxibustion colleges and schools for the blind. However, the textbooks were written separately and their contents and notations lacked uniformity. In China meanwhile, acupuncture and moxibustion terminology was included in the National Standards (GB: Guójiā Biāozhǔn) in China and adopted as the national standard. In South Korea, the books on meridian point studies used in schools obviously did not meet the standards recognized internationally. As was mentioned above, an important publication of the Japanese Acupoint Committee (1987) is the “*Keiketsu Shusei*” (21).

The decisions made by the WHO before 1989 are listed in Table 1. The standardization was only of extremely basic elements and terminology and not extensive. For example, Table 2 lists eight terms for meridians and points, which are basic technical terms used in acupuncture and moxibustion. The list in Table 1 is extremely short. However, the WHO International Standard Terminologies on Traditional Medicine (26)

published in August 2007 listed 234 acupuncture terms and 39 moxibustion terms. This achievement should be viewed positively as the first step towards standardization.

For some terms and their English notations before 1989, refer to the WHO/WPRO Standard Acupuncture Point Locations, Official Japanese Edition (20).

Table 1: WHO Standardization up to 1989

1. English notations of the basic terms
2. English names and notations of the twelve meridians
3. English names and notations of the eight extra meridians
4. The number of meridian points (14 meridians); 361 points, notations
5. Names of the 48 extra points and their notations
6. Names and positions of the specific lines (14 lines) in scalp acupuncture
7. Names and English notations of acupuncture instruments and their parts
8. Names and English notations of the nine classical needles
9. Names and English notations of the four modern needles
10. Bone proportional cun, finger cun

Table 2: Basic Technical Terms of Acupuncture and Moxibustion

- 経 — Meridian
- 絡 — Collateral
- 経絡 — Meridian and Collateral
- 正経 — Main Meridian
- 奇経 — Extra Meridian
- 経穴 — Meridian Point
- 奇穴 — Extra Point
- 鍼灸穴（腧穴） — Acupuncture Point

4) The Second Stage in Standardization

The Japanese Acupoint Committee was dismantled after the 1989 meeting of the WHO Scientific Group on International Acupuncture Nomenclature held at the WHO headquarters in Geneva. Its duties were to be transferred to the research chapter committee of the Japan Society of Acupuncture and Moxibustion (全日本鍼灸学会研究部) (current the Meridian Point Research Committee [経穴研究委員会]). As was mentioned above, after the publication of “*Hyojun Keiketsugaku*” (23), the Meridian Point Committee (経穴委員会) of the Japan Society of Acupuncture and Moxibustion carried out bone proportional cun research (under Chairman Kunihiko Hamazoe) and anatomical and clinical research (under Chairman Kansho Yamada), but none on standardization of meridian points in Japan.

In February 2003, a letter to Yukio Kurosu in Japan from *Wang Xuetai* in China called for the

resumption of discussions aimed at the standardization of meridian point locations.

In response, the first Informal Consultation Meeting on Development of International Standard Acupuncture Point Locations (WPRO, Manila) was held in October 2003 under the auspices of WHO/WPRO. In this meeting, a guideline for the standardization of meridian point locations was discussed. Participants agreed to take concrete steps towards standardization.

In response to the call for standardization of meridian point locations by the WHO/WPRO, Japan officially inaugurated the Second Japan Meridian Point Committee on April 24, 2004. The Committee was set up by five organizations, the Japan Society of Acupuncture and Moxibustion, Japan Acupuncture and Moxibustion Association, Japan College Association of Oriental Medicine, Japan Association of Massage & Acupuncture Teachers, and Japan Society for Oriental Medicine. The Committee formed a working group comprised of seven members, the chairperson, a nominee of the chair, and one representative each from the five organizations. Actual deliberations on meridian point locations began.

Table 3 lists the members of the Working Group.

Table 3: Members of the Second Japan Meridian Point Committee Working Group

Chairperson	Shuichi Katai (Japan Society of Acupuncture and Moxibustion)
Vice Chairperson	Shoji Shinohara (Japan Society of Acupuncture and Moxibustion)
Secretary	Shunji Sakaguchi (Japan College Association of Oriental Medicine)
Members:	Hisatsugu Urayama (Academic Officer of Traditional Japanese Medicine, chairperson's nominee)
	Yasuhiro Kawahara (Japan Acupuncture and Moxibustion Association)
	Toshimitsu Katori (Japan Association of Massage & Acupuncture Teachers)
	Kenji Kobayashi (Japan Society for Oriental Medicine)

As shown in Table 4, subsequently six meetings on standardization were held with the participation of Japan, China, and South Korea. One official international meeting was held and four task force team (TFT) meetings were held. In Japan, the Working Group met 49 times and engaged in various activities (20) relating to preparation for the three-nation standardization meetings, TFT meetings, and the international meeting, scrutiny of the agenda and content, and discussion of meeting arrangements. Some of the Working Group sessions involved overnight stays. The three-nation meetings were normally held over three days. Participating members always stayed up late into the night to discuss the content of the meeting to take place the following day.

Over the three days between October 31 and November 2, 2006, the Formal Consultation Meeting was held at the International Congress Center in Tsukuba, Ibaraki. Representatives from nine nations, two organizations, and the WPRO Councillor attended the meeting. The locations of 361 points were all finalized, but the notations of dual locations for only six meridian points, GV26 (水溝), LI19 (禾髎), LI20 (迎香), PC8 (劳宫), PC9 (中衝), GB30 (環跳), were adopted.

These decisions made at the Formal Consultation Meeting related to meridian points that were different from those previously taught in schools in Japan. Seven extra points and three alternative points based on other theories were made correct points; eighteen points resulted from the change in bone-cun measurement, three points resulted from the change in kanji notation/naming, and more than eighty points were adopted for other reasons. Over forty points were changed for different reasons as a result of the deliberations on location.

Then, in line with the decision of this Formal Consultation Meeting in Tsukuba, the WHO Standard Acupuncture Point Locations in the Western Pacific Region (27) (Photo 1) was published by the WHO/WPRO in May 2008. In its English version, one figure is attached to each point. This publication was compiled by a collaborative effort of the Second Japan Meridian Point Committee and Ido-No Nippon Sha.

The Second Japan Meridian Point Committee published the official Japanese edition (28), a translation from the English version (Photo 2), and published “*Syokai Keiketsubui Kanzen Gaido* (詳解・経穴部位完全ガイド)” (29) (Photo 3) and “*Keiketsu Shusei Fukkoku-ban* (経穴集成—復刻版—)” (21) (Photo 4). In addition, to promulgate the use of new locations in Japan, the Committee cooperated with the publication of the classroom textbook, “*Shinban Keiraku Keiketsu Gairon* (新版 経絡経穴概論)” (30) (Photo 5).

To emphasize the point already made, the attempt by the WPRO to standardize terminology and point locations worldwide is unprecedented. The many remaining tasks include not only re-examination from a philological perspective but also research from an anatomical, physiological, and clinical perspective.

Table 4: Meetings on the Development of International Standard Acupuncture Point Locations

October 2003	Informal Consultation Meeting on Development of International Standard Acupuncture Point Locations, Manila (WHO/WPRO)
March 2004	(Second) Informal Consultation Meeting on Development of International Standard Acupuncture Point Locations, Beijing (China Academy of Chinese Medical Sciences)- Discussion of working rules for the development of international standard acupuncture point locations (“Beijing Agreement” reached)
April 2004	(Second) Japan Meridian Point Committee was inaugurated- Deliberation of the 92 controversial points - Deliberation of the 92 controversial points
September 2004	(Third) Informal Consultation Meeting on Development of International Standard Acupuncture Point Locations, Kyoto (Meiji University of Oriental Medicine)
February 2005	First TFT Meeting (Beijing, China Academy of Chinese Medical Sciences)
April 2005	(Fourth) Informal Consultation Meeting on Development of International Standard Acupuncture Point Locations, Daejeon, South Korea (The Korea Institute of Oriental Medicine [KIOM])
August 2005	Second TFT Meeting (Beijing)
October 2005	(Fifth) Informal Consultation Meeting on Development of International Standard Acupuncture Point Locations, Osaka (Kansai University of Oriental Medicine)
March 2006	(Sixth) Informal Consultation Meeting on Development of International Standard Acupuncture Point Locations, Tokyo (University of Tokyo)
June 2006	Third TFT Meeting (Daejeon, KIOM)
October 2006	Formal Consultation Meeting on Development of International Standard Acupuncture Point Locations, Japan (Tsukuba City): - Nine nations and two organizations

	participated; location of 361 points were decided, six points, GV26 (水溝), LI19 (禾膠), LI20 (迎香), PC8 (勞宮), PC9 (中衝), GB30 (環跳), with dual locations.
March 2007	Presentation Meeting on WHO/WPRO International Standard Acupuncture Point Locations, (Tokyo, Ochanomizu University)- About 200 participants, mainly teaching staff from 90 acupuncture and moxibustion schools in Japan
February 2008	Fourth TFT Meeting (Manila, WPRO headquarters)- Checked on the English translation and figures of the WHO draft

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Chronological table of Japanese history of acupuncture and moxibustion

Events in Japan		International affairs
1868	Meiji restoration	
1874	'Isei (医制, medical system)' is proclaimed (Dajokan directive approving acupuncture and moxibustion treatment only under Western medical supervision)	
1880	The training school for the blind in Tokyo (楽善会訓盲院, <i>Rakuzenkai Kunmoin</i>) taken into government control	
1885	Acupuncture and Moxibustion Business Permits	
1887	'Department of Acupuncture and Massage (鍼按科)' established in schools for the blind. Revival of massage and acupuncture studies.	
1904	Eikichi Okada brings Japanese acupuncture and moxibustion to the attention of the International Psychopathy Society Conference (Vienna) Kinnosuke Miura presents A Study of the Extent of Tissue Damage Caused by Acupuncture, to the Second Japan Medical Society	
1906	Kinnosuke Miura presents " <i>Shinchiho ni Tsuite</i> (鍼治法ニ就テ)," to the Second Japan Medical Conference	
1910	Shingo Yamamoto publishes " <i>Kakufuken Shinkyujyutsu Shiken Mondai Kaitoshu</i> (各府縣鍼灸術試験問題解答集)"	
1911	Enactment of the regulation of Acupuncture and Moxibustion Practice (Ministry of the Interior Ordinance No. 11) Kagoshima Acupuncture Cauterization College established	
1912		China: Decision to limit medical curricula at universities to Western medicine (State Educational Reform Conference)
1915	Shionogi, Sankyo, and other companies commence pharmaceutical manufacture	
1918	The Report by the Research Committee on Meridian Point decreed (the report by the Research Committee on Meridian Point of Ministry of Education)	
1925		China: Abolition of Chinese medical education in medical colleges
1928		China: Proposal to abolish Chinese Medicine at the First National Conference on Education

1933	Shimemaro Hara's " <i>Manbyo ni Kiku Okyu Ryoho</i> (萬病に効くお灸療法,)" becomes a bestseller	
1934	" <i>Jikken Shinkyu Igakushi</i> (實驗鍼灸醫學誌)" published (Kazuo Komai, Hidetsurumaru Ishikawa)	China: <i>Cheng Danan</i> (承淡安) studies in Japan (up to 1935. Engages with Mitsugu Sakamoto at Tokyo Acupuncture and Moxibustion College)
1935	Japan Acupuncture and Moxibustion College established (Principal: Sorei Yanagiya)	
1936		China: Chinese medicine regulations promulgated (legitimization of Chinese medicine)
1937		China: Chinese Medicine Committee established in Ministry of Health
1938	The first issue of " <i>Ido-no Nippon</i> (医道の日本, <i>the Japanese Journal of Acupuncture & Manual Therapies</i>)" published National Health Insurance Act legislated	
1939	Shinichiro Takeyama, Keiri Inoue, and Sodo Okabe establish meridian and collateral therapy around this time	
1940	Sorei Yanagiya mentions the significance of the classics for the first time in " <i>Shogaku yori Gokaku made Shinkyu Igaku Zensho</i> (初学より合格まで 鍼灸医学全書)" (The Society of) Traditional Japanese Medicine (日本経絡治療学会) established; Sorei Yanagiya, Sodo Okabe, and Keiri Inoue Classical Acupuncture and Moxibustion Research Association (古典鍼灸研究会) established; Keiri Inoue, Shohaku Honma	
1942	Mitsugu Sakamoto: " <i>Koto Shinkyu Igaku Kyokasho</i> (高等鍼灸医学教科書)"	
1943	Japanese Acupoint Research Association (日本経穴研究会) established by Hakko Baba	
1945	" <i>Shinkyu Igaku</i> (鍼灸医学)" published (Hidetsurumaru Ishikawa) War ends	
1947	Hidetsurumaru Ishikawa explains the therapeutic mechanisms of acupuncture and moxibustion to the military government in Mie (July); GHQ (General Headquarters) recommend prohibition of acupuncture moxibustion (September); Opposition movement; the Practice of Anma, Acupuncture, Moxibustion, Judo Therapy, etc. Act (Law No. 217) enacted	
1948	The Practice of Anma, Acupuncture, Moxibustion, Judo Therapy, etc. Act (Law No. 217) comes into force Acupuncture and Moxibustion Medicine Society (日本鍼灸医学会) established	

1949		China: People's Republic of China founded. <i>Mao Zedong</i> clarifies his position on the importance of Chinese medicine (State Health Administration Conference).
1950	Acupuncture & Moxibustion Association (日本鍼灸師会) established	
1951	Renamed Anma Practitioners, Moxibustion Practitioners, Acupuncture Practitioners, and Judo Therapy Practitioners Law; Japan Acupuncture and Moxibustion Society (日本鍼灸治療学会) established	
1955		China: China Academy of Chinese Medical Sciences established World: International Conference of Acupuncture held in France
1956		China: <i>Mao Zedong</i> (毛沢東) proposes coupling Chinese and Western medicine. Chinese Medical Institutions established in Beijing, Shanghai, Chengdu, and Guangzhou.
1972	Sino-Japanese diplomatic relations normalized	WHO: Nixon shock and media reporting on acupuncture analgesia
1973	Japan Meridian-Flow Society (日本経絡学会) established (present Japan Traditional Acupuncture and Moxibustion Society [日本伝統鍼灸学会])	
1978	Meiji College of Acupuncture and Moxibustion established; Commencement of acupuncture and moxibustion education at institutes of higher education	
1981	The Japan Society of Acupuncture and Moxibustion (全日本鍼灸学会) established	
1982		WHO: WHO Working Group for the Standardization of Acupuncture Nomenclature (Manila) China: Article 21 of the constitution of the People's Republic of China 'The state develops medical and health services, promotes modern medicine and Traditional Chinese Medicine...'
1983	Meiji University of Oriental Medicine (four-year curriculum) established	
1984	Private school 'Gen Juku (原塾)' founded	
1987		World: The World Federation of Acupuncture-Moxibustion Societies (WFAS) established
1988	Large-scale revision of the Act for Practitioners of Massage, Finger Pressure, Acupuncture and Moxacauterization, etc.; Acupuncture, moxibustion, and anma come under national qualifications	China: State Administration of Traditional Chinese Medicine (SATCM) established

1989	Publication of " <i>Hyojun Keiketsugaku</i> (標準経穴学)" (First Edition, Edited by the Japan Acupoint Committee)	WHO: Meeting of the Scientific Group on International Acupuncture Nomenclature (Geneva) "WHO: <i>International Standard Acupuncture Nomenclature</i> "
1991	Master's degree Course in Acupuncture and Moxibustion established at the Graduate School, Meiji University of Oriental Medicine	
1993	Standardized national examinations for Acupuncturists and Moxibustionists commence	China: Major institutes of Chinese medicine renamed to universities of Traditional Chinese Medicine
1994	Ph.D. Course in Acupuncture and Moxibustion established at the Graduate School, Meiji University of Oriental Medicine	
1995		WHO: Guidelines for Clinical Research on Acupuncture announced
1996		WHO: Guidelines on Basic Training and Safety in Acupuncture announced WHO: 47 indications for acupuncture announced
1997		US: National Institutes of Health (NIH) consensus statement on acupuncture
1998	Action for Revocation of Administrative Disposition Regarding Unspecified Judo Therapist Training Institutes (the so-called Fukuoka decision, and subsequent dramatic increase in the number of acupuncture and moxibustion colleges)	
1999		China: Law of the People's Republic of China on Medical Practitioners comes into effect (legislation regarding Chinese medicine qualifications)
2002		WHO/WPRO: <i>Choi Seung-Hoon</i> (崔昇勳; Korea) appointed Regional Adviser for Traditional Medicine (up to 2008) China: Chinese Pharmaceutical Modernization Program (2002 to 2010) announced
2003		WHO/WPRO: International Standard Acupuncture Point Location project commences China: State Ordinance on Traditional Chinese Medicine comes into force
2004		WHO/WPRO: International Standard Terminologies on Traditional Medicine project commences
2005	Japan Liaison of Oriental Medicine (JLOM) established	WHO/WPRO: International Standard Information of Traditional Medicine project commences
		World: International Network for Developing Standards for Acupuncture (Japan, China, Korea, Australia)
2007		WHO: " <i>WHO International Standard Terminologies on Traditional Medicine in the Western Pacific Region</i> " published

2008		WHO: " <i>WHO International Standard Acupuncture Point Locations in the Western Pacific Region</i> " published WHO: Adoption of the Beijing Declaration
2009	"WHO/WPRO <i>Standard Acupuncture Point Locations Official Japanese Edition</i> " published; "Shinban Keiraku Keiketsu Gairon (新版 経絡経穴概論)" published	
2010		WHO: The First Conference on International Classification of Traditional Medicine held (Hong Kong)
2011	2011 Tokyo Declaration on Japanese Acupuncture and Moxibustion (Joint declaration by the Japan Society of Acupuncture and Moxibustion and the Japanese Traditional Acupuncture and Moxibustion Society) adopted	

Chapter2

Theory of Therapeutic Effects of Acupuncture and Moxibustion

Autonomic nervous system

Eitaro Noguchi, Hideo Ohsawa

1. Effects of acupuncture and moxibustion on autonomic reflex

1.1 Background

It has long been considered in Japan that the autonomic nerve system is involved in acupuncture and moxibustion therapies. In literature from the middle of the Meiji period, when the effect of acupuncture and moxibustion was beginning to be understood in the light of modern medicine, we can already find a statement that acupuncture acts on visceral organs via autonomic nerve system in “*Shinji-shinsho* (鍼治新書)” published in 1892 (the 25th year of the Meiji period) (1) (Figure 1).

Tekisai Okubo, the Principal and Director of the hospital of Gunma Medical School (群馬医学校), is regarded as the first person to understand acupuncture and moxibustion from the viewpoint of Western medicine, and he wrote “*Shinji-shinsho* (鍼治新書)” based on his years of clinical experience with acupuncture. In his book he defined the functional mechanism of acupuncture as ‘*Shinri* (鍼理),’ and described its two key features as follows (2) (Figure 2).

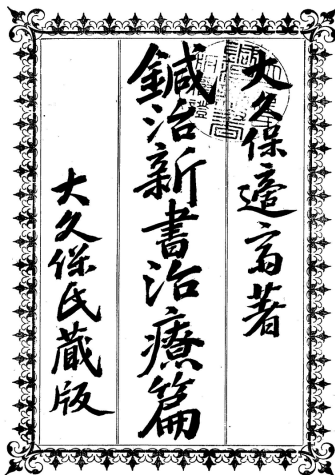


Figure 1 “*Shinji-shinsho* (鍼治新書)” published by Tekisai Okubo, the principal of Gunma Medical School (群馬医学校) in 1892 (the 25th year of the Meiji period). He defined the mechanism of the action of acupuncture as “*Shinri* (鍼理)” , and assumed that acupuncture modulates visceral function through sympathetic nerves.

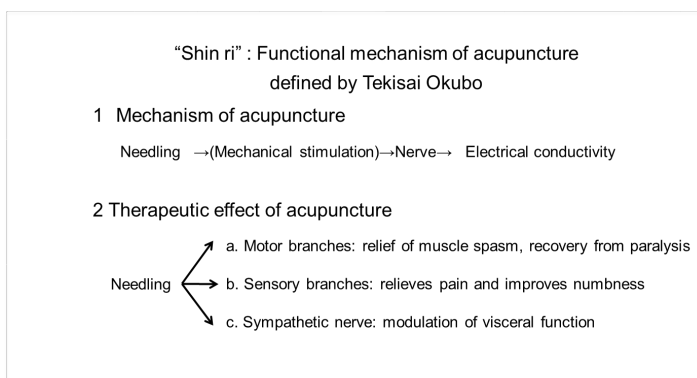


Figure 2. “*Shinri* (鍼理)” as a theory of therapeutic effect of acupuncture by Tekisai Okubo

The first feature regards the mechanism of action of acupuncture; he assumed that acupuncture has a mechanical effect on nerves and the effect is transmitted by the electrical properties of the nerves. The second is in regard to its therapeutic effect, and he discussed that a) action on motor branches leads to the relief of muscle spasm and recovery from paralysis, b) action on sensory branches relieves pain and improves numbness, and c) action on sympathetic nerves modulates visceral function. In England at the time, the structure and function of the autonomic nerve system was beginning to be systematized by Gaskell and Langrey, and Langrey reported the concept of “Autonomic Nervous System” for the first time in 1898, which was 6 years after Okubo published “*Shinji-shinsho*.”

Later, in 1912 (the 45th year of the Meiji period), Michio Goto published a paper entitled “Head’s zones and Japanese traditional methods of acupuncture and moxibustion” in *Kyoto igaku zasshi* (京都医学雑誌) (3) (Figure 3). In his paper, he discussed the linkage between Head’s zones and acupuncture meridian points, and described that cutaneous hyperalgesia is mediated by autonomic nerves as visceral-sensory nerves, in reference to an article by Mackenzie (1903) on the underlying mechanism of Head’s zones. He also indicated the relationship between the back transport points (背部愈穴), which came from “*LingShu* (靈樞)” back transport chapter in “*HuangDiNeiJing* (黄帝内经),” and the spinal dermatome, and described the reason why acupuncture and moxibustion therapy is effective in pain relief by mentioning ‘Because Head’s zones are hypersensitive to pain and thermal sensation, giving pain or thermal sensation with acupuncture or moxibustion would reflexibly improve the subjective disturbance by guiding the visceral pain to the skin in the corresponding Head’s zone.’

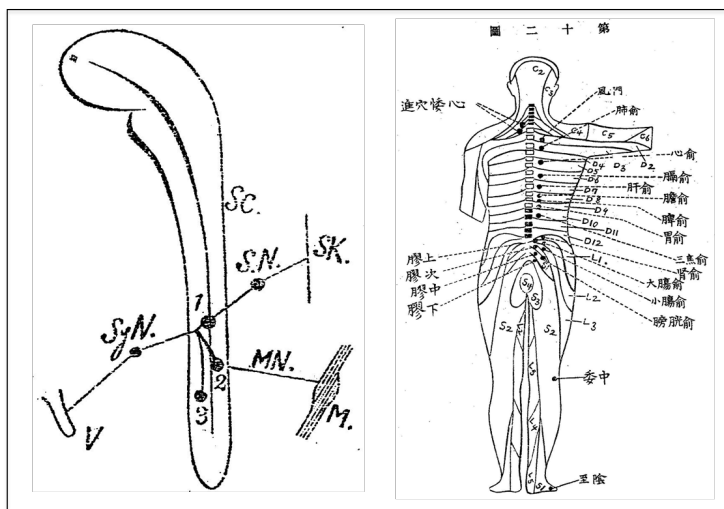
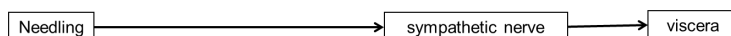


Figure 3
Schematic diagram of the mechanism proposed by Michio Goto in “Head’s zone and Japanese traditional acupuncture and moxibustion” in 1912 (the 45th year of the Meiji period) (the response of abdominal muscles and appendicitis is shown as an example: left), and the relation between acupoints and dermatome (right).

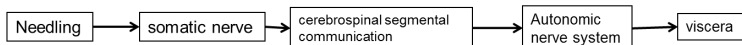
In the Taisho (1912-1926) and the early Showa periods (the late 1920’s), Hidetsurumaru Ishikawa and others studied intensely about autonomic nerves that transmit the visceral sensation in an attempt to demonstrate afferent double innervation, in regard to the double innervation rule of (efferent) autonomic nerves of visceral organs revealed by Langley. These studies lead to development of the theory of somato-visceral reflex uncture points in the research of acupuncture and moxibustion in Japan. However, the studies were insufficient to explain the effect of stimulation of acupuncture points located on the extremities

on visceral organs. Little attention was paid to the mechanism of how acupuncture and moxibustion as somato-sensory stimuli modulate visceral functions (Figure 4)

The hypothesis by Tekisai Okubo



The hypothesis by Ishikawa and his colleagues



The hypothesis by Sato et. al on the basis of somato autonomic reflex

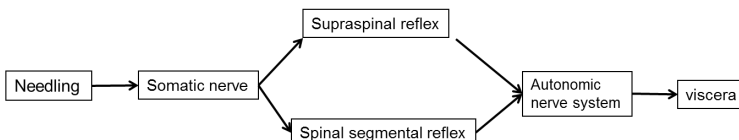


Figure 4. History of the mechanism of acupuncture via autonomic nerve as elucidated in Japan.

In Japan, acupuncture and moxibustion was believed to evoke therapeutic effects via autonomic nerves, which was only an assumption based on the observed phenomena caused by acupuncture and moxibustion. Sato et al. revealed that somato-autonomic reflex involves “spinal segmental reflex” and “supraspinal reflex,” and lead to a better understanding of action mechanisms of acupuncture for various organs.

Meanwhile in Europe, in 1914 Bainbridge revealed that stimulation of sensory neurons in sciatic nerves increased heart rate in anesthetized dogs, and that this response was due to diminished vagal tone and sympathetic stimulation, and partly due to circulating adrenaline. After this report, until the 1960’s, many studies on somato-circulation reflex had been conducted; however, it was only after the early 1970’s that Akio Sato and a German researcher, Schmidt RF revealed the outline of the somato-autonomic reflex as the underlying neurophysiological basis.

In 1973 (the 48th year of the Showa period), Sato and Schmidt published a review entitled “Somato-sympathetic reflexes: afferent fibers, central pathways, discharge characteristics” in the journal “*Physiological Review*,” and systematically summarized the structure and nature of the somato-sympathetic nerve reflex revealed by Sato and others in the late 1960’s and the early 1970’s. This research had an extremely important influence on the subsequent development of the basic research on acupuncture and moxibustion therapy, and lead to many reports on the underlying mechanisms by observing the change in several visceral functions induced by acupuncture and moxibustion stimulation via somato-autonomic reflex (4).

1.2 Autonomic reflex

1.2.1 Classification of autonomic reflex

Reflexes mediated by autonomic nerves are classified as follows (5) (Figure 5):

- 1) Somato-visceral reflex: In this reflex, somato-sensory nerves are the afferent pathways, and autonomic nerves are the efferent pathways.
- 2) Most of the effects of acupuncture and moxibustion stimulations on visceral functions occur through this mechanism.
- 3) Viscero-visceral reflex: Afferent visceral nerves are the afferent pathways, and autonomic nerves are the efferent pathway.
- 4) Hypotensive effect of Carotid sinus needling occurs via baroreceptor reflex.
- 5) Viscero-somatic reflex: Afferent visceral nerves are the afferent pathway, and somatic motor nerves are the efferent pathways.
- 6) In this chapter, outline of somato-visceral reflex is mainly reviewed.

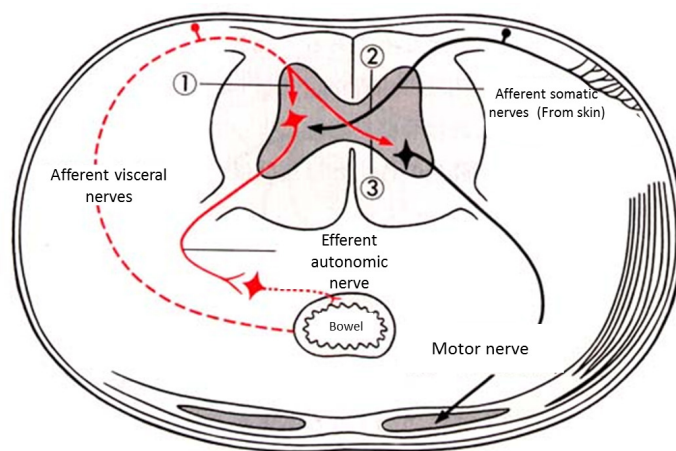


Figure 5 Reflex mediated by autonomic nerves
 ① Viscero-visceral reflex,
 ② Somato-visceral reflex,
 ③ Viscero-somatic reflex
 (Cited with modification from Schmidt RF. Shinkei seirigaku (神経生理学) Kyoto: Kinpodo, 1988)

1.2.2 Somato-visceral (autonomic) reflex

In somato-visceral (autonomic) reflex, the afferent pathway is composed of somato-sensory nerves, and the efferent pathway is composed of autonomic nerves.

Sato and Schmidt experimentally demonstrated electrical traffic between somatosensory nerves and autonomic nerves, by recording reflex discharges induced in sympathetic nerves by electrical stimulation of somatosensory nerves (6) (Figure 6).

Namely, they revealed that 1) in anesthetized animals in which emotional factors are eliminated, stimulation of somatosensory nerves induced reflex discharges in sympathetic nerves, 2) two distinct components, A-reflex component induced by stimulation of only myelinated nerves, and C-reflex component induced by additional stimulation of unmyelinated nerves, are observed; and 3) there are two pathways for somato-sympathetic reflex: one has its center in the spinal cord, and the other is the supraspinal reflex, with its center in the brain.

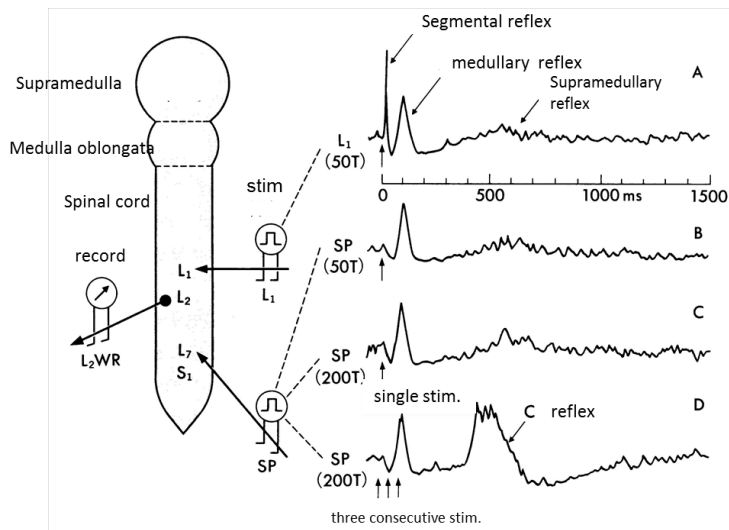


Figure 6 Somato-sympathetic reflex potential

A: Segmental, medullary and supramedullary reflexes induced on L2WR by stimulation to L1 segmental nerve.

B-D: Medullary and supramedullary reflexes induced by stimulation to hind limb cutaneous nerve (SP). Consecutive high voltage stimulation also induce C reflex, excitation of unmyelinated fibers.

(Cited with modification from Sato A, et al. Jiritsukino Seirigaku (自律機能生理学). Kyoto: Kinpodo

These findings indicated the possibility that various responses in visceral organs are produced via autonomic efferents by therapies utilizing somatosensory stimulation such as acupuncture and moxibustion, Anma-Massage-Shiatsu therapies (あん摩マッサージ指圧療法), and physical therapies, thereby providing extremely important implications for the further development of basic studies on acupuncture and moxibustion.

1.2.3 Characteristics of somato-visceral (autonomic) reflex

Somato-visceral (autonomic) reflexes have two pathways, namely spinal (segmental) reflex and supraspinal reflex, which are distinguished by the level at which its relevant reflex center exists (5,7,8) (Figure 7).

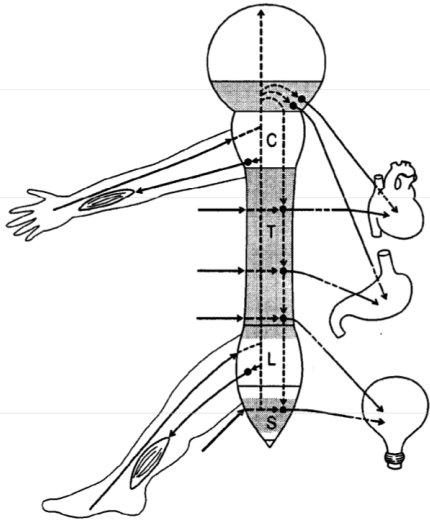


Figure 7 Schematic diagram of somato-autonomic reflex (spinal reflex and supraspinal reflex)
 (Cited with modification from Sato A, et al. Rev Physiol Biochem Pharmacol. 130, 1997)

(1) Spinal segmental reflex

Spinal segmental reflexes tend to occur when the input level of somatosensory nerves into the spinal cord and the output level of autonomic efferents from the spinal cord are at the same level or in the nearby spinal segments. For instance, stimulation of perineum evokes inhibitory or acceleratory reflex in bladder contraction, and stimulation of abdomen elicits inhibitory reflex in gastric motility. Spinal somato-visceral reflexes are mostly under suppression from supraspinal level under normal conditions when the central nerve system is intact.

(2) Supraspinal reflex

Spinal segmental reflex rarely occurs by somatosensory stimulations of the limbs. This is because the absence of preganglionic autonomic neurons in the cervical and lower lumbar spinal cord, where input from somatosensory nerves from the limbs is received. Therefore, afferent input from the stimulation of the limbs commonly ascends to the brainstem to be integrated, and evokes systemic visceral reflexes via autonomic efferent pathways. Somato-circulation reflex (blood pressure and heart rate) is one example.

1.3 Afferent mechanism of acupuncture stimulation

1.3.1 Afferent nerves of acupuncture stimulation (manual stimulation)

The effects of manual acupuncture stimulation in anesthetized rats on gastric motility (9), bladder contraction (10), blood pressure (11), and heart rate (12,13), as well as their neural mechanisms have been revealed. Various responses in autonomic functions elicited by the acupuncture stimulations are all abolished after severance of the somatosensory nerves innervating the stimulated region.

In the classic theories of Oriental Medicine, visceral responses elicited by acupuncture stimulation

of acupuncture points are explained as arising through meridians and collaterals. If meridians and the nervous system are entirely different things, responses in target visceral organs would remain even after severance of somatic nerves; however, studies reported to date indicate that severance of somatic nerves innervating stimulated sites abolish responses in visceral effector organs evoked by acupuncture stimulations (9-13). Therefore, meridians and collaterals, which ancient Chinese people believed in, might mainly be dependent on neural functions in modern medicine.

The specific groups of nerve fibers that are excited by the stimulation of manual acupuncture have been unknown. Recently, Kagitani et al. (14) revealed that manual acupuncture-like needle stimulation to the hindlimbs, at ST36 (足三里) point, activated afferent nerve fibers belonging to all four groups of afferents, groups I, II, III, and IV, in anesthetized rat, by recording single unit afferent nerve discharge activities in the dorsal roots at the 4th or 5th lumbar segment (L4-L5) (Figure 8).

In clinical practice of acupuncture and moxibustion, it is conceivable that various vital responses are elicited and utilized for treatment by changing the activated afferent nerve fibers with the proficient manipulation of acupuncture needles based on experience.

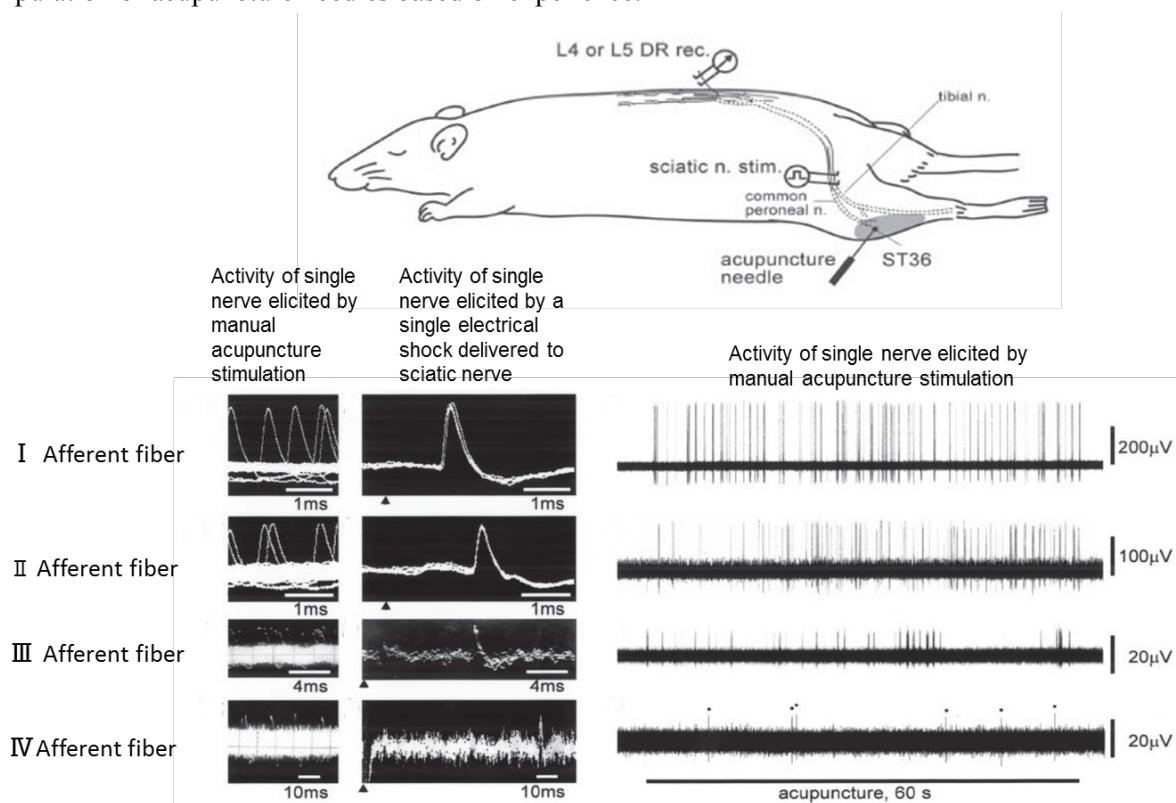


Figure 8 Upper: Schematic diagram of the experimental procedure: The activity of a single nerve fiber in the L4 or L5 dorsal root was derived, and the activities elicited by manual acupuncture-like stimulation of the ST36 (足三里) point were recorded in anesthetized rats. The conduction velocity of the derived single nerve fiber was measured by recording the evoked action potential induced by a single electrical shock delivered to the sciatic nerve, and was used to identify the group of the nerve fibers. Lower: Sample recordings (of single unitary afferents in the spinal dorsal roots).

(Cited with modification from Kagitani F, et al. *Jpn J Physiol.* 55(3): 149-155, 2005)

1.3.2 Recording of compound action potentials of afferent nerves evoked by electro-acupuncture stimulations

Electro-acupuncture stimulation allows identification of the group of the activated afferent nerve fibers by changing stimulus strength. Figure 9 presents a schematic diagram and typical recordings of compound action potentials in the saphenous nerve by electro-acupuncture stimulation to the hindpaw in anesthetized rats. The method for electro-acupuncture stimulation was as follows: two acupuncture needles were inserted about 5 mm apart and to a depth of about 5 mm, and stimulation was performed with square wave pulses of duration 0.5 ms using a (constant current) electrical stimulator for physiological experiments. The saphenous nerve was separated from its surrounding tissues in the femoral area and transected, and the action potentials were derived from the distal cut end of the nerve using bipolar platinum wire recording electrodes, and amplified and recorded on a storage oscilloscope and averaged by a computer. As results, the mean threshold of the compound action potentials of the A β (group II) fibers was 0.18 (range, 0.10-0.20) mA and maximum stimulus strength was 2.0 mA; the action potential of A δ (group III) fibers appeared above a stimulus strength of 0.5 (0.4-0.8) mA and reached a maximum at about 2.0 (0.8-3.0) mA; and the action potentials of C (group IV) fibers appeared with a stimulus strength above 3.0 (2.0-3.0) mA and reached a maximum at 8.7 (8.0-10.0) mA (15).

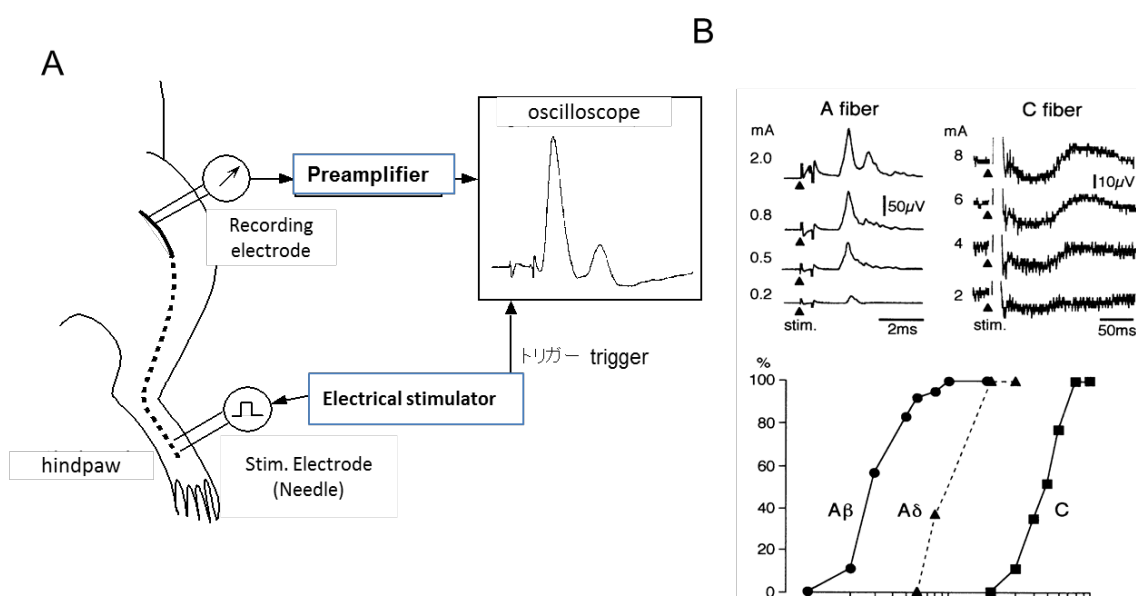


Figure 9 Compound action potentials evoked in the saphenous nerve by electro-acupuncture stimulation to the hindpaw in anesthetized rats.

A. Schematic diagram of the recording method of the compound action potentials in the saphenous nerve elicited by electro-acupuncture stimulation to the hindpaw.

B. Evoked compound action potentials recording from the saphenous nerve by electro-acupuncture of a hindpaw. Upper: typical recordings. Lower: Abscissa: stimulus strength in mA. Ordinate: magnitude of evoked potentials expressed in % of maximum potentials. (Cited with modification from Ohsawa H, et al. J Auton Nerv Sys. 64: 101-106, 1997)

Based on these results, groups of nerve fibers to be activated are selected by different electro-acupuncture stimulus strengths, and their effects on various autonomic functions are studied. Table 1 shows a list of groups of nerve fibers involved in autonomic responses by electro-acupuncture stimulation reported to date. Thus, it is clear that different groups of afferent nerve fibers are involved in the response, depending on the difference in autonomic functions and stimulated sites. These results should provide important indications when determining the stimulus strength during acupuncture stimulation.

Table 1 Summary of the effects of electro-acupuncture stimulations on autonomic functions

Function	Site of stimulation	Response	Afferent neurofibra		
			II	III	IV
Pupil	Hindpaw	mydriasis	○	○	○
Gastric and duodenal motility	Abdomen	inhibition			○
	Hindpaw	facilitation		○	○
Cerebral blood flow	Forepaw	increase		○	○
Function of the adrenal medulla	Hindpaw	facilitation		○	○
	Tibial anterior muscle	facilitation /inhibition		○	○

2. Effects of acupuncture stimulation on various visceral functions

2.1 Heart rate and blood pressure

Noxious mechanical stimulation of various skin regions in anesthetized rats enhanced efferent activities of cardiac sympathetic nerves and increased heart rate. Response of increased heart rate by such cutaneous stimulation appears as systemic response elicited by stimulation of any skin area, but the responses are prominent when the stimulation is applied to the limbs. In acutely spinalized rats (transection of the upper spinal cord prevents the influence of somatosensory stimulation from reaching the upper central nerve systems), such systemic response was abolished, and increase in heart rate was observed by stimulations of chest and upper abdomen, the segmental levels of which are near to the spinal level of cardiac sympathetic nerve output (16).

Noxious mechanical stimulation of skin also enhanced renal sympathetic nerve activity and elevated blood pressure in anesthetized rats. As is the case with heart rate, this pressor response was observed particularly when the stimulations were given to the limbs, although it appears as systemic response evoked by the stimulation of any skin area. Systemic response was abolished in acutely spinalized animals, and

increase in heart rate and blood pressure were elicited by stimulations of chest and abdomen. These facts suggest that spinal segmental mechanism have potent effect in spinalized animals, whereas systemic response via central nervous system is predominant in animals with intact brain.

Thus, noxious stimulation elicits increased responses in heart rate and blood pressure, but on the other hand, acupuncture stimulation is reported to evoke decreased responses.

Manual acupuncture-like stimulation of a hindlimb, an area corresponding to the ST36 (足三里) point, in anesthetized rats inhibited the activities of renal sympathetic nerve as vasoconstrictor, and depressor response was observed. This response was abolished by transection of somatosensory nerves innervating the hindlimb. Following surgical separation of the hindlimb skin from the underlying muscle and individual stimulations of either the skin or the muscles, reduction in renal sympathetic nerve activity and depressor response was elicited remarkably by the stimulation of muscles alone, but not by that of the skin alone (11) (Figure 10).

Nishijo et al. (17) reported that acupuncture stimulation in humans produced a decrease in heart rate. Pharmacological blocking experiments revealed that this response was mediated by beta-adrenergic receptor and muscarinic acetylcholine receptor.

Decrease in heart rate was also observed by manual acupuncture-like stimulation to a hindlimb, an area corresponding to the ST36 (足三里) point, in anesthetized rats, and this response was abolished by severance of somatosensory nerves innervating the hindlimb. When the skin was surgically separated from the muscle and acupuncture stimulation was applied to either the skin or muscles separately, heart rate was decreased by stimulation of muscles only, but not affected by stimulation of skin only. The efferent mechanism was not influenced by transection of the vagus nerves but abolished by transection of the cardiac sympathetic nerves (12), (13) (Figure 11). Furthermore, recordings of efferent activity of cardiac sympathetic nerves revealed that acupuncture-like stimulation induced a decrease in the activity of the cardiac sympathetic efferent nerves (13) (Figure 12).

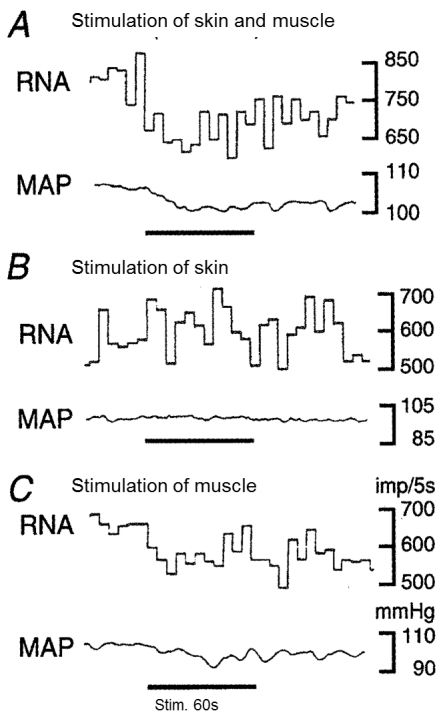


Figure 10 Effect of acupuncture-like stimulation at ST36 (足三里) on blood pressure and renal sympathetic nerve activity (in anesthetized rats).

RNA: renal sympathetic nerve activity, MAP: mean arterial blood pressure

(Cited with modification from Ohsawa H, et al. J Auton Nerv Sys 51: 27-35, 1995)

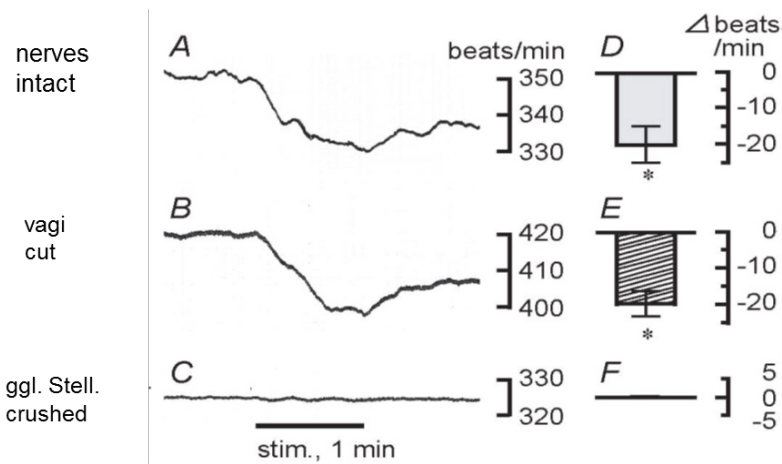


Figure 11 Effects of acupuncture-like stimulation, area corresponding to ST36 (足三里), on heart rate before and after vagotomy and stellectomy (in anesthetized rats). (Left panel shows typical recordings of heart rate, and right panel shows the mean \pm SEM of the changes in heart rate by acupuncture-like stimulation. (Cited with modification from Uchida S, et al. J Physiol Sci. 57: 377-382, 2007 [ref. 13])

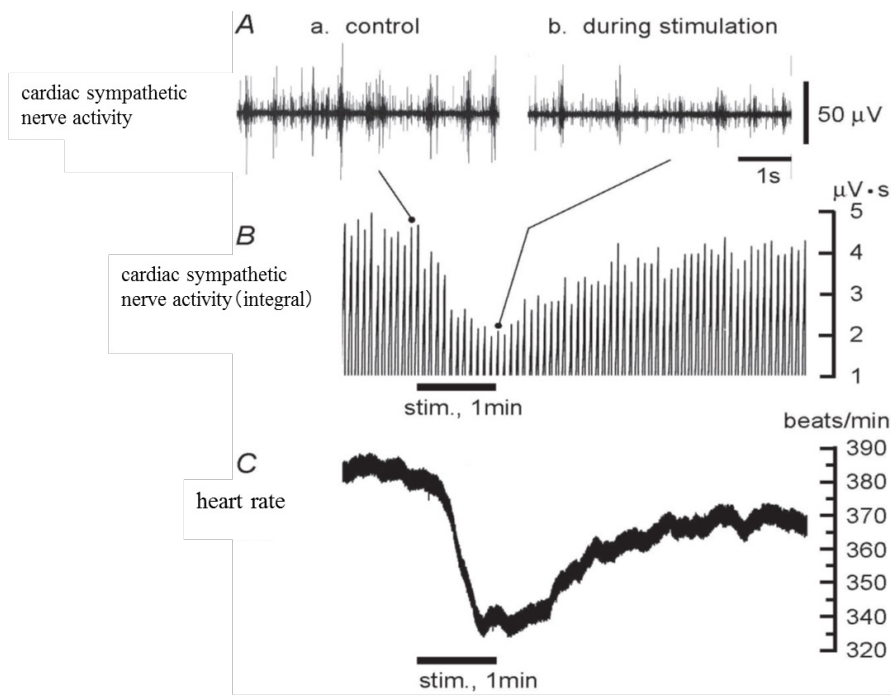


Figure 12 Sample recordings of the response in cardiac sympathetic nerve activity (A, B) and heart rate (C) to acupuncture-like stimulation (area corresponding to ST36 [足三里]).

(Cited with modification from Uchida S, et al. *J Physiol Sci.* 57: 377-382, 2007 [ref. 13])

2.2 Gastrointestinal motility

Gastric motility in anesthetized rats (recorded by measuring intragastric pressure using a balloon inserted to pyloric region from duodenum) is potently suppressed by noxious mechanical stimulation (18) or acupuncture stimulation (9) of the abdominal skin. This response is mediated by excitation of the efferent activities of gastric sympathetic nerves. Moreover, inhibitory reflex of gastric motility by abdominal stimulation can be observed in acutely spinalized rats in which nerve traffic to the brain stem is impaired by transection of spinal cord, indicating that it is a spinal segmental reflex. In contrast, gastric motility is slightly promoted by the stimulation of the hindlimb or forelimb. This response is elicited by the excitation of gastric vagal efferent nerve activity, and is a bulbar reflex (Figure 13).

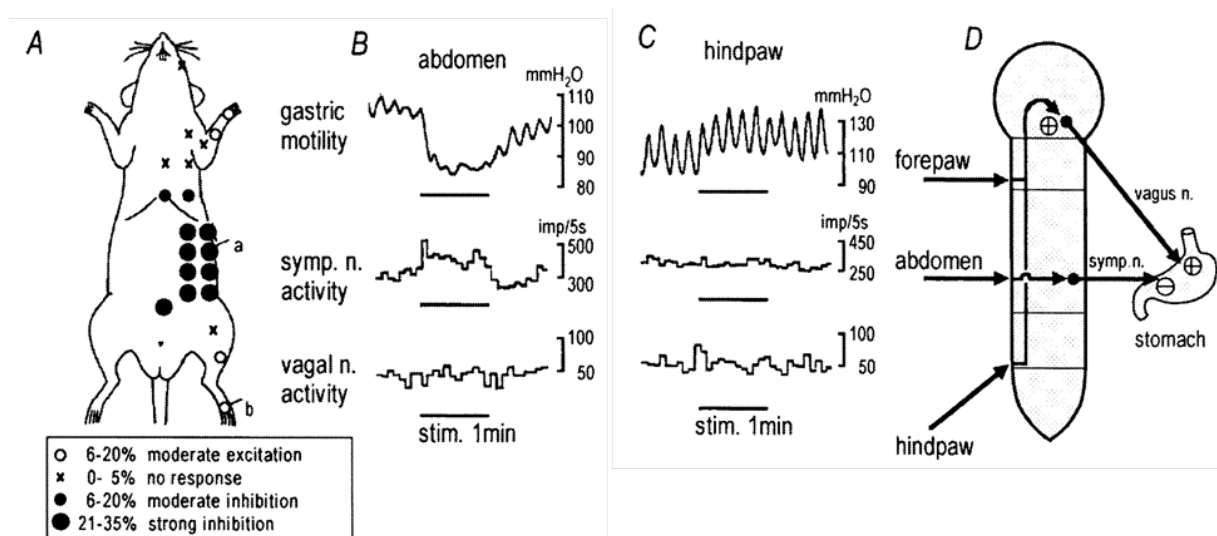


Figure 13 Effects of acupuncture-like stimulation on gastric motility (in anesthetized rats).

A: Gastric motility in response to acupuncture-like stimulation of various areas. B: Change in gastric motility, gastric sympathetic nerve activity, and gastric vagus nerve activity by acupuncture stimulation of abdomen. C: Change in gastric motility, gastric sympathetic nerve activity, and gastric vagus nerve activity by acupuncture stimulation of the hindpaw. D: Schematic diagram of the mechanism of the response in gastric motility elicited by acupuncture stimulations to the abdomen and limbs.

(Cited with modification from Sato A, et al. *Neurosci Res.* 18: 53-62, 1993 [ref. 9])

Yamaguchi et al. (19) reported that electro-acupuncture stimulation of abdominal area at the intensity of 6 mA or more, which is sufficient to activate unmyelinated group IV afferent fibers, could produce significant inhibitory responses in gastric motility; however, stimulation at intensities that activate only myelinated fibers did not elicit the response. In addition, they demonstrated that facilitatory response in gastric motility began to appear with electro-acupuncture of the hindpaw at strength of 2 mA or more, which is sufficient to excite group III afferent fibers, and reached maximum at stimulation intensity of 3 mA or more, which further activates group IV afferent fibers as well. These findings revealed that different afferent

fibers are involved in inhibitory and facilitatory responses in gastric motility induced by stimulation of abdomen and hindpaw, respectively.

Noguchi et al. (20) reported the effects of electro-acupuncture stimulation on duodenal motility in anesthetized rats. Duodenal motility was facilitated by electro-acupuncture stimulation of the hindpaw; this response was significantly observed with stimulation at intensities of more than 2 mA, which is above the threshold to excite group III afferent fibers, and the response increased dependent on the stimulation intensity (Figure 14A). Disappearing after vagotomy or spinal transection, this response was shown to be a supraspinal reflex response involving vagus nerve as its efferent pathway.

On the other hand, electro-acupuncture stimulation applied to abdominal area inhibited duodenal motility; significant inhibition was observed at the stimulation intensities of more than 5 mA, which excites group IV afferent fibers, and the response reached maximum at stimulation intensity of 10 mA (Figure 14B). This response was abolished after sectioning the splanchnic nerves, but existed in acutely spinalized rats, meaning that this is a spinal reflex involving splanchnic nerves as its efferent pathway.

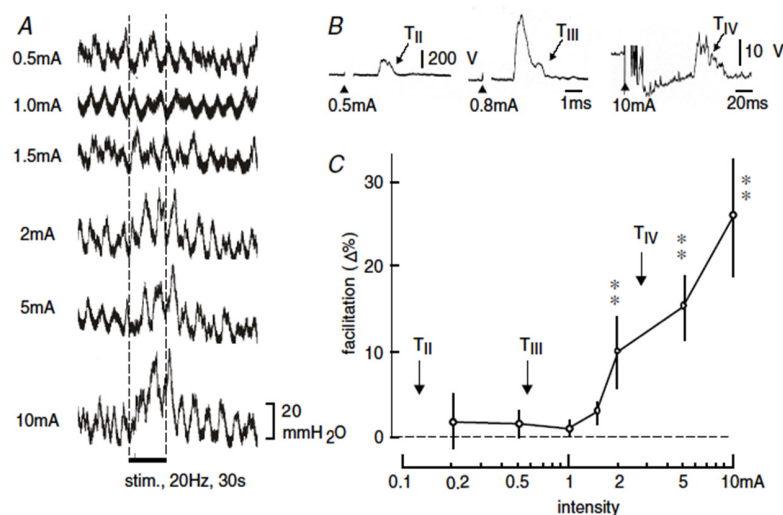


Figure 14A Effect of electro-acupuncture stimulation on duodenal motility (stimulation of the hindpaw)

A: Sample recordings of the responses of duodenal motility to electro-acupuncture stimulation.

B: Sample recordings of the evoked combined action potentials of the saphenous nerve by electro-acupuncture stimulation of a hindpaw.

C: Response of duodenal motility to electro-acupuncture stimulation and threshold intensity of somatosensory nerves.

(Cited with modification from Noguchi E, et al. Jpn J Physiol. 53: 1-7, 2003)

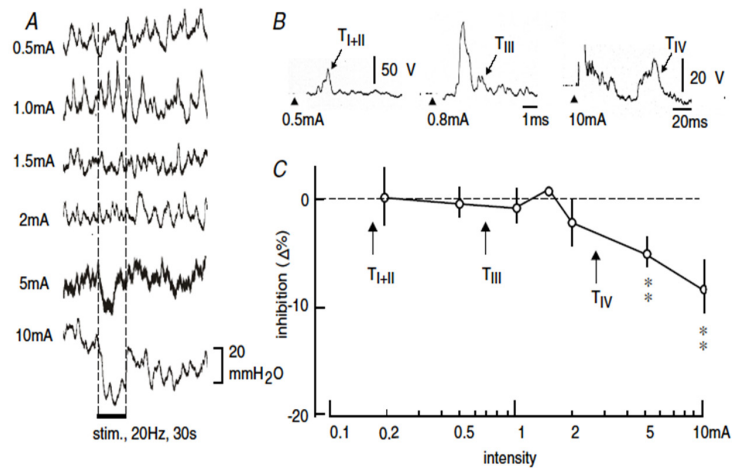


Figure 14B Effects of electro-acupuncture stimulation on duodenal motility (stimulation of the abdomen)

A: Sample recordings of the responses of duodenal motility to electro-acupuncture stimulation.

B: Sample recordings of the evoked combined action potentials of intercostal nerve by electro-acupuncture stimulation of the abdomen.

C: Response of duodenal motility to electro-acupuncture stimulation and threshold intensity of somatosensory nerves.

(Cited with modification from Noguchi E, et al. *Jpn J Physiol.* 53: 1-7, 2003)

Thus, similar to gastric motility, duodenal motility was shown to be inhibited by stimulation of the abdominal area at intensities that excite group IV afferent fibers, and facilitated by stimulation of the hindpaw at stimulation strengths that can excite group III afferent fibers.

These basic studies using anesthetized animals suggested that different responses in gastrointestinal motility might be elicited by the acupuncture stimulations applied to different areas or with different stimulation intensities in the clinical practice of acupuncture. For instance, diarrhea (enhanced gastrointestinal motility) in irritable bowel syndrome (IBS) might be treated with acupuncture applied to acupuncture points in the trunk, such as in the abdomen or in the back, and constipation (diminished gastrointestinal motility) might be treated with therapy applied to acupuncture points on the lower leg, which would make the acupuncture and moxibustion therapy more effective.

2.3 Bladder contraction

When internal pressure of the bladder is maintained high in anesthetized rats, the urinary bladder produces micturition contraction rhythmically. Acupuncture-like stimulation applied to the perineal area skin under this condition inhibited discharges of pelvic efferent nerves, including parasympathetic nerves innervating the bladder, and consequently inhibited the rhythmic micturition contractions of the urinary bladder. This reflex inhibition was elicited only by stimulation of perineal area, and stimulation of other areas was ineffective (Figure 15). Persistence of this response in acutely spinalized rats indicates that this is a spinal

segmental reflex (10).

When internal pressure of the bladder is low in anesthetized rats, touch applied to perineal area increases the activity of pelvic nerve, which involves parasympathetic nerves innervating bladder, and leads to bladder contraction. Also, noxious stimulation produces the same response. This response is maintained in acutely spinalized rats (21).

These results seems to support the clinical findings that acupuncture treatment for micturition disorders, including nocturia and neural bladder, are frequently applied to meridian points in lower abdomen and sacral area. Also, the finding that bladder contraction responses induced by perineal stimulations differ depending on whether the internal pressure of bladder is high or low is interesting. This indicates that different responses are induced by the difference in the vital conditions such as tonus of autonomic nerves, even when the intensities or sites of stimulation are identical, which might partly explain the phenomena related to deficiency (*Kyo*) and excess (*Jitsu*), and supplementation and draining (補瀉, *Hosha*) seen in clinical acupuncture and moxibustion practice.

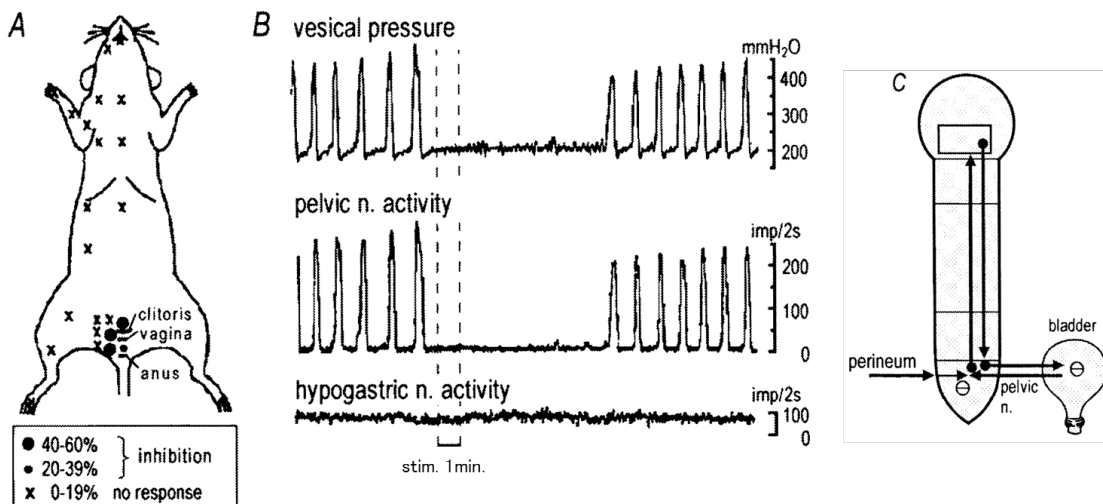


Figure 15 Effects of acupuncture stimulation on bladder contraction (in anesthetized rats).

A: Response of bladder contraction by acupuncture stimulation to various areas.

B: Change in internal pressure of the bladder, pelvic nerve activity, lower abdominal nerve activity by acupuncture stimulations to perineal area.

C: Schematic diagram of the bladder inhibitory response by acupuncture stimulation to perineal area.

(Cited with modification from Sato A et al. *Neurosci Res.* 15, 1992)

2.4 Function of the adrenal medulla

Noxious mechanical stimulation of the skin in anesthetized rats reflexively increases the adrenal sympathetic efferent nerve activity. This response is produced by stimulation of all areas, but the response is persistent and prominent when stimulation is given to areas of the lower chest or abdominal skin. On the other hand,

brushing of the skin as non-noxious stimulation applied to neck, lower chest, abdomen, or thigh inhibits the adrenal sympathetic nerve activity during the stimulation. In addition, catecholamine secretion of the adrenal medulla, measured in venous blood from adrenal vein, was increased by noxious stimulation and decreased by non-noxious stimulation, which showed the same pattern as the adrenal sympathetic nerve activity.

In acutely spinalized rats, only the stimulation of lower chest and abdomen, which is close to the spinal level at which adrenal sympathetic nerve arises, produced the response in adrenal medullary function. Both noxious and non-noxious stimulations increased the adrenal sympathetic nerve activity as well as the secretion of adrenomedullary catecholamine. Spinal segmental response is observed in acutely spinalized rats, whereas in the presence of intact brain, such spinal segmental organization is rarely seen and systemic response via central nervous system appears. Inhibition of adrenal sympathetic nerve activity by non-noxious stimulation is considered to require mechanism involving supraspinal level (22-24).

Mori et al. (25) studied adrenal sympathetic nerve activity and catecholamine secretion from adrenal medulla during electro-acupuncture stimulation to hindpaw and hind leg, corresponding to ST36 (足三里), in anesthetized rats. Though both are located in the same hindlimb, the hindpaw contains more skin tissue and anterior tibial muscle area contains more muscle tissue, and stimulations to the two areas elicited different responses. As for electro-acupuncture to the hindpaw, increase in adrenal sympathetic nerve activity was observed at stimulation strength of 2 mA or more, which is sufficient to excite group III afferent fibers. Likewise, secretions of adrenaline, noradrenaline, and dopamine were increased in venous blood from adrenal vein (Figure 16).

In contrast, electro-acupuncture stimulation of anterior tibial muscle in the hind leg, area corresponding to ST36 (足三里), elicited either increasing or decreasing response almost equally in adrenal sympathetic nerve activities by stimulation intensities of 2 mA or more. Similarly, adrenomedullary catecholamine secretion was either increased or decreased (Figure 17).

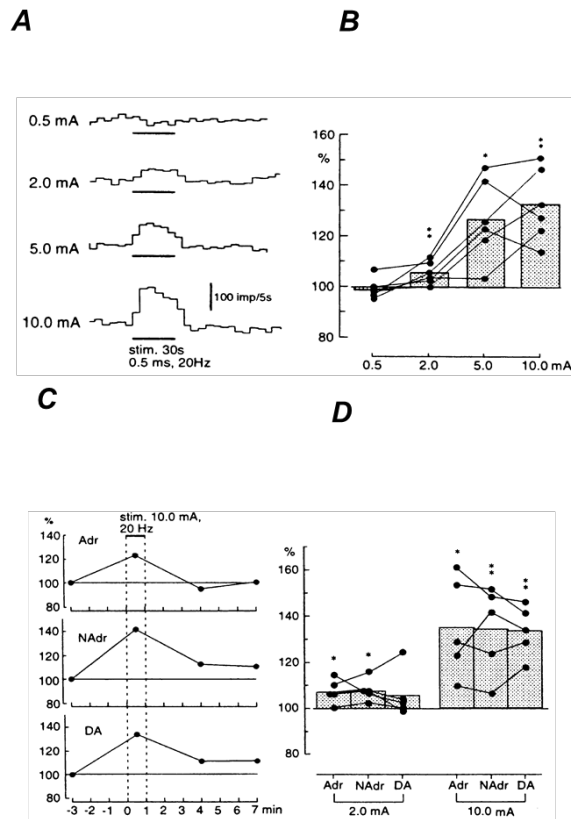


Figure 16 Effects of electro-acupuncture stimulations to hindpaw on functions of adrenal medulla

A: Sample responses of adrenal sympathetic nerve activity to electro-acupuncture stimulations to the hindpaw.

B: Graph of relations between stimulus intensity (abscissa) and magnitude of change in adrenal sympathetic nerve activity (ordinate). Each column represents a mean, and values indicated by closed circles from the same rat are connected with lines.

C: Sample time course of change of response of the catecholamine secretion rate from the adrenal gland to electro-acupuncture stimulation at 10 mA.

D: Mean value and data of the magnitude of change in the response of the catecholamine secretion rate from the adrenal gland during electro-acupuncture stimulation.

(Cited with modification from Mori H. et al. J Auton Nerv Svs.79: 93-98. 2000)

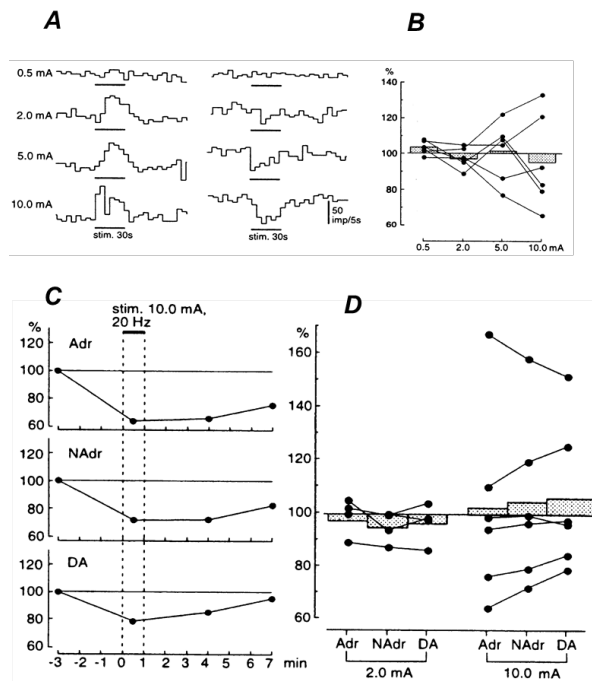


Figure 17 Effects of electro-acupuncture stimulation of the hindleg on function of adrenal medulla

A: Sample responses of adrenal sympathetic nerve activity to electro-acupuncture stimulations to the hind leg. Left panel shows excitatory responses, and right panel shows inhibitory responses.

B: Graph of relations between stimulus intensity (abscissa) and magnitude of change in adrenal sympathetic nerve activity (ordinate). Each column represents a mean, and values indicated by closed circles from the same rat are connected with lines.

C: Sample time course of response of the catecholamine secretion rate from the adrenal gland to electro-acupuncture stimulation at 10 mA (an example of inhibitory response).

D: Mean value and data of the magnitude of change in the response of the catecholamine secretion rate from the adrenal gland during electro-acupuncture stimulation.

(Cited with modification from Mori H, et al., *J Auton Nerv Sys.*79: 93-98, 2000)

2.5 Cerebral blood flow

Acupuncture stimulation of the cheek, forelimbs, and hindlimbs in anesthetized rats produced increases in cerebral blood flow. This response of increased cerebral blood flow took place independently of the response in blood pressure.

Cortical cerebral blood flow was increased by electro-acupuncture stimulation of the forepaw at stimulation strengths of more than 1.5 mA, which sufficiently evokes excitation of group III fibers, and further increase in the response was observed at stimulation intensities of 5 and 10 mA, which additionally excite group IV fibers. For this response, it is revealed that excitation of cholinergic nerves originating in the nucleus basalis of Meynert in the basal forebrain release acetylcholine in the cortex, resulting in an increase in cortical cerebral blood flow via muscarinic and nicotinic acetylcholine receptors (26).

2.6 Pupil

Pupil diameter in anesthetized rats in circumstances of light adaptation was dilated by electro-acupuncture stimulation to a hindpaw. This reflex response of pupil dilation was not influenced by transection of cervical sympathetic nerves, but was abolished by cutting the oculomotor nerve, which involves parasympathetic nerves innervating pupil, indicating that this response is due to inhibitory reflex of parasympathetic nerves (11).

The response of pupil dilation by electro-acupuncture stimulation was produced significantly with stimulation intensities of 0.5 mA or more, which are sufficient to excite group II afferent fibers. The magnitude of dilation response increased as stimulus intensity increased, and reached maximum at the stimulation intensity of 6 mA, which is sufficient to excite group IV afferent fibers. The dilation response is evoked by excitement of group II afferent fibers, which mediates tactile and pressure sensation, and Shimura et al. (27) demonstrated that pressure stimulation to the hindlimb produced dilation response.

In circumstances of light adaptation, the tone of parasympathetic nerves innervating pupil is known to be increased. The results of these studies seem to indicate that electro-acupuncture stimulation can reduce such an excessive parasympathetic tone. Under dark adaptation, sympathetic nerves innervating pupil are known to be at high level of tone, and pupil response under dark adaptation might differ from that in light adaptation, which warrants further investigation.

3. Effect of acupuncture stimulation mediated by axon reflex

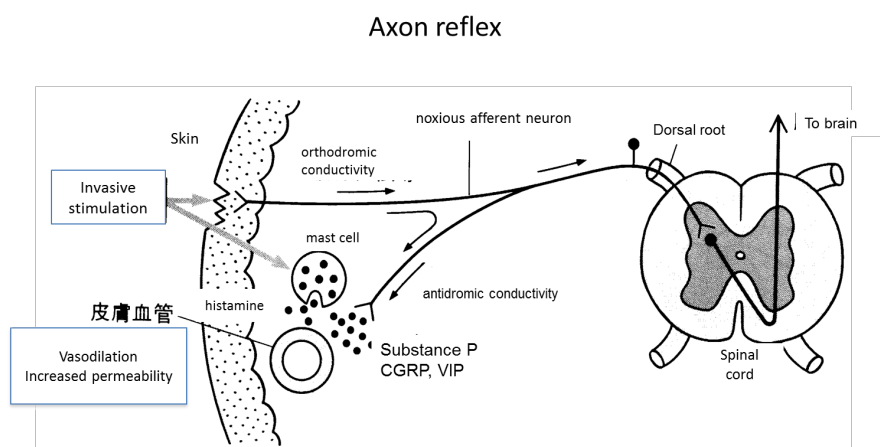
Historically, axon reflex was named by Langley and Anderson to describe a phenomenon observed within branching from an axon of an autonomic efferent nerve fiber. Later, Thomas Lewis named a phenomena observed in the skin when some kind of stimulation including mechanical stimulation a 'triple response': reddening of the stimulated site, followed by edema in the adjacent skin, and then flushing within 2 to 3 cm of the surrounding area. The flushing caused by vasodilation around stimulated area is called flare.

As it is easy to observe flare formation in the skin, a number of studies have been conducted on skin, and acupuncture and moxibustion simulations in humans and anesthetized rats have already been reported to induce flare formation (28).

This flare response is considered an axon reflex that occurs within peripheral nerves and does not involve the central nervous system, as shown by the fact that the response is abolished by cutting cutaneous nerves. It is explained that in axon reflex, excitation of thin unmyelinated nerve fibers (induced by skin stimulation) is not only transmitted to the central nervous system as sensory information, but antidromically activates the afferent nerve and elicits vasodilation at the distal end of the nerve. Calcitonin gene-related peptide (CGRP), found by Amara et al. in 1982 as a vasodilatory factor released from distal terminal of afferent nerve, coexists with Substance P at the distal end of A δ and C fiber in cutaneous nerve, and subcutaneous administration of CGRP induces vasodilation in the skin for hours. Flare is now considered to be mediated by CGRP, because antagonists of CGRP inhibit the vasodilation induced by antidromic

stimulation of the afferent nerve. On the other hand, Substance P is considered to be involved in the increase in fluid accumulation within tissue induced by the increased vascular permeability, which contributes to wheal formation, one of the triple responses (29) (Figure 18).

To study the mechanism underlying the response in local blood flow to acupuncture and moxibustion stimulation, Jansen et al. investigated blood flow in musculocutaneous flap (in the rat); they observed that electro-acupuncture stimulation of the proximal part of the flap induced increase in the skin blood flow in the musculocutaneous flap, which was equivalent to the response to administration of the Substance P or CGRP, and reported the increase in local blood flow by acupuncture stimulation mediated by vasodilatory factor at the stimulated site (30).



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Figure 18 Mechanism of axon reflex

When some kind of stimulation, including mechanical stimulation, is applied to skin, a “triple response,” of reddening of the stimulated site, followed by edema in the adjacent skin, and then flushing in the surrounding area (flare) occurs.

This flare response is abolished by cutting cutaneous nerves, indicating that flare is an axon reflex that occurs within peripheral nerves and does not involve the central nervous system.

Calcitonin gene-related peptide (CGRP) coexists with Substance P at the distal end of A δ and C fiber in cutaneous nerve, and inhibition of vasodilation by CGRP antagonist suggests that flare response is mediated by CGRP, whereas Substance P is considered to contribute to the increase in vascular permeability which lead to wheal formation.

In 1996, Hotta et al. suggested a possible involvement of vasodilatory mechanism following electrical stimulation of unmyelinated fibers in the central cut end of the saphenous nerve. The observed increase in the nerve blood flow in the sciatic nerve in rat was independent of changes in mean arterial blood pressure by the stimulation. Also, this increase was abolished by topical application of a CGRP antagonist, hCGRP (8-37). The blood flow in the sciatic nerve was increased even after the connection of the lumbosacral

afferents and efferents with the central nervous system is transected close to the spinal cord. Therefore, these responses are suggested to be produced via mechanism mediated by axons that innervate both the skin and the vasa nervorum of the sciatic nerve (31) (Figure 19).

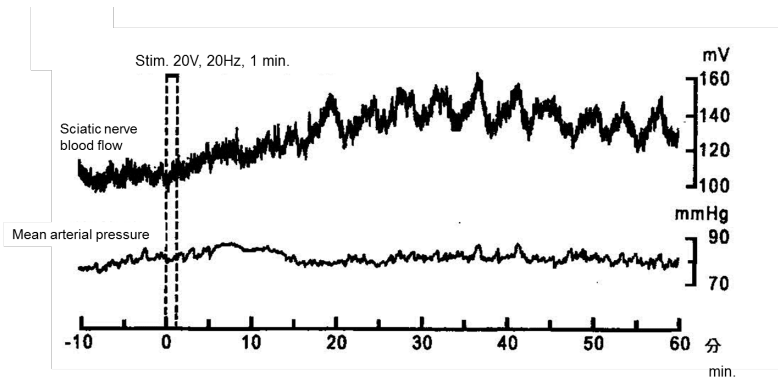


Figure 19 Stimulation of the saphenous nerve for 1 min in anesthetized rats with disrupted spinal cord induced increase in sciatic nerve blood flow for more than 1 hour. (Hotta H, et al. *Neurosci Res.* 24: 305-308, 1996 [ref 31])

Furthermore, in 2000 Sato et al. demonstrated the existence of this axon reflex in skeletal muscle besides skin and nerve, by transection and antidromic stimulation of the dorsal root of lumbar nerves in anesthetized rats. In this study, they used laser Doppler flowmetry to measure the muscle blood flow in biceps femoris after stimulation of muscle afferent nerves, and contribution of CGRP to the response was investigated. After dorsal roots of spinal nerves were cut at the 3rd-5th lumbar segments and electrical stimulation was applied to the distal cut end of the dorsal root for 30 seconds, increases in muscle blood flow for 3-15 minutes without significant increase in systemic arterial blood pressure were induced at the stimulation intensities adequate to excite unmyelinated C fibers. This increase in skeletal muscle blood flow started about 10 seconds after the onset of stimulation, and peaked at approximately 130% of the control value at about 30 seconds after the stimulation. The muscle blood flow response was nearly abolished by topical application of hCGRP (8-37), a CGRP antagonist. Consequently, they concluded that antidromic vasodilation following stimulation of unmyelinated C afferents in dorsal roots is independent of systemic blood pressure and is mediated by CGRP.

These findings indicate the possibility that acupuncture and moxibustion stimulation might induce axon reflex-like vasodilation in skeletal muscles and nerve vasa nervorum (32) (Figure 20).

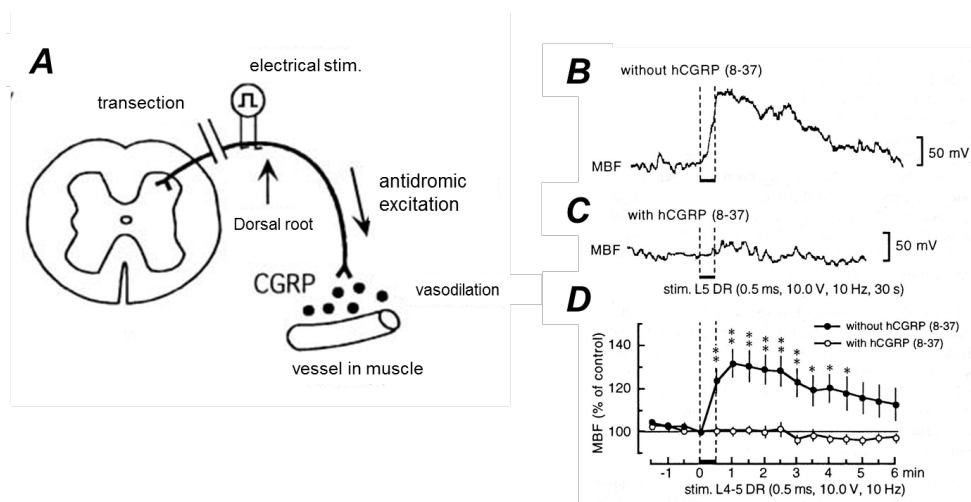


Figure 20 Axon reflex-like response of increased skeletal muscle blood flow elicited by transection and antidromic stimulation of the dorsal root of the spinal cord in anesthetized rats. (Cited with modification from Sato A, et al. *Neurosci Lett.* 283: 137-140, 2000 [ref 32])

A: Schematic diagram of the experiment

B: Typical response of muscle blood flow to (transection and) antidromic stimulation of dorsal root at the 5th lumbar segment.

C: Muscle blood flow response after topical application of hCGRP(8-37) to the surface.

D: Summary of muscle blood flow response. Significant increase in muscle blood flow started 1 minute after the stimulation, and the response was abolished by application of hCGRP(8-37).

Based on these findings, Noguchi et al. investigated changes in the muscle blood flow in bilateral triceps surae muscle caused by moxibustion-like thermal stimulation using a laser Doppler blood-flow meter (Figure 21 A). Increase in bilateral triceps surae muscle blood flow was observed in response to the stimulation of the hindpaw, which was dependent on increase in systemic blood pressure, and this response was abolished bilaterally by transection of the sciatic nerves ipsilateral to the stimulated site. However, stimulation of triceps surae muscle area where blood flow was measured unilaterally induced transient decrease followed by increase in blood flow independent of systemic blood pressure, and this response was considered a change in local blood flow (33) (Figure 21 B).

The effects of nerve transection or application of antagonist on the two-phase response were further studied; the response was not abolished when lumbar spinal cord was pithed, but was abolished by topical application of lidocaine to the stimulated site.

On the other hand, the transient decrease in the muscle blood flow disappeared after administration of phentolamine, and the subsequent increase was abolished by either transection of sciatic nerve or application of hCGRP (8-37).

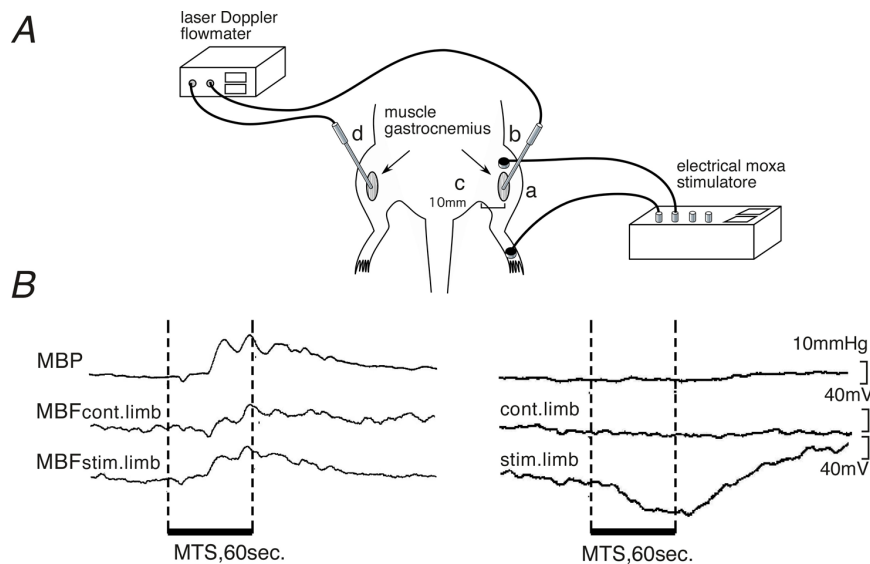


Figure 21 Effect of moxibustion-like stimulation on triceps surae muscle blood flow

A: Schematic diagram of experiment: muscle blood flow measurement at bilateral triceps surae muscle and moxibustion-like stimulation of the hindpaw or hindleg.

B: Increase in blood pressure and bilateral muscle blood flow induced by stimulation of the hindpaw (left). Two-phase response in ipsilateral muscle blood flow induced by stimulation to the hindleg. The response was not accompanied by change in systemic blood pressure.

These results demonstrated that moxibustion-like thermal stimulation of the gastrocnemius muscle induces decrease in the local blood flow via sympathetic nerve α -receptors, and increase in response involves the mechanism mediated by axon-reflex between proximal sciatic nerve and lumbar spinal cord (34) (Figure 22).

These findings indicated that local acupuncture and moxibustion treatment using the ‘ouch point (阿是穴, *Ah-shi* point)’ in clinical practice elicits not only flare formation in the skin but also prolonged increase in blood flow in the underlying muscle, which revealed a part of the mechanisms for removal of pain-producing substance by improvement in local muscle blood flow, and effect to relieve muscle fatigue.

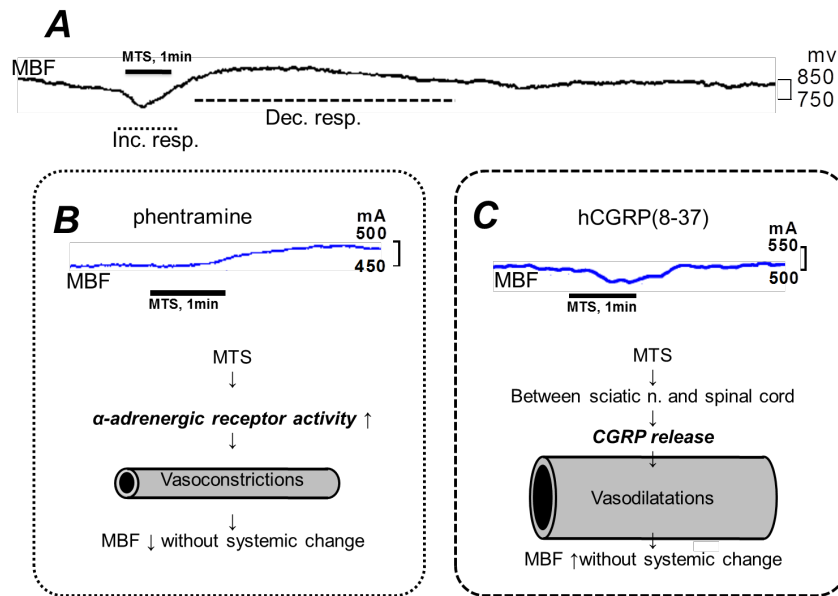


Figure 22 Mechanism of the muscle blood flow response at the site of moxibustion stimulation

A: A typical example of two-phase response in muscle blood flow observed at the moxibustion-stimulated site on triceps surae muscle: a transient decrease and subsequent increase in muscle blood flow.

B: Initial transient decrease in the muscle blood flow was not abolished by spine destruction, but disappeared after administration of phentolamine, a sympathetic nerve α -receptor antagonist.

C: Increase in the muscle blood flow was observed even after spine destruction, but abolished by administration of hCGRP(8-37), a CGRP antagonist. Therefore, it was concluded that decrease in response in blood flow is caused by direct stimulation of α -receptors of sympathetic nerves between proximal sciatic nerve and spinal cord, and increase in response is elicited by CGRP through axon reflex.

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Immunity

Acupuncture-moxibustion and immunity

Kazuo Tohya

Currently in Japan, many practitioners of clinical acupuncture and moxibustion believe that the mechanism underlying therapeutic effect of acupuncture and moxibustion involves the body's immune system, and the association of acupuncture and moxibustion with immunity attracts a lot of interest. In a questionnaire conducted by the Japan Society of Acupuncture and Moxibustion in 2007, 80% or more practitioners responded that 'acupuncture and moxibustion treatment has an effect on immune system' and many responded that 'moxibustion or moxibustion-based treatment is effective' for enhancing immunity (1). The following facts may explain these results: i) practitioners were taught during their training that 'acupuncture and moxibustion have an action of enhancing immune system'; and ii) clinical experience showing, for example, that 'patients who received acupuncture and moxibustion treatment become less likely to catch a cold' supports the belief that 'acupuncture and moxibustion activate immune system ... and enhance resistance to infection.'

Western medical studies on the biological effects of acupuncture and moxibustion appear to have been undertaken since the end of the Meiji period (1868-1912), although the concept of 'immunity' was not sufficiently defined in Western medicine at that time. The term '*Men'eki* ('immunity' in Japanese)' literally means 'being protected from infectious disease.' The concept is based on experience gained throughout the history of the struggle for survival against various pathogenic microorganisms, including viruses and bacteria: 'once a person contracts a disease by infection and luckily recovers from it, he or she will never develop the same disease again (permanent immunity).' Such experiential knowledge accumulates over time. For example, in China and Turkey in the 15th century, scabs obtained from patients with smallpox were administered to healthy people by inhalation, in an attempt to prevent infection from the virus. At the end of the 18th century, British physician E. Jenner succeeded in acquiring resistance to smallpox infection by artificially inoculating healthy people with vaccinia, and this achievement heralded the subsequent development of modern immunology: i.e., about 100 years later, at the end of the 19th century, L. Pasteur established vaccine therapy based on Jenner's principle; E. Behring and S. Kitasato discovered antitoxin (antibody), and E. Metchnikoff found the role of phagocytosis by leukocytes. Since the earliest days of immunology, the immune basis for the therapeutic effect of moxibustion has been and continues to be studied in Japan, as described below.

a. Early studies on acupuncture-moxibustion and immunity in Japan

In Japan, studies on acupuncture and moxibustion from an immunological perspective began in the early

Showa period (1926-1989), when the mechanism of 'permanent immunity' was still elusive, as well as in the West. There was, however, increasing understanding that antibody and cellular phagocytosis might somehow participate in the body's defense. During the 1920-30s, serological studies were conducted to investigate the response (mostly the biological response) of the body to acupuncture and moxibustion stimulation. Results from these studies were suggestive of enhancement of innate and acquired immunity, subsequently demonstrated as 'increased number of leukocytes in peripheral blood,' 'increased phagocytic capacity of leukocytes,' and 'increased antibody production in response to an exogenous antigen' (2). After World War II, academic activities remained at a low level for a while. Nevertheless, the above-mentioned early results had a considerable impact on the subsequent teaching of the theoretic basis for treatment with acupuncture and moxibustion in Japan.

In 1972, the efficacy of acupuncture anesthesia was reported overseas (in China) and acupuncture and moxibustion studies drew attention in Japan. After that the action mechanism of acupuncture stimulation was mainly studied in an electrophysiological field in relation to the nervous system. Meanwhile, in immunology during the same period in the West, two distinct populations of lymphocytes, T cells and B cells, were discovered, and the basis for their mutual relationship has been becoming clear. In addition, the development of techniques for producing monoclonal antibodies led to the further advancement of immunological research; it became possible to use surface markers as a basis for separating and functionally classifying lymphocyte subpopulations. In this context, in 1980s, novel immunological knowledge was introduced into acupuncture and moxibustion studies in Japan: the changes in dynamics and cytotoxic activities of peripheral blood T cells and B cells in response to acupuncture stimulation, as well as the changes in cellular immune activity indicated by the tuberculin reaction, were investigated. Since the effects of acupuncture and moxibustion stimulation on the immune system were confirmed by modern medicine, basic research about relationship between them was re-evaluated in the relevant study field in Japan.

Between the end of 1970s and 1980s, the higher educational institutions as acupuncture and moxibustion training courses (one college and one junior college) were introduced in Japan. So it became possible to study acupuncture and moxibustion scientifically at those specialized institutions (later graduate schools were also established). In these institutions, experimental studies on the relation of acupuncture and moxibustion to immunity were performed using small experimental animals such as mice and rats. Initially, the investigations focused on moxibustion studies about the morphological changes of histology in lymph node and spleen, and dynamics of T cells, B cells, and plasma cells within them, using conventional histological and immunohistochemical methods. These attempts were to generate new findings relating to the mechanism of moxibustion and to re-evaluate the previous results, because few studies on moxibustion have been conducted since the early Showa period, in contrast to the many studies on the neurophysiological effects (anesthetic and analgesic effects) of acupuncture.

In the 1980-90s, new immunological findings were obtained from the analysis of *in vitro* experiments including co-culture of functionally-specialized immunocompetent cells, and also from *in vivo* experiments examining the molecular biological events evoked after immunization to experimental animals. Especially, the important findings were obtained to understand cellular and humoral immunity, that is the molecular

mechanisms underlying T and B cell interactions and the antigen presentation to T cells by dendritic cells.

Following those rapid developments of immunology in Western medicine, the research on acupuncture-moxibustion and immunity was actively continued by the institutions in acupuncture and moxibustion colleges. In the 1990s, it was reported that acupuncture stimulation could influence the blast formation of lymphocytes and the ratio of lymphocyte subsets. Moreover, effects on acquired immunity, such as delayed-type hypersensitivity and antibody production, were also investigated in this period. As for innate immunity, effects of acupuncture and moxibustion on phagocytosis by neutrophils and the role of natural killer (NK) cells against the growth and metastasis of transplanted tumors were also investigated. However, most of the above-mentioned series of findings were focused to immunological phenomenon induced by acupuncture and moxibustion stimulation. In this context, it still remained unknown how acupuncture and moxibustion could influence the qualitative alterations of acquired immune system, and how the action mechanism behind those phenomenon could be explained from a viewpoint of modern immunological knowledge.

b. Trend of recent studies on acupuncture-moxibustion and immunity

In current immunological theory, T cell function and the cytokine network occupy a critical position to understand an intricately developed immune system. Especially, it is important that type 1 (Th1) and 2 (Th2) subsets of helper T cells participate in cellular and humoral immunity under the reciprocal inhibitory regulation mechanism by cytokines. This regulatory balance is thought to be involved in the maintenance of physiological immune functions, as well as in the mechanism of the pathogenesis of immune disorders such as allergy and autoimmune disease. The recent finding of new subsets of helper T cells, including regulatory T cells (Treg) and Th17 has provided a new understanding of mechanisms of immune phenomena or immune diseases, which were not previously understood.

The presence of the cytokine network is also essential for maintenance of the immune system. Secretory cells located in the center of this network are the helper T cells described above. Their functional classification is based on differences in cytokine secretion. Therefore, the pattern of expression of a specific cytokine (or the function of the T cell secreting that cytokine) can be an important marker for investigating immune system dynamics.

Because cytokines regulate immune responses, the mechanism of the effect of acupuncture and moxibustion on the immune system was investigated using cytokines as markers, starting in the late 1990s in Japan. In those studies, variation in levels of proinflammatory cytokines (including interleukin [IL]-6) were investigated by regarding acupuncture and moxibustion as noxious stimuli, and levels of immunoregulatory cytokines (such as interferon- γ and IL-2) were investigated by regarding acupuncture and moxibustion as immunoregulative stimuli. In addition, methodology of the measurements of cytokine protein levels in human plasma by immunoassays, or capacity of cytokine secretion of isolated lymphocytes from blood or peripheral lymphoid organs by molecular biological technique (including DNA, RNA) have provided highly objective results to the study. It has now become possible to describe at the molecular level the potential effects of acupuncture and moxibustion on the quality of immune functions in terms of changes in cytokine

expression, as described below. Further, studies on acupuncture-moxibustion and immunity have yielded new findings; humoral factors derived from the nervous and endocrine systems have been associated with cytokine production, and the dynamics of cytokine production have been linked to the influence of stress.

The immune system in the mucosa covering the surface of the respiratory and gastrointestinal tracts, i.e., the mucosal immune system, has also attracted interest in recent immunological research. As described below, findings showing the association of the mucosal immune system with acupuncture and moxibustion have been reported since around 2000.

Thus, the history of research on acupuncture-moxibustion and immunity in Japan seems to begin with investigation of the therapeutic effects of moxibustion at the end of the Taisho period (1912-1926). Although their progress has been far from smooth, the investigations to elucidate the mechanism of their therapeutic effect are ongoing, having been influenced by the developments in acupuncture and moxibustion education in Japan and the accumulated findings of rapidly-evolving current immunological research.

Effects of acupuncture and moxibustion stimulation on the immune system

Yuki Aono, Kazuo Tohya

Although the effects of acupuncture and moxibustion treatment on the immune system have been borne out by clinical experience, the detailed mechanism of the effects remains to be elucidated. In this section, the effects of acupuncture and moxibustion stimulation on innate and acquired immunity will be discussed separately, by describing studies in humans and experimental animals of the physical responses to acupuncture and moxibustion stimulation, as well as experimental systems used to evaluate possible therapeutic efficacy for immune system diseases.

a. Effects on the innate immunity

Innate immunity is the body defense system which is mediated by phagocytes including macrophages, neutrophils, dendritic cells, and natural killer (NK) cells as effector cells to eliminate nonspecifically the invading antigen to the body. This mechanism in contrast to the mechanism of acquired immunity (principally mediated by lymphocytes) does not require antigen specificity or immunological memory. So it is seemingly easy to evaluate increased immunocompetence, but actually, some trained technique is needed to manipulate innate immune cells (unlike acquired immune cells, i.e., lymphocytes) and therefore few acupuncture and moxibustion studies dealt with these cells have been reported.

Among innate immune cells, macrophages and dendritic cells, which first encounter foreign antigen invaded the body, are important for the body's defense. These cells can uptake, degrade, and process the

antigen and migrate to lymph nodes. In the lymph node, they have antigen presenting capacity (i.e., present antigen fragments [parts of the antigen degraded to peptides] together with major histocompatibility complex [MHC] class II molecules, to helper T cells, which are central to the induction of acquired immunity). Langerhans cells found in the epidermis are a subset of dendritic cells and potent antigen-presenting cells when they are activated. Antigen fragments on the membrane surface of these antigen-presenting cells form complexes with MHC class II molecules. Each complex specifically binds to T-cell receptor, and then induces clonal expansion of antigen-specific T cells and secretion of IL-2, triggering the initiation of the acquired immune response. Meanwhile, macrophages, activated by contact with antigen and IFN- γ secreted by activated T cells, secrete reactive oxygen and proteolytic enzymes that degrade the exogenous antigen. In their role as antigen presenting cells after phagocytosed antigens, macrophages secrete various cytokines when activated through the action of Toll-like receptor (TLR), and play a regulatory role in the induction of local inflammatory reaction by producing nitric oxide and prostaglandin.

Although having this wide variety of functions, macrophages are adhesive *in vitro* and therefore require the use of skilled technique to manipulate them, as mentioned above. Since it is difficult to culture macrophages over long periods, analysis of expression of MHC class II molecules of the isolated cells by flow cytometry after direct administration of exogenous antigen into experimental animals is suitable to evaluate innate immunity, including the capacity for antigen presentation and phagocytosis. In addition, the direction of the immune response may be indicated by expression of genes encoding macrophage-derived cytokines and related factors that trigger inflammation.

(1) Effects of acupuncture stimulation on the innate immunity

In mice, when intradermal needles are inserted in an extremity to a depth of 5 mm (site corresponding to the ST36 [足三里] acupuncture point) or trunk (BL23 [腎俞] acupuncture point), and the site is stimulated bilaterally for 15 minutes without anesthesia twice-weekly for about 2 months, the cellular function of the innate immune system with phagocytic capacity shows alteration (3). Accordingly, fluorescein isothiocyanate (FITC)-labeled latex beads (about the same size as bacteria) were injected into the abdominal cavity of acupuncture-treated mice. The rate of phagocytosis of the beads by peritoneal exudate cells was evaluated using flow cytometry and the expression of membrane surface antigen involved in antigen presentation was examined.

In both stimulation groups (extremity and trunk), as compared with the control group (no stimulation), the percentage of cells engulfing labeled beads was increased, though slightly, and the amount of engulfed beads indicated more phagocytosis by exudate cells from the trunk-stimulation group than from the extremity-stimulation group. Most exudate cells recovered from the abdominal cavity were confirmed to be CD11b-positive macrophages. When the antigen presenting capacity was examined using MHC II expression as a functional marker, the percentage of cells expressing MHC II was similar in the extremity- and trunk-stimulation groups, whereas MHC II expression tended to be higher in the acupuncture stimulation groups than the control group. Thus, although the mechanism of action is unclear, acupuncture stimulation on the trunk of mice is expected to increase the capacity of

macrophages to phagocytose and present antigen, and potentially, to enhance innate immunity. The tendency toward increase in IL-12 mRNA expression in peritoneal exudate cells also supports the potential role of acupuncture. Although it remains a matter of speculation, NK and NKT cells may be activated by IL-12, as well as by macrophages, leading to the activation of both the innate and acquired immune systems. Indeed, the enhancement of antitumor activity of NK cells by acupuncture stimulation has previously been observed in experimental animals (4).

(2) Effects of moxibustion stimulation on innate immunity

Macrophages and NK cells are used to evaluate effects of moxibustion stimulation on innate immunity. Stimulation by direct moxibustion with 3 cones of moxa to the trunk of rats (sites corresponding to the bilateral BL20 (脾俞) and BL23 (腎俞) acupuncture points) twice-weekly for 3 months affected the function of their peritoneal macrophages (5). In contrast to the previously described effects of acupuncture stimulation, moxibustion stimulation reduced the percentage of macrophages that phagocytosed antigens. There was, however, a trend toward increased expression of MHC class II molecules in the moxibustion group. It is highly likely that moxibustion might reduce the total phagocytic capacity of the macrophages, but enhance their antigen presenting capacity by increasing expression of MHC class II molecules once each macrophage has phagocytosed antigens. After moxibustion, the number of exudate cells recovered from the abdominal cavity is small, and the number of macrophages that can be obtained from the exudate is decreased. The change of distribution of macrophages appears to be a cause of this result. Macrophage is an immunocompetent cell that is recruited rapidly under the influence of migratory factors, including chemokines, immediately after infection, or at the wound site. Therefore, when local tissue damage is caused by moxibustion, macrophages would be expected to immigrate temporarily to the moxibustion-stimulated skin (the site of inflammation) and carry out their functions, such as processing denatured protein; as a result, recovery of macrophages from the abdominal cavity may be less likely. In fact, intercellular adhesion molecule-1 (ICAM-1)-positive vessels (like high endothelial venules) are found to develop in tissues around the site of moxibustion stimulation. Cells of macrophage lineage are expected to be efficiently recruited to the region of moxibustion stimulation by means of adhesion molecules. In addition, a trend of increase of IL-1 β mRNA expression, a cytokine expressed by peritoneal exudate cells, is demonstrated; it is reasonable to consider this increase to be a consequence of tissue damage by moxibustion.

Moxibustion stimulation experiments (like acupuncture stimulation experiments) in implanted tumor-bearing animals have shown a post-stimulus increase in the antitumor activity of murine splenocytes (6, 7). The mechanism underlying the effect may involve the increased expression of IFN- γ and IL-12 caused by the moxibustion, as described previously.

b. Effects on the acquired immunity

Unlike innate immunity, which primarily mediated by phagocytic cells, acquired immunity mainly involves

lymphocytes and is coordinated by helper T cells. The helper T cells generate the cellular immune response by inducing and activating killer and effector T cells and generate the humoral immune response (antibody production) by activating B cells. Thus, the evaluation of acquired immunity may depend on changes in the response of helper T cells during the secondary response.

To evaluate effects on acquired immunity, a certain marker of the immunological capacity is quite important, which could reflect the conditions of both 'antigen specificity' and 'immunological memory.' In animal experiments, the genetic backgrounds of the materials are identical. Additionally, it is possible to establish antigen-specific T cells by direct subcutaneous injection of a given antigen, and to artificially induce immunological memory. On the other hand, in human subjects, it is unclear what antigens individual subjects are previously exposed to and whether immunological memory is maintained. In addition, unlike experimental animals, human subjects cannot be immunized with a given antigen, and immunization cannot be expected to induce an identical immunological memory. Therefore, except for the studies involving human subjects with a particular disease, studies in humans to evaluate the effects of acupuncture and moxibustion stimulation are considerably difficult and several issues may arise if antibody production level or lymphocyte subsets are used as a marker of immunocompetency.

For studies examining both acupuncture and moxibustion stimulation, assessment of the pattern of cytokine secretion by helper T cells would reveal the direction of the induced immune response. Given that cytokine is not storage-typed materials and is consumed at a high rate, it is desirable to evaluate the level of mRNA expression at a stage prior to cytokine biosynthesis, rather than the actual level of cytokine protein.

(1) Effects of acupuncture stimulation on acquired immunity

Most previous reports indicate that acupuncture and moxibustion stimulation change the cytokine secretion pattern in immune cells (i.e., lymphocytes and macrophages). Reports on the changes in IFN- γ and IL-10 strongly support their effects on the acquired immune response.

The application of low-frequency electro-acupuncture (EA) stimulation in rats at sites corresponding to the BL20 (脾俞) and BL23 (腎俞) acupuncture points changed the level of IFN- γ and IL-10 mRNA expression in splenic lymphocytes after pre-immunization with human immunoglobulin (HGG) (8). Generally, increased IFN- γ (secreted from Th1, killer-T, and NK cells) can induce enhancement of cellular immunity. No secondary response is induced in splenocytes (cultured without antigen) from immunized and acupuncture stimulated rats (acupuncture-stimulation group), but IFN- γ mRNA expression in these splenocytes is apparently increased relative to IFN- γ mRNA expression in splenocytes from immunized rats without acupuncture stimulation (control group). But when the cultured splenocytes are stimulated by antigen to induce a secondary response, there is no such difference in the expression between the two groups. So it is speculated that the increased expression of IFN- γ mRNA is not a response to specific antigen, but a part of the body's response to the acupuncture stimulation. The increase in IFN- γ mRNA seems to be independent of stimulation by specific antigen and to have little effect on the acquired immune response. Rather, constitutively high-level of IFN- γ mRNA expression may be observed in acupuncture-stimulated rats. It is unknown at this point whether

the increase in IFN- γ mRNA expression enhances the primary acquired immune response. In splenocytes of rats that have received EA stimulation at the site corresponding to the ST36 (足三里) acupuncture point, similar increased expression of IFN- γ is confirmed at the protein level, and increased NK activity is observed at the same time (4). In addition, in peripheral blood lymphocytes from healthy adults who have received acupuncture stimulation at the BL18 (肝俞), BL20 (脾俞), BL23 (肾俞), and ST36 (足三里) acupuncture points, similar change in IFN- γ expression is observed as an increase in the level of intracellular cytokine protein (9).

Meanwhile, IL-10 mRNA expression is apparently increased when splenocytes obtained after acupuncture stimulation are stimulated in culture with antigen to induce a secondary response. It seems that this increase is not the body's direct response to acupuncture stimulation, but represents an acupuncture-induced modification of the acquired immune response. IL-10 is secreted mainly from Th2 cells and, like TGF- β , is called an 'inhibitory cytokine.' IL-10 inhibits expression of MHC class II molecules on the antigen-presenting cell and secretion of IL-12, leading to the suppression of Th1 functions. The observation that secretion of the inhibitory cytokine is increased when the secondary response is induced by antigen stimulation in acupuncture-stimulated splenocytes suggests that EA stimulation at the BL20 (脾俞) and BL23 (肾俞) acupuncture points inhibits the acquired cellular immune response. Thus, EA stimulation may be able to suppress inflammatory reactions associated with the response to antigen entry into the body.

The mechanism underlying the impact of acupuncture stimulation on the cytokine secretion pattern of T cells is unclear. As recent immunological studies describe, possibly the most compelling hypothesis is that the autonomic nervous system and endogenous opioids may affect antigen presenting cells, changing the pattern of cytokine secretion from T cells (10). The change in the ratio of lymphocyte subsets in peripheral blood after the acupuncture stimulation may also reflect an effect on the immune system mediated through the autonomic nervous system (11).

(2) Effects of moxibustion stimulation on acquired immunity

As previously mentioned, it is extremely difficult to induce an antigen-specific immune response, a characteristic of acquired immunity, in human subjects because of differences in immunological memory between individuals. So researchers attempted to examine the effect of moxibustion on the function of T cells (the cells centrally located in acquired immunity) by evaluating the response against artificial antigen stimulation. When peripheral blood-derived lymphocytes from healthy adults treated by moxibustion for 2 months were stimulated by solid-phase anti-CD3 antibody, the lymphocytes expressed a significantly higher level of IFN- γ mRNA than before moxibustion (12). T cells are activated when receptors on the T-cell surface recognize MHC class II molecules and antigen fragments on the antigen presenting cell. At this time, the CD3 -T-cell receptor complex sends a signal into the cell. Therefore, the crosslinking of CD3 molecules with antibody can be used to artificially activate the immune response that would ordinarily be activated through antigen receptor.

The level of IFN- γ mRNA expression is increased also without the stimulation by solid-phase

anti-CD3 antibody in lymphocytes derived from moxibustion-stimulated individuals, but the increase is greater after stimulation by solid-phase anti-CD3 antibody. Given that IFN- γ mRNA expression is increased by moxibustion and greater increase is observed when T cells are activated by CD3 stimulation, it seems that the increased expression may represent an effect on acquired immunity, the actual secondary immune response to antigen. Thus, moxibustion is found to increase the secretion of IFN- γ mRNA and to facilitate the enhancement of cellular immune response. Insofar as moxibustion causes mild tissue damage on the skin surface, mRNA expression of TNF- β , a proinflammatory cytokine, is also increased (Figure 1). However, since the level of TNF- β expression is high with or without the stimulation by solid-phase anti-CD3 antibody, it would be better to consider the change in this cytokine level as a by-product of the immune response, rather than as a consequence of the effect on acquired immunity.

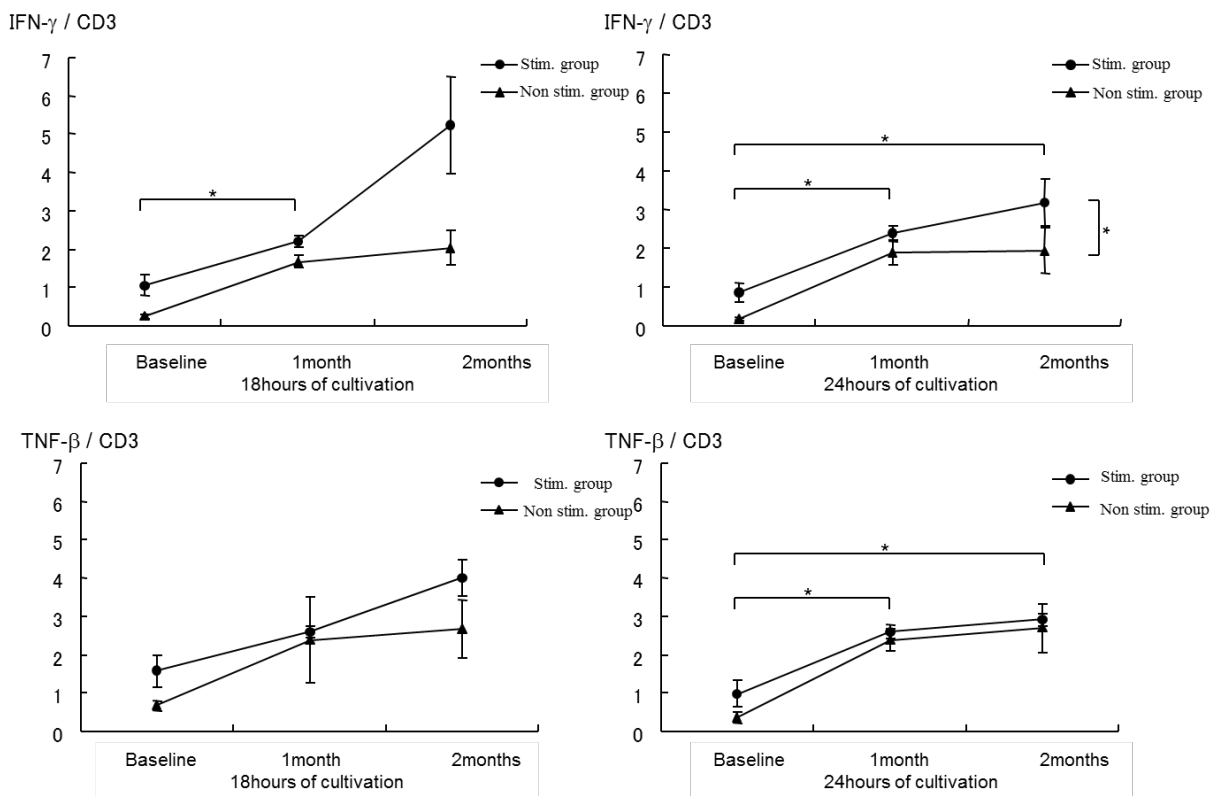


Figure 1 Change of cytokine mRNA expression elicited by moxibustion stimulation

Lymphocytes are derived from peripheral blood 1) before applying moxibustion stimulation, 2) one month after moxibustion stimulation and 3) two months after stimulation. They are cultivated on anti-CD3 antibody-coated culture plates (stim. group) or non-coated ones (non stim. group) for 18 hours and 24 hours, respectively. Then total RNAs are extracted from each lymphocyte, and the expression of IFN- γ mRNA and TNF- β mRNA are detected by RT-PCR method. (mean \pm SEM, * p <0.05)

It is demonstrated also in animal experiments that moxibustion changes the pattern of cytokine mRNA expression. According to the concept of local immune regulation, the effect of moxibustion, which causes mild inflammation on the skin, is expected to be a regional lymph node response

manifested by lymph draining from the stimulated region. Various components from burned moxa, which penetrate subcutaneously during the moxibustion, may be carried into the lymph flow via lymph capillaries and afferent lymph vessels and affect the immune response in regional nodes. The application of moxibustion stimulation at the site in normal rats (corresponding to the ST36 (足三里) acupuncture point in humans) increases expression of IFN- γ mRNA, just as in human subjects (13). The source of IFN- γ is thought to be predominantly Th1 cells activated in the node. Also, in the stimulated lymph node, increased expression of IFN- γ mRNA is preceded by expression of IL-12 mRNA. IL-12 is a cytokine secreted from activated cells of the innate immune system and plays a role in linking innate with acquired immunity by inducing differentiation of Th1 cells. Thus, moxibustion seems to induce differentiation and activation of Th1 cells in the regional lymph node and seems to create an environment conducive to a cellular immune effect, such as a Th1-dominant immune response. At the same time, since IL-12 enhances the cytotoxic activity of NK and NKT cells and IFN- γ enhances the phagocytic activity of macrophages, moxibustion is expected to affect innate immunity and raise the level of the body's basic resistance to infections and other diseases. The increased expression of IFN- γ and IL-12 associated with moxibustion in experimental animals has also been reported in other countries, which suggest that moxibustion can enhance acquired immunity.

If the enhancement of Th1 activity by moxibustion affects the cytokine network, it may help improve the course of immune diseases or diatheses caused by Th1/Th2 imbalance. A typical example might be type I allergy, which involves antigen-specific IgE. In the immune system of patients with chronic allergy symptoms, Th2 cells rather than Th1 cells predominantly respond to antigen stimulation; so the cytokine balance would chronically favor Th2 responses, and consequently, differentiation of IgE-producing plasma cells may be easily induced, leading to hypersensitivity to allergens through degranulation of mast cells. One of the suitable animal models of allergic disease is a Brown Norway rat strain, which has highly sensitive mast cells and a Th2-dominant immune response to antigen. Repeated sensitization with allergen can lead to Th2 activation in this animal, that is, increased IL-4 mRNA expression, and rapid elevation of blood IgE level. Application of moxibustion at the site corresponding to the ST36 (足三里) point in the animal before allergen sensitization effectively inhibits IgE production and allergen-specific intradermal reaction after sensitization (Figure 2) (14). Moxibustion may facilitate IFN- γ secretion by inducing differentiation and activation of Th1 cells, and the above-mentioned inhibition seems to be a consequence of inhibitory effect of IFN- γ on Th2 cell activity. In clinical acupuncture and moxibustion practice, some patients with allergic diseases, such as atopic dermatitis and hay fever, are reported to respond to the therapy. The therapeutic response may include suppression of IgE production and reduction of cutaneous pruritus. It is suggested that immunological mechanism underlying this response may be similar to restoration of cytokine balance, which has been demonstrated by experiments in the animal models described above.

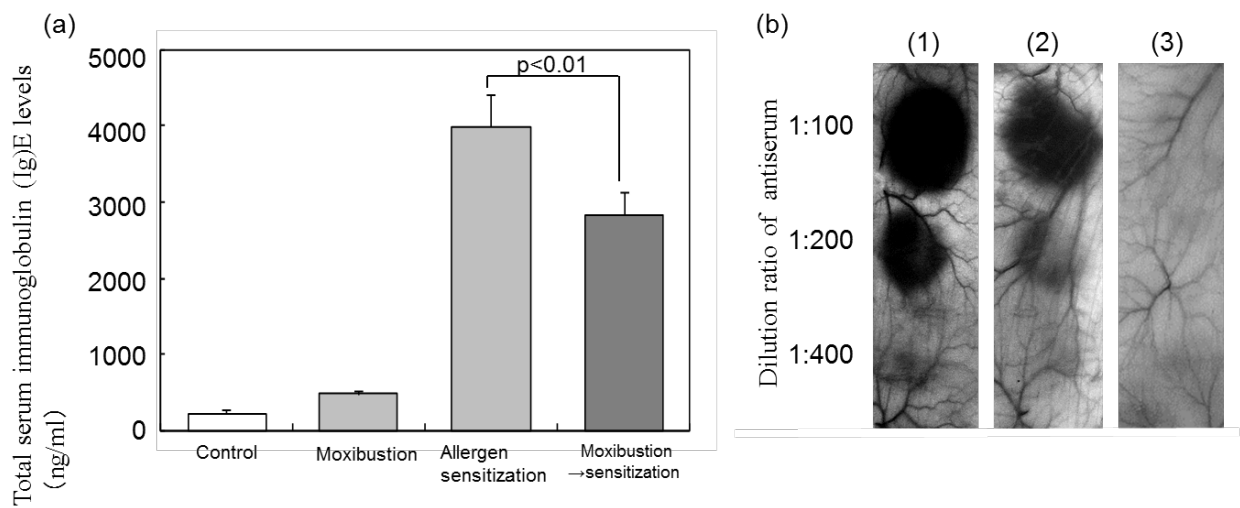


Figure 2 The total serum immunoglobulin (Ig)E levels (a) and the inhibition of intracutaneous allergen (b) after moxibustion stimulation to Brown Norway rats

Moxibustion stimulation to ST36 of Brown Norway rats with allergic diathesis inhibits the increase of total serum immunoglobulin (Ig)E levels induced by sensitization of an allergen (a). It also inhibits specific allergen-induced intracutaneous reaction demonstrated by passive cutaneous anaphylaxis test (b). In figure (b), (1) shows the result when only allergen sensitization is performed, (2) shows the result when allergen sensitization is performed after moxibustion stimulation. And (3) shows the results when inactivation of IgE is performed.

Effects of acupuncture and moxibustion stimulation on the mucosal immune system

Tatsuya Hisajima

a. Mucosal immunity

We are routinely exposed to various microorganisms, including pathogens. Pathogenic microorganisms enter the body primarily through the mucosa of the gastrointestinal and respiratory tracts, and uterus. Therefore, the mucosa has a defense mechanism against pathogenic microorganisms that would otherwise invade, colonize, and infect the body. The mechanism is called ‘mucosal immunity’ and consists of various mucosal defense systems, ranging from primitive nonspecific systems to sophisticated infection- and disease-specific ones. The former systems include innate barriers and natural immunity at the front line of defense against infection, and the latter includes acquired immunity. In addition, mucosal immunity has a mucosa-specific immunoregulatory mechanism that protects vital functions by eliminating pathogenic antigens while not eliminating non-pathogenic ones (mucosa-mediated tolerance).

(1) Nonspecific defense mechanisms

(a) Innate barriers (Figure 3)

- Physical mechanisms: The mucus covering the mucosal surface is mainly composed of mucin, a glycoprotein. Mucin may bind to pathogenic microorganisms in the mucus and can physically prevent them from adhering to epithelial cells. Furthermore, normal mucosal epithelia serve as an important structural defense against invasion, colonization, and passage of pathogenic microorganisms.
- Chemical mechanisms: The chemical defense factors in the mucus include endogenous antibacterial agents, such as defensin, lactoferrin, and lysozyme, and nonspecific secretory IgA (sIgA), a humoral factor.
- Biological mechanisms: Indigenous microbial flora, which are non-pathogenic microorganisms adhering to mucosal epithelia, prevent colonization and overgrowth of pathogenic microorganisms and inhibit establishment and spread of local or systemic infection.

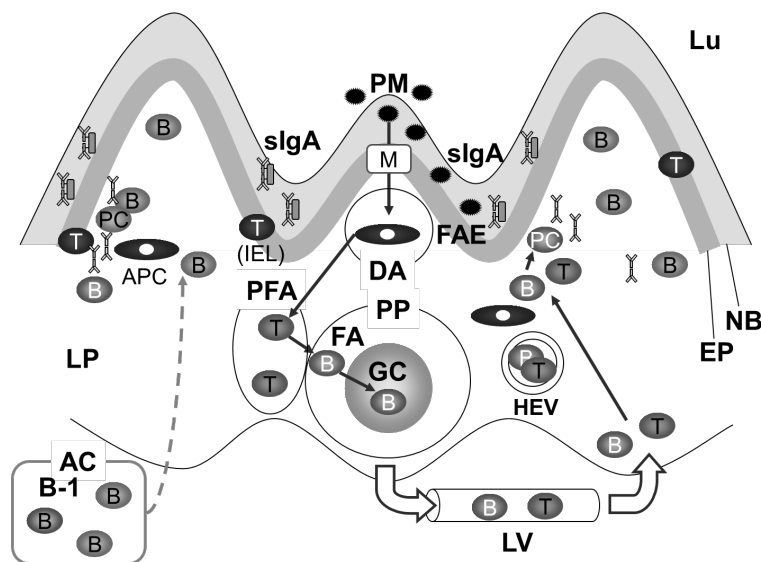


Figure 3: Transportation of IgA to the mucosal surface in the common mucosal immune system via Peyer's patch
 The red arrows indicate the induction pathway of immunocytes after the antigen recognition in the common mucosal immune system.

AC, abdominal cavity; APC, antigen -presenting cell; B, B cell ; DA, dome area; EP, epithelial cell; FA, follicular area; FAE, follicle-associated envelope; GC, germinal center; HEV, high endothelial venule; IEL, intestinal intraepithelial lymphocyte; LP, lamina propria; Lu, lumen; LV, lymph vessels; M, microfold cell ; IB, innate barrier; PFA, parafollicular area; PM, pathogenic microbe; PC, plasma cell; PP, Peyer's patch ; sIgA, secretory immunoglobulin A; T, T cell.

(b) Innate immune system

When pathogenic microorganisms cross the above-mentioned innate barrier, polymorphonuclear leukocytes (neutrophils, eosinophils), mononuclear leukocytes (monocytes, macrophages), dendritic cells, NK cells, cytokines (TNF- α , IL-1, IL-12, INF- γ), the complement system, and plasma proteins all contribute to their elimination similarly to systemic immunity. In addition, intestinal intraepithelial lymphocytes (IELs) with various cytokine-producing capacities are found in the intestinal epithelial layer, and $\gamma\delta$ T cells in the IELs play an important role in prevention of infection, induction of oral immunity, sIgA production, and development and differentiation of epithelial cells.

In the (innate) immune response, immune cells are known to recognize and respond to pathogenic microorganisms through lipopolysaccharide-binding protein and mannose receptor on the cell surface, as well as through TLR, which has recently drawn a great deal of attention. These receptors are referred to as 'pattern-recognition receptors (PRRs).' They recognize and receive signals from molecular structures called 'pathogen-associated molecular patterns (PAMPs),' which are specific to various pathogens including bacteria and fungi. At least 11

TLR subtypes (TLR1–11) have been identified, so far, in humans and found to localize in immune system cells, such as macrophages, dendritic cells, and NK cells, as well as in epithelial cells of the lung, kidney, and gastrointestinal tract, vascular endothelial cells, skin, and other tissues. All TLRs are type I transmembrane proteins and have a cytoplasmic domain similar to that of IL-1 receptor. Specific TLRs contribute to the recognition of each pathogenic microorganism. Signals from TLR are transduced through adaptor molecules (i.e., myeloid differentiation primary response gene 88 [MyD88], IL-1 receptor-associated kinase [IRAK], and tumor necrosis factor receptor-associated factor [TRAF6]) and then activate nuclear factor-kappa B (NF- κ B); thus TLRs play a critical role in the innate immune response. The recognition of pathogenic microorganisms facilitates release of various chemokines and cytokines responsible for the activation of cells of the innate immune system through PRR signaling cascades. As a result, effective inflammatory response for defense against infection is induced, leading to the subsequent activation of acquired immunity.

(2) Specific defense mechanism (acquired immune system)

In the mucosa, inhaled or ingested pathogenic microorganisms bind to antibody secreted into the lumen of the respiratory or gastrointestinal tract, and host colonization is inhibited. The class of antibody produced in this setting is mostly IgA, and IgA production is a feature of mucosal immunity. In IgA production, inductive and effector sites play important roles; the former sites are regional lymph nodes of each organ, including the gut-associated lymphoid tissue (GALT), nasopharyngeal-associated lymphoid tissue (NALT), and bronchus-associated lymphoid tissue (BALT), and the latter sites are mucosal tissues. Antigens that enter through the mucosal surface are recognized at inductive sites by antigen presenting cells, which then activate immunocompetent cells. The activated immunocompetent cells leave the inductive sites, course through the body in the lymph and blood, and then selectively return to effector sites again (homing). Thus, the transport of IgA to the mucosal surface is carried out by a homing pathway called the common mucosal immune system (CMIS).

Taking the small intestine as an example, the mechanism of IgA transport from epithelium to lumen after antigen invasion, in addition to the CMIS, can be explained as follows (Figure 3). After entering through the mucosa, the antigen crosses M cells, a part of the follicle-associated epithelium (FAE) that covers the dome area (DA) of the Peyer's patch, and is recognized by antigen presenting cells, such as dendritic cells, in the DA. Then, antigen presenting cells express costimulatory molecules (CD80, CD86) and, together with MHC class II molecules, present the antigen to CD4⁺ T cells (or to CD8⁺ T cells through MHC class I molecules) in the parafollicular area (PFA). Activated T cells produce and secrete cytokines and activate B cells in the follicular area (FA). Activated B cells migrate to the germinal center (GC) and differentiate into IgA⁺ precursor B cells. Activated IgA⁺ precursor B cells migrate via lymphatic vessels in the PFA, mesenteric lymph nodes, and thoracic duct into the blood, and then return to the lamina propria (LP) of the intestinal tract, where they undergo terminal differentiation

into IgA⁺ plasma cells. IgA⁺ plasma cells in the LP are attracted by chemokines expressed in the basement membrane around villi and crypts, and then produce and secrete IgA. IgA secreted by IgA⁺ plasma cells in the LP binds to poly-Ig receptor (pIgR) expressed in dimeric form at the base of the epithelial cell. The resulting IgA-pIgR complex is carried to upper surface of the epithelial cell by means of endocytosis and vesicular transport. Then the complex is secreted into the lumen and serves as sIgA to neutralize and eliminate pathogenic microorganisms. T cells activated in the Peyer's patch are also redistributed to the LP and epithelial layer by homing. Most of such cells are $\alpha\beta$ T cells, distinct from $\gamma\delta$ T cells localized in the IELs. $\alpha\beta$ T cells produce cytokines of the Th1 type (IFN- γ) and Th2 type (such as IL-4, IL-5, IL-6, and IL-10); Th2 cytokines control the terminal differentiation of IgA⁺ precursor B cells into plasma cells. Both CD5⁻ B cells (B-2 cells) acting in the CMIS pathway as described above and CD5⁺ B cells derived from the abdominal cavity (B-1 cells) reside in the LP of the small intestine. Because B-1 cells can secrete IgA against non-protein antigen independent of T-cell effects, they are closely related to the innate barrier in the nonspecific defense mechanism (Figure 3).

Understanding mucosal immunity is anticipated to help the treatment of inflammatory bowel disease and food allergy, which are possibly caused by the failure of mucosal immune functions, as well as the development of transmucosal vaccines against microbial infections contracted through mucosa, and novel therapies combined with probiotics.

b. Effects of acupuncture and moxibustion stimulation on the mucosal immune system

Changes in salivary sIgA after acupuncture stimulation have been studied in Japan, although research on the association of acupuncture and moxibustion with the mucosal immune system is scarce. Moreover, the effects of acupuncture and moxibustion stimulation on several parameters, including cytokines, have been investigated mainly overseas in animal models of inflammatory bowel disease and patients with this disease, particularly ulcerative colitis (UC), which is believed to be caused by the failure of mucosal immunity.

It has been reported in a rat model of UC that EA and moxibustion stimulation at the CV6 (气海) and ST25 (天枢) points over 14 days inhibits the expression of IL-1 β and IL-6 mRNA in the spleen and colon (15), and decreases the levels of IL-1 β , IL-6, and TNF- α in the supernatants of cultured peripheral blood monocytes obtained from rats, and that the supernatants of monocytes from stimulated rats increase the induction of apoptosis of neutrophils isolated from peripheral blood (16). Since IL-1 β , IL-6, and TNF- α are proinflammatory cytokines produced mainly by monocytes and macrophages, EA and moxibustion stimulation may suppress these cytokines by affecting monocytes and macrophages in the blood and tissues. Neutrophils are important leukocytes that migrate from the blood to sites of enhanced inflammation resulting from the elimination of foreign bodies, mucosal damage, and cytokine production. It is speculated that EA and moxibustion stimulation may induce apoptosis of neutrophils in the blood, thereby lowering the number of neutrophils able to migrate to the site of inflammation. It can be further speculated that EA and moxibustion stimulation in the rat model of UC suppresses proinflammatory cytokines in monocytes, thereby reducing inflammation and recruitment of neutrophils into inflammatory sites in the colonic mucosa. A study demonstrated that EA stimulation at the ST36 (足三里) point over 10 days decreased myeloperoxidase

(MPO) activity in the colon, TNF- α mRNA expression, and serum TNF- α level (17). Neutrophils (the key causal factor in mucosal inflammation) and TNF- α (which induces the synthesis of proinflammatory cytokines such as IL-6 and IL-8) are the most important factors in inflammation. In rats with UC, MPO activity (a neutrophil marker) and TNF- α expression are elevated. So the anti-inflammatory effect of EA stimulation on the colonic mucosa may be exerted through neutrophils and TNF- α . In patients with UC, moxibustion stimulation mainly at the CV6 (气海), CV12 (中脘), ST25 (天枢), and ST36 (足三里) points decreased (below pre-stimulation levels) expression of IL-8 and ICAM-1 in the colonic mucosa (18). TNF- α and other factors in the region of inflammation stimulate synthesis of large amounts of IL-8 by various cells, including immune, vascular endothelial, and epithelial cells. IL-8 plays an important role in the migration of neutrophils and T cells and in tissue damage. ICAM-1 contributes to inflammation by inducing rolling and adhesion of neutrophils and monocytes on the endothelial cell surface. Therefore, moxibustion stimulation is expected to diminish the extravasation and tissue infiltration of leukocytes in patients with UC.

Thus, it is suggested that EA and moxibustion stimulation may control UC inflammation by suppressing cytokine production and chemotaxis of monocytes, macrophages, and neutrophils, and as yet uninvestigated factors such as Th1/Th2 balance, Tregs, TLRs, which play crucial roles in the pathological mechanism of UC.

c. Relationship between IgA production and the nervous system

It is known since the late 1980s that neurotransmitters, such as substance P (SP), vasoactive intestinal polypeptide (VIP), and somatostatin act on immune cells and affect IgA level. Recently it has been reported that, after lipopolysaccharide (LPS) stimulation, IgA⁺ B cells adjacent to VIP/neuropeptide Y (NPY)/calcitonin gene-related peptide (CGRP)-positive nerve fibers in the lamina propria are increased along with the increase in intestinal sIgA (19, 20). Thus, although the effect of acupuncture and moxibustion stimulation on this relationship has not been investigated, it is known that neuropeptide affects IgA production, which plays a crucial role in the natural and acquired mucosal immunity. This fact helps elucidate the relationship between the mucosal immune system and nervous system. Thus, acupuncture stimulation may regulate the mucosal immune system by the acting on the nervous system, as previously described for systemic immunity.

Acupuncture-moxibustion and immunity in the future

Tatsuya Hisajima

In this section, the peculiarities of the immune system and history of and recent findings from studies on acupuncture-moxibustion and immunity are described. Acupuncture and moxibustion stimulation is speculated to affect the natural, acquired, and mucosal immune systems, and is increasingly expected to have clinical application to immune system diseases, such as type 1 hypersensitivity reaction and ulcerative

colitis.

As immunology progresses with a focus on T-cell functions and the cytokine network, studies on acupuncture-moxibustion and immunity also focus on cytokines and now use methods to explore the cytokine secretion capacity at the gene level. In recent years, the number of immunological studies on acupuncture and moxibustion stimulation has increased, but most of these reports describe effects of stimulation on the immune system; the stimulatory mechanism remains uncertain. To understand the immune system, studies in genetically engineered mice, including knockout ones, are essential. The same can be used to elucidate the mechanism of the stimulatory effect of acupuncture and moxibustion on the immune system. In order to conduct studies in genetically-modified animals, researchers and graduate students with a knowledge of immunology as well as biology and biochemistry are needed, and it is important that institutions that teach and do research in acupuncture and moxibustion improve the environment for the education and research in immunology.

The effects of acupuncture and moxibustion on the immune system in small animals, e.g., mice, will be appreciated only when the findings in animals are applied to clinical studies in human subjects and expanded fully. However, acupuncture and moxibustion medicine is a holistic approach, based on assumptions that differ from those of Western medicine, the focus of which is the mechanism of disease. Therefore, since there is a present need for Evidence-based Medicine (EBM) in clinical research, it also seems necessary to consider that (compared with Western medical studies) acupuncture and moxibustion studies cannot always provide the same data. In the future, how to incorporate randomized controlled trial design and blinding, specified in WHO guidelines, into clinical acupuncture and moxibustion research will be a major challenge. It should also be remembered that therapy for improving symptoms of patients is needed more than the focus on EBM in medicine.

In Japan, basic research on acupuncture-moxibustion and immunity started with findings of 'increased phagocytic capacity of leukocytes' in the late Taisho period (1912-1926), and continues with assessment of cytokine expression at the gene level. So acupuncture and moxibustion practitioners are now able to ascertain the effects of acupuncture and moxibustion treatment on the immune system objectively (from experimental data) rather than rely on their clinical 'senses.' We hope that the basic and clinical immunology of acupuncture and moxibustion stimulation is further studied and that this treatment approach will continue to be found to contribute to the control of immune disorders such as allergic diseases and autoimmune diseases including infections and inflammatory bowel disease.

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Acupuncture and moxibustion in brain science

Introduction

Tomoaki Kimura

It goes without saying that higher brain function under the control of a highly developed cerebral cortex is an important characteristic of human beings. Satisfying research on higher brain function, however, has not been conducted for a long time. The main reason seems to be that it is technically difficult to apply noninvasive approaches to the study of a complex nervous system consisting of over 10 billion nerve cells.

However, recent dramatic progress in science and technology has led to noninvasive methods to measure human brain function and these have been put to practical use one after another. These technological advances have raised expectations for progress in brain science. In fact, the U.S. Congress designated 1990–2000 as “the decade of the brain,” and sponsored research activities directed toward elucidation of brain function. Following this policy, European communities also declared a “European decade of brain research” starting in 1992 and the results have been fruitful.

In this section, we will introduce and summarize recent findings of studies on acupuncture and moxibustion that used these methods to examine brain function: 1) conventional electroencephalography, evoked potentials, and magnetoencephalography; 2) positron emission tomography (PET) and single-photon emission computerized tomography (SPECT); 3) functional MRI (fMRI).

Research using electrophysiological methods

Ippeï Watanabe, Tomoaki Kimura

1. Research using electroencephalography (EEG)

Mori, Yano, and Hori et al. reported the relationship between acupuncture stimulation and changes in EEG in Japan (1,2). They observed that acupuncture stimulation changes basic normal brain waves. Frequency analysis and topography of EEG signals were carried out on two-dimensional maps depicting the energy of each frequency band as a color that depended on its signal intensity. In these reports, enhancement of α wave activity (basic rhythm, 8–12 Hz) was seen after “comfortable” electro-acupuncture stimulation (LI4 [合谷]–LI10 [手三里], 1 Hz for 15 minutes). Hori et al. reported that they observed emergence of a diffuse α pattern or front midline θ (Fm θ) activity persisting 15 minutes after electro-acupuncture stimulation to the same points, and concluded that a humoral mechanism was involved in the effects generated by acupuncture stimulation. In addition, in a study using α -ReAT (α -wave reappearance time) as an index, α -ReAT was shortened by electro-acupuncture stimulation (LI4 [合谷]–LI10 [手三里], 1 Hz for 15 minutes). These temporal and spatial enhancements of α wave activity and reduction of α -ReAT indicate that acupuncture stimulation slightly suppresses the function of the thalamus and brain-stem reticular activating system, and the emergence of Fm θ waves also suggested acupuncture stimulation relieves situational anxiety.

2. Research using evoked potentials

Although changes in EEG can be recorded in a subject at rest, specific external events also affect EEG wave pattern, which can be calculated by signal averaging. These extracted wave patterns are called evoked potentials. Evoked potentials were classified based on the interval between the stimulus and the onset of its effect into three groups: short-latency (approximately 0–8 msec), middle-latency (approximately 8–50 msec), long latency (approximately 50–300 msec) (3). Short-latency evoked potential was reported to reflect mainly the primary response of the cerebral cortex.

In a study of the effect of acupuncture stimulation on short-latency evoked potential, Kimura et al. reported that the latency of early cortical components induced by electrostimulation to deep tissues with an insulated acupuncture needle differed from that of the wave pattern seen when electrostimulation was applied to the external surface of the skin. From this data, they concluded that the direct electrostimulation of deep tissues with insulated acupuncture needles may be processed by pathways different from those used to process electrostimulation of the skin (4). This result gives us insight into the specificity of acupuncture stimulation of deep tissue, which can be characterized as direct and precise.

In contrast to short-latency evoked potential, long-latency evoked potential represents complex, higher brain function. The potentials evoked by particular events are called event related potentials (ERPs). Among the many kinds of ERPs, the wave pattern induced by sharp pain is known as the pain-related late positive

component (p-LPC), and regarded as an index of analgesia (5). It is reported that the characteristic feature of this wave pattern is its stronger correlation to the subjective intensity of pain than to the intensity of stimulation (6). Yamada et al. and Watanabe et al. investigated the effects of acupuncture analgesia using the p-LPC, and they compared amplitude of the p-LPC before, during, and after acupuncture treatment. In this study, pain by artificial pain stimulation was suppressed during and after acupuncture treatment and the amplitude of the p-LPC was also reduced simultaneously (7,8).

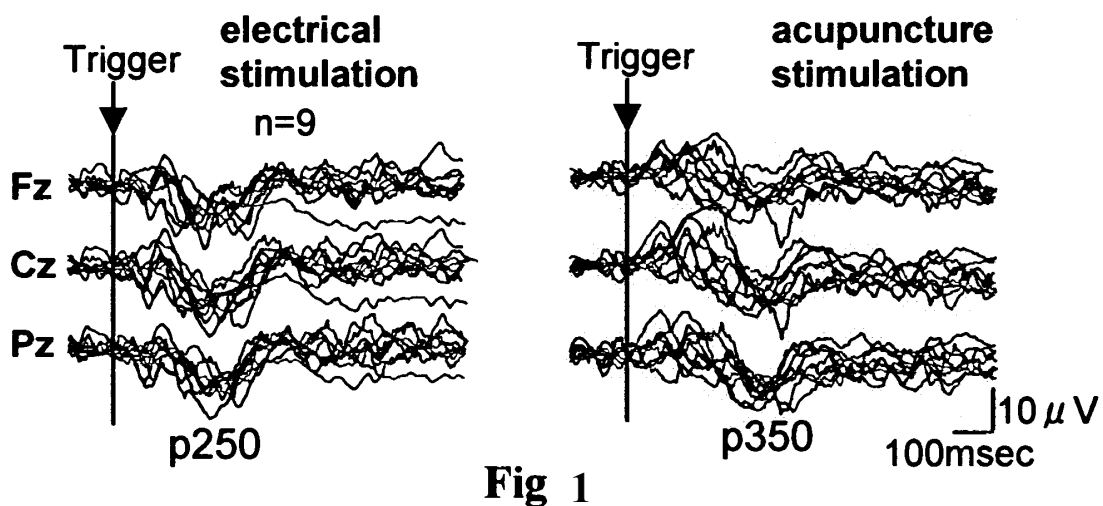
Watanabe et al. examined evoked potentials induced by acupuncture stimulation itself and reported that the acupuncture stimulus-induced potential was similar to the p-LPC but had a slightly longer latency possibly because of the manner of its stimulation (Figure 1) (9).

3. Research using magnetoencephalography (MEG)

EEG and evoked potentials are used to observe changes in potential induced by neural activity in the brain. On the other hand, magnetoencephalography (MEG) observes the magnetic field, which is perpendicular to the electrical current. Unlike the electrical current, the magnetic field is not easily attenuated by components of the human head (e.g., bone and soft tissue). It can locate, therefore, neural activity more accurately. In the investigation by Kimura et al. of brain activity evoked by electro-acupuncture stimulation to LI4 (合谷) point, MEG revealed that early brain activity was induced by deeper electro-acupuncture stimulation rather than by percutaneous electrostimulation (Figure 2). They also demonstrated this tendency at the motor point of the abductor pollicis brevis (corresponding to the Yuji [LU10] point) (10). These results indicate that the early phase of cortical processing of the acupuncture stimulus to deep tissue is different from that of transcutaneous nerve stimulation, and appear to identify a special feature of the input pathway of acupuncture stimulation.

4. Summary

In this section, we summarized the electrophysiological studies investigating the effects of acupuncture stimulation on central nervous system. At the beginning, studies in this area used mainly EEG to assess global changes in brain activity, and then, used evoked potentials to determine their timing. Some recent studies even attempt to identify the active region of the brain using MEG or other methods. Since electrophysiological methods directly capture electrical excitement (the essential feature of neural activity in the brain), these findings are important and further studies are needed.



(渡邊一平ら：事象関連電位からみた針刺激時に生じる特異な感覚（得気）の特性について，温泉気候物理学会より）

Figure 1: Event related potentials by electrical and acupuncture stimulation

Reproduced from: Watanabe I, et al. Characteristic event-related potential features of the process of obtaining *de qi* (得気) sensation on needle stimulation (in Japanese). (J Jpn Soc Balneol Climatol Phys Med)

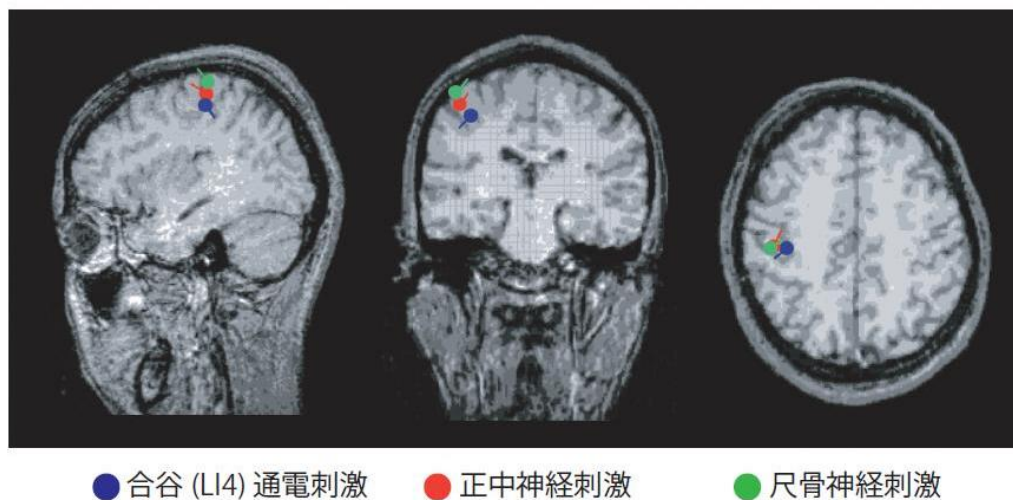


Figure 2: Source location of the short latency component in the cerebral cortex induced by electro-acupuncture stimulation at meridian points

合谷通電刺激：LI4 (合谷) electro-acupuncture stimulation

正中神経刺激：Median nerve stimulation

尺骨神経刺激：Ulnar nerve stimulation

Research with PET/SPECT

Takashi Seki

1. Principles of PET/SPECT

On conversion to a neutron, a proton releases a positron. When positrons collide with free electrons (e-) in the ground state, they are annihilated. In this annihilation, energy corresponding to rest mass energy of two particles will be released as two photons moving in opposite directions. The annihilation photons captured by a detector (inorganic crystal scintillator) will produce scintillation light that is measured at the same time. This light signal will be collected by a photomultiplier where it is converted to an electrical signal that is exhibited as an image.

Function/metabolism imaging or blood flow/function assessment are carried out by body-surface scanning to determine the distribution of radioisotope-labeled agents administered to subjects. Nuclide labeled agents, emitting positrons and generating annihilation gamma rays, are used in Positron Emission Tomography (PET) scanning. On the other hand, nuclide labeled agents emitting a single photon are used in Single Photon Emission Computed Tomography (SPECT) scanning.

2. Features of PET/SPECT studies

Both PET and SPECT are diagnostic tools that use radionuclides to monitor regional cerebral blood flow (rCBF) or regional cerebral metabolic rate (rCMR). rCBF and rCMR are thought to reflect regional brain function. In addition, these can detect distribution of specific neural receptors using radioactive reagents.

The time resolution of these methods is insufficient for investigation of the real-time imaging of brain activity, and spatial resolution is approximately 8 mm³ (11,12).

Positron emission nuclides used for PET examination have a very short half-life and require a cyclotron for generation in the same facilities. Synthesis of various labeled imaging agents and their quality control are also required, which discourages the introduction of the equipment. In addition, radiation exposure must be considered, especially when the examinations are performed repeatedly for research.

SPECT utilizes single-photon-emitting labeled nuclides, which can be easily synthesized with commercially available kits supplied by pharmaceutical companies. It also can be performed in emergency settings.

3. Previous research

PET/SPECT, as well as functional magnetic resonance imaging (fMRI), have been used for the investigations of acupuncture treatment to elucidate the mechanisms of its effects on pain control or cerebrovascular disease, and the mechanisms underlying the generation of *de qi* (得氣) sensation and the placebo effect.

Yano et al. conducted pioneering experiments in Japan. They investigated cerebral glucose metabolism during electro-acupunctural stimulation to LI4 (合谷) and LI10 (手三里) points unilaterally with PET.

Increased glucose metabolism was observed in slice OM40–45 showing the frontal and temporal lobes contralateral to the acupuncture-stimulation sites, and in slice OM80 showing the bilateral frontal, parietal, and temporal lobes. In OM45, glucose metabolism was elevated in the contralateral frontal and temporal lobes (13).

Newberg et al. conducted a study using SPECT with hexamethylpropyleneamine oxime (HMPAO), a radiopharmaceutical. They performed SPECT twice in seven patients with chronic pain: once before and once after acupuncture treatment relieved the pain. SPECT was also performed in five healthy subjects before and after acupuncture treatment. In healthy subjects, nervous activity was increased in the thalamus and prefrontal cortex after the treatment. Compared to healthy subjects, chronic pain patients showed stronger but asymmetric input signals in the bilateral thalamus. However, this asymmetry disappeared after the treatment. These data suggested that acupuncture analgesia is related to the activity of the frontal lobe, brain stem, and thalamus (14).

Hsieh et al. compared the effects of acupuncture to LI4 (合谷) point with those of acupuncture to a non-acupuncture point close to LI4 (合谷) using PET in healthy subjects. Acupuncture resulted in activation of the hypothalamus, midbrain, insula, anterior cingulate cortex, and cerebellum. The hypothalamus was activated only when subjects obtained *de qi* sensation by acupuncture stimulation to LI4 (合谷) point. LI4 (合谷) is conventionally the acupuncture point stimulated to achieve analgesia. These results suggested that hypothalamus should play a major role in generation of an analgesic effect by acupuncture (15).

Schlunze et al. performed PET with ¹⁵O-labeled water (H₂[¹⁵O]) in healthy subjects under anesthesia to exclude the placebo effect. They assigned 13 subjects to two arms: acupuncture to LI4 (合谷) point in one group and acupuncture to the non-acupuncture point between the third and fourth metacarpal bones in the other. Images were obtained before and after acupuncture under anesthesia. In the acupuncture to LI4 (合谷) point arm, blood flow was reduced in the right medial frontal gyrus and left putamen. On the other hand, in the acupuncture to the non-acupuncture point arm, decrease of blood flow was observed in the right medial frontal gyrus not the left putamen. This result showed that penetration of skin by an acupuncture needle affected the activity of the medial frontal gyrus regardless of the point of stimulation (16).

Harris et al. compared the binding capacity of mu-opioid receptor using PET with (11)C-carfentanil in two groups of subjects (an acupuncture group and a sham acupuncture group). Subjects were treated for 4 weeks. PET was performed at baseline and at the last treatment. Binding capacity of mu-opioid receptor in the area of the brain that processed pain or feelings (cingulate gyrus, insula, caudate nucleus, thalamus, and amygdala) was increased in the acupuncture stimulation group but decreased in the sham acupuncture group. This suggested a link between the mu-opioid receptor and acupuncture-induced analgesia (17)

Lai et al. investigated changes of glucose metabolism in the brain during acupuncture to the TE5 (外関) point in healthy subjects. They compared common filiform needles with placebo (retractable) needles that do not penetrate skin during acupuncture. Stimulation by filiform needles was continued until the subjects obtained *de qi* sensation. They found a difference between the sites of glucose metabolism activation stimulated by the filiform needle treatment and that stimulated by placebo needle treatment (18).

It is reported that acupuncture treatment increased rCBF around ischemic lesions in cerebrovascular

disease patients. Lee et al. compared rCBF using SPECT in 6 patients with middle cerebral artery occlusion and in 8 healthy subjects before and after acupuncture treatment. CBF was increased especially in the zone of hypoperfusion surrounding the ischemic lesion in all patients. On the other hand, in healthy subjects, CBF was increased in the bilateral parahippocampalis gyrus, premotor area, frontal lobe, and temporal lobe and in the unilateral globus pallidus.

This finding suggested that acupuncture treatment activated the area adjacent to the ischemic lesion or the reconstituting area in cerebrovascular disease patients (19).

Sato et al. investigated the anti-inflammatory effects of acupuncture treatment using PET not in the brain but in the knee joints of patients with rheumatoid arthritis. They found that acupuncture treatment alleviated symptoms, but had no significant effects on local inflammation (i.e., on sedimentation rate, C-reactive protein, and PET findings). As they applied PET to organs other than the brain, this research gives us insight into a new study approach (20).

4. Perspectives

PET and/or SPECT have been shown to be very effective tools for assessment of the physiological effects of acupuncture.

With their increase in popularity as research tools, PET/CT and fMRI are expected to facilitate good research. These studies are just the beginning and further progress in this field is expected.

Research with functional MRI

Toshihiro Higuchi

1. What is functional MRI?

MRI that can obtain tomographic images of the body using magnets (magnetic fields) and radiowaves (radiofrequency waves) to detect signals from the hydrogen nuclei (^1H) in the water or fat of living subjects is a noninvasive measurement method commonly used in daily practice. Functional MRI (fMRI) uses MRI technology to measure brain function and is applied in a wide variety of brain research studies. When local brain activity is increased, blood flow and oxygen consumption of the region are also increased. Since the blood flow increase is greater than the oxygen consumption increase, oxyhemoglobin with diamagnetic properties increases relative to deoxyhemoglobin with paramagnetic properties, which decreases. This results in enhancement of MRI signals (i.e., the blood oxygenation level dependent [BOLD] effect)(21). Since fMRI is not only noninvasive, but can also be repeated consecutively (unlike PET or SPECT, both of which require radioisotopic agents), it has the advantage in brain research. In addition, it can also capture the activities in

the whole brain including deep brain structures and the cerebellum (unlike EEG or near-infrared spectroscopy [NIRS], which survey mainly activities at the surface of the brain). After various external stimulations, fMRI identifies MRI signal enhancement in regions where brain function is activated. For example, when a subject performed a unilateral thumb and finger opposition exercise as a task, fMRI could detect signal enhancement in the contralateral primary sensorimotor area. Similarly, the distribution of brain activity in response to visual stimulation of part of the visual field has been imaged, which corresponds to a retinotopic map. fMRI also has been applied to analysis of brain activities reflecting language comprehension, word recall, and even more complex tasks. In clinical settings, fMRI has been performed as a preoperative test in patients with a brain tumor to understand the positional relationship between the lesion and the region controlling important functions such language, sensorimotor control, and vision.

2. Analysis of brain function during acupuncture

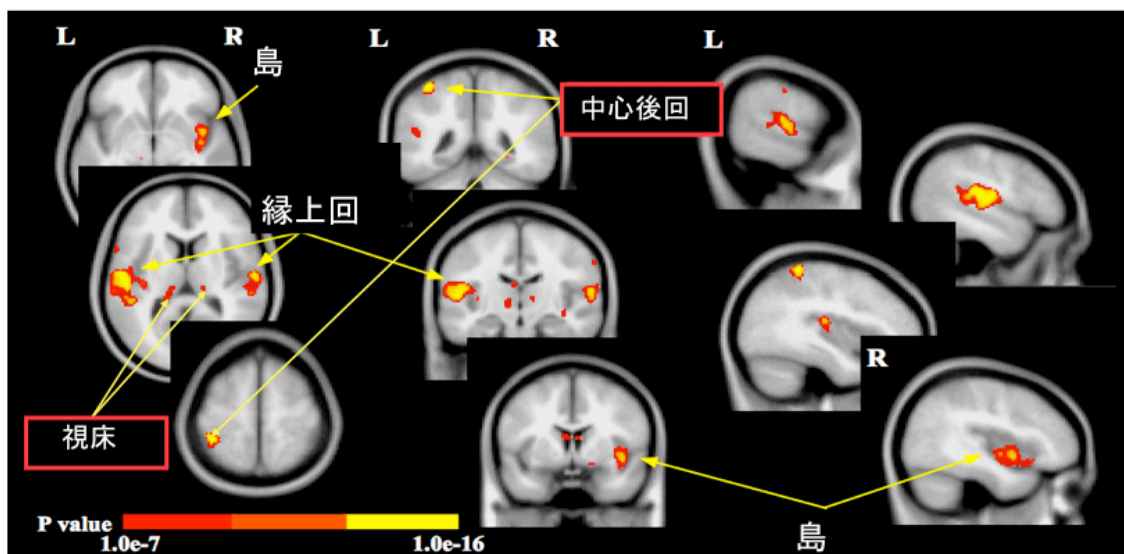
Our study on the mechanism of action of acupuncture using fMRI found that tactile stimulation at the surface of acupuncture points with a sponge induces activation of a part of the sensorimotor area (Homunculus) corresponding to the stimulated body part (22). Comparing brain activity in response to tactile stimulation of LI4 (合谷) point by a brush (Figure 1) with that in response to electro-acupuncture stimulation at the same point (0.05 msec, 4Hz, LI4 [合谷]–LI10 [手三里]) (Figure 2) found that the former stimulus activated only the contralateral postcentral gyrus (primary sensory area), bilateral supramarginal gyrus (secondary sensory area), thalamus, and insula, while the latter stimulus activated only the bilateral supramarginal gyrus (secondary sensory area), insula, (anterior) cingulate gyrus, and medial frontal gyrus (supplementary motor area) (Figure 2). It was reported that the primary sensory area, secondary sensory area, (anterior) cingulate gyrus, insula, thalamus, and prefrontal cortex are involved in the processing of pain perception in the brain (23). Activation of not only the secondary sensory area and insula but also the cingulate gyrus and medial frontal gyrus (which are not activated by tactile stimulation), indicates that electro-acupuncture stimulation activates regions of the brain involved in the processing of pain perception. This data also suggested that acupuncture stimulation is mediated through polymodal nociceptors (polymodal pain receptors). Although the bilateral supramarginal gyrus was clearly activated by acupuncture stimulation with twirling (捻鍼) (1 Hz) to LI4 (合谷) point unlike tactile stimulation, the contralateral postcentral gyrus was not activated. Comparing warm stimulation (35°C) with thermal pain stimulation (47.5°C) to LI4 (合谷) point, we observed thermal pain-specific brain activity in the putamen, thalamus, cingulate gyrus, postcentral gyrus, and medial frontal gyrus. Thus, like electro-acupuncture stimulation and acupuncture stimulation with twirling, thermal pain stimulation (47.5°C) may also activate areas of the brain involved in the processing of pain stimuli.

Since the effects of acupuncture stimulation persist, changes in brain activity provoked by stimulation might also persist. To observe these changes, conventional data analysis methods are not suitable. Therefore, we reviewed conventional reference function (hemodynamic response function) used in a hypothesis-testing analysis. Then, we introduced independent component analysis (ICA), an exploratory data analysis method used in the analysis of brain activity during sleep, and established a reference function that assumes brain

activity is maintained for 15 minutes after stimulation. In conventional analysis, which assumes brain activation ceases just after stimulation, only the bilateral supramarginal gyrus was activated on acupuncture stimulation with twirling at LI4 (合谷) point, but in our analysis, which assumed activation persists 15 minutes, not only the bilateral supramarginal gyrus, but also the prefrontal cortex, cingulate gyrus, supplementary motor area, and cerebellum were activated. This spatial distribution of brain activity was more widespread than that involved in processing pain perception, and shows that acupuncture stimulates more areas of the brain. Additionally, we examined brain activity at rest for 10 minutes after 6 minutes of acupuncture stimulation with twirling at LI4 (合谷) point. Using ICA, instead of hypothesis testing analysis, the activity after stimulation was observed at rest for 10 minutes in many other areas of the brain including primary and higher-order visual cortex [secondary and tertiary]), primary sensory area, secondary sensory area, supplementary motor area, and cingulate gyrus. Thus, the pattern of brain activity was maintained at rest after stimulation.

3. Summary

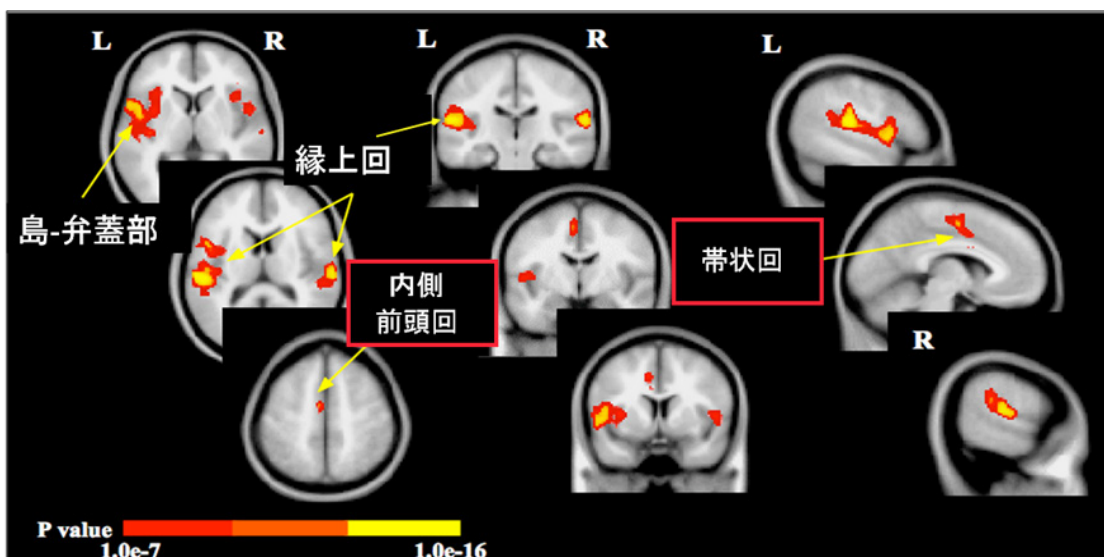
fMRI revealed that activity of areas of the brain processing pain perception are increased during acupuncture stimulation and persist, and, just after stimulation, the area of brain activity even expands. In addition, the area of the brain activated when at rest after stimulation is much broader and includes the visual cortex.



島 : insula 中心後回 : postcentral gyrus 縁上回 : supramarginal gyrus 視床 : thalamus

Figure 1: fMRI of tactile stimulation to LI4 (合谷) point of the right hand.

Brain activity is observed in the contralateral postcentral gyrus (primary sensory areas), bilateral supramarginal gyrus (secondary sensory area), thalamus, and insula on tactile stimulation to the skin surface of LI4 (合谷) point of the right hand.



島-弁蓋部 : insula-opercular cortex 縁上回 : supramarginal gyrus 内側前頭回 : medial frontal gyrus 帯状回 : cingulate gyrus

Figure 2: fMRI of electro-acupuncture stimulation to LI4 (合谷) point of the right hand.

Brain activity is observed in the bilateral supramarginal gyrus (secondary sensory area) and insula as well as the (anterior) cingulate gyrus and medial frontal gyrus (supplementary motor area), but not in the contralateral postcentral gyrus (primary sensory area) on electro-acupuncture stimulation to LI4 (合谷) point of the right hand.

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Chapter 3

Representative Systems or Methods in Acupuncture and Moxibustion in Japan

Daiki Takahashi
Shoji Kobayashi

Meridian Therapy (Meridian treatment)

Overview

Meridian therapy is a classic-based acupuncture method in which every disease is understood as a deficiency or excess state of meridians and collaterals, and the state can be cured through supplementation and draining mainly by means of acupuncture and moxibustion. It is also called ‘*Sho* (証, pattern)-based therapy’ (therapy based on patterns). It is a classical theory-based acupuncture and moxibustion therapy, created during the early Showa era (1940’s) in Japan.

Specifically, six-position pulse diagnosis is used to identify deficiency (*Kyo*) or excess (*Jitsu*) of meridians. Selection and treatment of five phase points on limbs, according to the principle of mother-supplementing child-draining described in the “*NanJing* (難經),” Chapter 69, is regarded as a standard of care. Since its establishment in the 1940’s, the methods for diagnosis and treatment of meridian therapy have, however, gradually changed in the course of history. It would appear that features of meridian therapy are ‘basic patterns’ based on four patterns and ‘six-position pulse diagnosis,’ which examines deficiency or excess based on the difference in pulse strength. Meridian therapy consists of *honchiho* (treating the root) and *hyochiho* (treating the tip). Shin’ichiro Takeyama explained as follows: in *honchiho*, based on the diagnosis or disease pattern determined as ‘primary pattern,’ command points on extremities are applied and fluctuation of meridians is modified; and in *hyochiho*, at the same time, a syndrome is treated with direct measures of supplementation and draining on the reactive points manifesting the fluctuation, i.e. meridian points, in view of the association with meridians.

Regarding the name ‘meridian therapy,’ Keiri Inoue noted, ‘meridian therapy is a name revealing the essence of the art of acupuncture and moxibustion,’ and Takeyama stated, ‘inheritance of a tradition left by an ethnic group means transmission by understanding the essence of the tradition and applying it to the present day...We understood the classical essence of acupuncture and moxibustion, including the “*SuWen* (素問),” “*LingShu* (靈樞),” and “*Nanjing* (難經),” learned the clinical system and its support pillar, oriental view and thinking, and then hoped to apply it to the present day in this country. That is why we referred to this traditional art of acupuncture and moxibustion not as ‘classical art of acupuncture and moxibustion,’ but as ‘meridian therapy,’ a new name.’

During the Meiji era (1868–1912), the government attempted to westernize medical system as well as any other field in Japan, and extinguished *Kampo* and acupuncture and moxibustion, the medicines practiced at that time. Acupuncture and moxibustion, which had persisted also as a profession for visually impaired people, was allowed to remain, but explanations based not on the traditional therapeutic theory but on Western medical theory were required. Meridian points, more than 350 points, on the whole body were organized into 120 points and named ‘*koketsu* (acupuncture point, 孔穴, kong xue)’; and the concept of

meridians and collaterals was abolished (*kaisei koketsu* [revised meridian points]). Treatment of meridian points (in this context, this means not meridian points on meridians, but acupuncture points including meridian point, extra point, and ouch point) then became mainstream.

Meanwhile, some seniors performed treatment with coordination of meridians, and a group of young acupuncturists was set up to disseminate and transmit the treatment to the next generation. The group, called ‘*Shinjin Yayoi Kai* (新人弥生会, New Yayoi Association),’ was established in 1939, comprising Sorei Yanagiya as a leading member, Sodo Okabe, and Keiri Inoue, both of whom would later become major players in the meridian therapy group, and Shin’ichiro Takeyama. Meridian-based treatment continued to develop, and a diagnosis and treatment system called meridian therapy was created in 1941. In 1939, Keiraku Chiryō Gakkai (経絡治療学会, the Society of Meridian Therapy, currently, Traditional Japanese Medicine) was set up and Okabe assumed the presidency. The Traditional Japanese Medicine currently has 12 branch offices across Japan and 4000 members; hosts an academic meeting in March and Traditional Japanese Medicine Summer School in August every year; and publishes a journal, “*Keiraku Chiryō* (経絡治療)” quarterly. It is the largest such study group in Japan.

Problems

During the more than 50 years that have passed since the birth of meridian therapy, several problems have arisen.

One of the problems is the diversity in therapeutic approaches and needling techniques among meridian therapy practitioners. Two representative meridian therapists who contributed to creation of meridian therapy, Sodo Okabe and Keiri Inoue, took different treatment approaches from each other, as described below. Inoue had few beds and a small staff, performed treatment by using one needle to plural treatment points without needle retention, and specialized in treating diseases such as tuberculosis, cold, and asthma. On the other hand, Okabe had many beds and a large staff, used treatment with needle retention, and specialized in treating conditions such as locomotors disorder and pain.

	No. of beds	Staff size	Therapeutic method	Specialties
Inoue	Few	Small	Treatment with one needle	Tuberculosis, cold, asthma
Okabe	Many	Large	Needle retention	Locomotors disorder, painful disease

It was then found from long-term historical experience that meridians and collaterals, i.e., the flow system of qi (Ki) and blood, exists in shallow areas of the body surface, and the disease structure changed to the one focusing on deficiency pattern in Japan; therefore, shallow needling with needle retention became frequently used to treat diseases with light, pain-free stimulation.

People influenced by meridian therapists, including Okabe and Inoue, later launched several study groups. In these study groups, problems regarding the earlier meridian therapy were examined. Some groups referred to the therapy used in the group as meridian therapy, and others use different name without meridian therapy.

	Establishment	Notable member(s)
<i>Keiraku Chiryō Gakkai</i> (経絡治療学会, [Society of] Traditional Japanese Medicine)	1940	Sorei Yanagiya, Sodo Okabe, Keiri Inoue, Hakko Baba, Somei Okabe, Meiyu Okada, Denmei Shudo, Masakazu Ikeda
<i>Koten Shinkyū Kenkyū Kai and Myaku Gakkai</i> (古典鍼灸研究会 付脈学会, Classical Acupuncture and Moxibustion Research Association and Myaku Gakkai)	1940	Keiri Inoue, Shohaku Honma, Masafumi Inoue Higuchi
<i>Nihon Keiketsu Kenkyū Kai</i> (日本経穴研究会, Japanese Acupoint Research Association)	1943	Hakko Baba
<i>Toyo Hari Igaku Kai</i> (東洋はり医学会, Toyohari Association)	1959	Kodo Fukushima
<i>Mei Shin Kai</i> (明鍼会, Meishin Association)	1968	Meiyu Okada
<i>Toho Kai</i> (東方会, Toho Association)	1970	Bunkei Ono
<i>Nihon Dento Keiraku Shinpoukai</i> (日本伝統経絡鍼法会, Japanese Traditional Meridian and Collateral Acupuncture Association),	1971	Yuraku Kudo
<i>The Shinkyū Keiraku Kenkyū Koshin Kai</i> (鍼灸経絡研究紘鍼会, Meridian and Collateral Acupuncture Study Association)	1974	Tadashi Takemura
Shakuju Association (積聚会)	1980	Shoji Kobayashi
Gensai School (弦躋塾)	1985	Denmei Shudo
<i>Kampohariikai</i> (Oriental Medical Acupuncture Association, 漢方鍼医会)	1993	Haruo Koizumi, Kenji Fukushima, Masahiko Kagaya

Kodo Fukushima of the *Toyo Hari Igaku Kai* (東洋はり医学会, Toyohari Association) is one of the notable meridian therapists. In 1959, Fukushima, a visually impaired acupuncturist, had set up ‘*Mojin*

Keiraku Chiryō Kenkyūkai (盲人経絡治療研究会, Meridian Therapy Study Group of the Visually Impaired),’ which grew into the present-day Toyohari Association (now it has 40 branches in Japan and 18 overseas). The Toyohari Association has a treatment principle called ‘*sokoku chosei* (相剋調整, restraining modification),’ developed through the therapeutic progression of Fukushima, president of the association. It is a treatment approach in which deficiency of meridian or visceral qi (Ki) is identified and supplemented according to the principle of restraining in severe or chronic diseases. Fukushima constructed the theory of restraining modification from an experience of having treated his own disease and achieved cure. The Toyohari Association regards the principle as its own formal treatment method. The Association published an English-translated book, titled ‘Meridian Therapy.’

While the Toyohari Association has developed unique meridian therapy, some members who left the association launched *Kampohariikai* (漢方鍼医会, Oriental Medical Acupuncture Association). Kenji Fukushima and colleagues argued that meridian therapy had created a therapeutic system based on disease symptoms of twelve meridians, and locally manifested disease symptom and been lacking pathology and disease pattern. They believed that clinical acupuncture and moxibustion treatment could not be legitimate and would not exert true therapeutic power without pathology based on the theory of Oriental medicine. They therefore left the Toyohari Association in November 1992, and established *Kampohariikai* in January 1993 for the purpose of fostering clinicians with acquaintance of Oriental Medical theory, i.e., Oriental Medical acupuncture doctors. They have named the therapeutic system incorporating pulse quality diagnosis and pathology based on the theory of Oriental medicine ‘*Kampoharichiryō* (漢方はり治療)’

Yuraku Kudo, president of *Nihon Dento Keiraku Shimpokai* (Japanese Traditional Meridian and Collateral Acupuncture Association, 日本伝統経絡鍼法会), found a relationship between a specific meridian point and a specific part of meridian and collateral when he had treated meridians and collaterals and meridian points directly as targets of diagnosis and treatment using methods not dependent on pulse diagnosis alone. He further studied the relationship and established a treatment methodology.

Masafumi Inoue (son of Keiri Inoue) of the *Koten Shinkyū Kenkyū Kai and Myaku Gakkai* (古典鍼灸研究会 付脉学会, Classical Acupuncture and Moxibustion Research Association and Myaku Association) expanded meridian therapy using selection of points according to six-position pulse diagnosis and the *NanJing*, Chapter 69. His treatment is based on a pulse diagnosis called “*Jingei Kiko Shin* (人迎気口診, carotid and wrist pulse diagnosis). The *Jingei Kiko Shin* is a pulse diagnostic method that was first described in “*MeiJing* (脈経)” and substantiated in “*SanInJiYiBingZhengFangLun* (三因極一病証方論, Treatise on the Three Categories of Pathogenic Factors and Prescriptions).” Inoue M. revived and reconstructed this diagnostic method, and then combined it with six-position pulse diagnosis. He suggested ‘Inoue style pulse quality diagnosis (井上脉状診),’ which can provide information such as etiology, therapy, and prognosis. He published an English-written paper, titled “*Pulse diagnosis and its clinical application.*”

Michiyoshi Baba, who studied under Sodo Okabe and Hakko Baba, his father, performs six-position pulse diagnosis not bilaterally, but unilaterally. His treatment is characterized by the evaluation of *cun*, *guan*, and *chi* (inch, bar, and cubit) one position at each time, and involves no needle retention.

As for procedural inventions, Bunkei Ono of the Toho Association (東方会) devised ‘touch needling

(接触鍼),’ a needling technique without insertion, and Denmei Shudo of Gensai School (弦躋塾) suggested super-rotation needling (超旋刺). In super-rotation needling, a guide tube is placed on an acupuncture point, the tip of a needle is adhered to the skin by holding the head of needle handle very lightly, then the guide tube is removed and the handle is rotated about 20 degrees using the thumb and index finger. The rotation needs to be performed as fast as possible, preferably 500 rotations per minute or faster. Shudo published an English-translated book on meridian therapy, titled “*Japanese Classical Acupuncture: Introduction to Meridian Therapy.*”

There are several associations that incorporate abdominal examination in diagnosis, including the *Shinkyu Keiraku Kenkyu Koshin Kai* (鍼灸経絡研究紘鍼会, Acupuncture and Moxibustion Meridian Study Ko-shin Association) and the Shakuju Association (積聚会).

The Shinkyu Keiraku Kenkyu Koshin Kai was founded by Tadashi Takemura, the first president, with a goal of practicing meridian therapy with abdominal examination, which everyone may learn easily, unlike pulse diagnosis, which is hard to learn for beginners.

Shoji Kobayashi, founder of the Shakuju Association, puts the focus of diagnosis on the abdominal examination and performs *Shakuju* therapy, in which the treatment applied to the back. In the pursuit of acupuncture and moxibustion treatment based on Oriental concepts, the *Shakuju* therapy puts a focus on and incorporates a fundamental concept of divination (易), providing ideas that can include any therapy. The Association has been holding seminars in the United States since 2004, and published an English-translated book, “*Acupuncture Core Therapy.*”

Present status of studies, and future perspectives

When Ichushi web, the database run by Japan Medical Abstract Society, was recently searched for “*keiraku chiryo* (経絡治療, meridian therapy),” 1378 items were returned (as of 9 December 2011). The 1378 items included names of journals. When restricting the search to article titles and abstracts, the results included 665 items, most of which were clinical reports.

The Society of Traditional Japanese Medicine (経絡治療学会), of which Okabe served as the first president, and the Toyohari Association (東洋はり医学会), of which Fukushima was the first president, joined together in 1972 and gathered several other schools, leading to the establishment of the Japan Meridian-Flow Society (日本経絡学会). Although studies, discussions, and developments mainly of meridian therapy were expected, the Toyohari Association left the Society a little past the 10th anniversary. Because each of the many study groups had constructed distinct theories at that time, the terminology was not standardized and researchers could not even hold coherent discussions with each other. Under the theme of ‘patterns in acupuncture and moxibustion,’ a 5-year effort was then made to identify differences in point of view, diagnosis, and treatment of each study group. In this process, the role that the Japan Meridian-Flow Society should play and the direction that acupuncture and moxibustion in Japan was required to go in were revealed. Many study groups tried to improve by learning from each other, and developed. From the thought

that the frame of ‘Japan Meridian-Flow Society’ should be removed and researchers should move in the direction of larger collaborative efforts, the Society was restarted, changing its name to ‘The Japan Traditional Acupuncture and Moxibustion Society (日本伝統鍼灸学会)’ in 1996, so as to be recognizable globally.

The Society of Traditional Japanese Medicine published a textbook on meridian therapy, “*Nihon Shinkyu Igaku — Keiraku Chiryō Kisoheh* (日本鍼灸医学 経絡治療・基礎編)” in 1997, and its English-translated version, “*Traditional Japanese Acupuncture: Fundamentals of Meridian Therapy*” is now commercially available. Two meridian therapists, Denmei Shudo and Masakazu Ikeda, are among the authors of the book. In addition, Shudo and Ikeda individually published English-translated books on meridian therapy: “*Japanese Classical Acupuncture: Introduction to Meridian Therapy*” and “*The Practice of Japanese Acupuncture and Moxibustion,*” respectively. The Society of Traditional Japanese Medicine then published “*Nihon Shinkyu Igaku — Keiraku Chiryō Rinshohēn* (日本鍼灸医学 経絡治療・臨床編)” in 2001, which summarizes concepts of patterns, four examinations (*Shishin*), pathology and disease patterns, and therapeutic principle. “*Nihon Shinkyu Igaku— Kisoheh*” was enlarged and revised in 2008, and awaits the publication of an English-translated version. In the enlarged and revised edition, questions about and needs for developments of meridian therapy, which has a history of more than 70 years and is regarded as the center of the theory, are intensified.

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Treatments using intradermal needles and press tack needles (Thumbtack Needles)

Summary

Intradermal needles (皮内鍼) were first devised by Kobei Akabane in 1952 for use in acupuncture treatment. The size of the intradermal needle used in the Akabane method is roughly 0.15 mm in diameter and 8–9 mm in length. The needle is extremely thin, made of special metal, and has a small head. Using special tweezers, the acupuncturist inserts the needle point to a depth of 2–3 mm. As the name suggests, the needle is intended for insertion into the skin and not underneath the skin and therefore the angle of insertion is almost horizontal. After insertion, the needle is taped into position.

According to the book “*Chugoku Shinkyugaku Kogi* (中国鍼灸学講義),” a translation of Chinese textbook “*Zhenjiuxue Jiangyi*”, the press tack needle (円皮鍼), was developed by acupuncture needle craftsmen in China who devised it for ear acupuncture therapy when intradermal needles were introduced to China. The press tack needle is called “qin-zhen (揸針)” in Chinese ('qin (揸)' meaning 'press' or 'push'). Because of its shape, qin-zhen is inserted vertically against the surface of the skin. Meanwhile, independently invented needles similar to press tack needles, known as “ring sharp,” have been reportedly in use since 1959. The Japanese name “*empishin* (for press tack needle)” was an in-house marketing name created by Masanobu Maruyama, President of Kanaken Medical Instruments Inc. It is now a widely used term. It is also referred as “thumbtack needle” in *International Standard Terminology for Traditional Medicine in Western Pacific Region* published in 2007.

Indications

In his book “*Hinaishin-ho* (皮内針法),” Akabane lists the following conditions as treatable by therapy, which can be administered to all parts of the body:

Stiffness of the back of the neck and shoulders, scapula joint pain, intercostal neuralgia, low back pain, sciatica, knee and foot arthralgia, gastrointestinal disorder and diarrhea, liver disorder, asthma, pulmonary infiltration and pleurisy, gynaecological disorders, pain-free labor, haemorrhoids, menstrual pain, hypertension, acute appendicitis, frostbite, and pain or paralysis of the face.

The press tack needle was introduced for use in ear acupuncture, but in 1976, Shiozawa reported for the first time in the *Japanese Journal of Acupuncture & Manual Therapies* cases showing the effectiveness of press tack needles in therapies other than ear acupuncture (“wonderful complete response” in cases of sciatica and slipped disc). He listed the following as indications:

Drooping of the upper eyelid, facial palsy, stiff shoulder, frozen shoulder, low back pain, shoulder and

back pain, intercostal neuralgia, sprain, brachial neuralgia, cervical contusion ('whiplash'), various arthralgias, herpes, and heaviness/bloated feeling in the upper abdomen.

Cases of herpes, abdominal pain, and rheumatism are also mentioned. As with intradermal needles, press tack needles are used on all parts of the body.

Current Research and Future Outlook

A search on the Ichushi Web (in Japanese) retrieved 108 hits for 皮内鍼(針) (intradermal acupuncture) and 206 hits for 円皮鍼 (針) (press tack acupuncture). (Both search results are as of December 9, 2011.) Basic research on press tack acupuncture deal with the difference in stimulating sensation as a function of needle length. Clinical research and case reports deal with the alleviation of pain and other symptoms of dialysis patients, functional dysmenorrhea, post-operative nausea and vomiting, muscle pain and fatigue of athletes as well as the improvement of postnatal lactation.

Although there are fewer research papers on intradermal needles than on press tack needles, administration of intradermal needles to treat scapulohumeral periarthritis and motor disorder are reported. In his article in 1976, Shiozawa stated that both the intradermal needle and the press tack needle were effective in the treatment of pain, heaviness, paralysis, and stiffness of the skin. He stated that the only difference between the intradermal needle and the press tack needle is that the latter is easier to use. The intradermal needle requires more practice. He also noted that for patients whose pain is severe, the press tack needle has a stronger effect. However, some papers report that the convenience of the press tack needle has led to its more frequent use and that the two types of needles are used for different parts of body or at different insertion angles. These are topics for future research.

In his book, a pupil of Akabane, Satoshi Fukushima, quotes Akabane as saying, 'My dream is that all the homes around the world can use intradermal needles just like a cold remedy, intradermal needles that have no adverse effects whoever uses it (...).' Perhaps because of Akabane's aspiration, his book has been translated into English (Kobei Akabane, *Intradermal Needle Method* [皮内針法]). In the "Akabane (赤羽氏法)," "Chasing the Dragon's Tail," and "Traditional Japanese Acupuncture," the method involving use of intradermal needles is mentioned. In "Japanese Acupuncture," both the intradermal needle and the press tack needle are mentioned. The *North American Journal of Oriental Medicine* has reported clinical cases of intradermal needle use (<http://najom.org/index.html>).

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Treatments using spoon needle (鍤鍼, *Teishin*)

Outline

The spoon needle (鍤鍼, *Teishin*) is a type of needle that appears in the nine classical needles and twelve sources of “*LingShu*” (『靈樞』九鍼十二原) and, like the round needle (圓鍼), it does not penetrate the skin.

The spoon needle is described in the “*LingShu*” as ‘three and half cun (10.6 cm long),’ ‘the point is as sharp as a millet seed,’ and ‘the main part of the needle is the larger portion, with its tip rounded,’ and further, that ‘the meridian vessel is massaged for qi (Ki) and blood circulation, but deep depressions in the skin and muscle must be avoided, otherwise qi (Ki) will be disturbed,’ which shows these needles are not inserted.

Spoon needles are not commonly used in present day Chinese acupuncture, which places importance on *de-qi* (得氣) induced by needle insertion and manual stimulation; however, in Japan, Keiri Inoue and Shohaku Honma together reintroduced spoon needles to Japan in 1952 through their writings on the needles and their origins in the “*Japanese Journal of Acupuncture & Manual Therapies* (医道の日本誌),” which

was based on their studies of the classic texts.

Inoue and Honma explained that ‘Acupuncture and moxibustion supplement and drain (補瀉, *Hosha*) deficiency and excess (虛實, *Kyojitsu*) of meridian by stimulating meridian points (*Keiketsu*). Acupuncture has long been said to facilitate draining, and moxibustion to facilitate supplementation. Yet, practitioners devoted solely to acupuncture know not only that performing moxibustion is often time-consuming, but also that supplementation by acupuncture accelerates the effects of treatment, and that devoting one’s whole life to this method is a worthwhile endeavor.’ They explained how they poured themselves into supplementation by acupuncture, and through their studies into the effects and instruction of acupuncture, and finally devised spoon needles as the most suitable device for acupuncture supplementation.

Indications

Inoue and Honma said that spoon needles are intended for supplementation for deficiency-pattern patients, so they are used for both qi (Ki) and blood deficiencies, as in the following symptoms:

Anemia, cardiasthenia, tinnitus, palpitations, dizziness, limb withering and weakness, abdominal pain, headache, constipation, difficult labor, weak breathing, palpitation with slight activity, respiratory distress, asthma, listlessness, memory failure, oversensitivity, tachycardia, fever, etc.

They also claimed that using spoon needles is by far suitable than filiform and other inserted needles for patients who suffer from hypersensitivity.

Current and future research

In the “*LingShu*” it is written that the meridian vessels are massaged for qi (Ki) and blood circulation, but deep depressions in the skin and muscle must be avoided; otherwise, qi (Ki) will be disturbed. Massaging meridians to improve qi (Ki) and blood circulation also means that the surrounding blood is activated to eliminate pathogens from the body. It is also written in the chapter of “*GuanZhen* (官針)” that illness lies in the vessels and that deficiency symptoms associated with meridian qi (Ki) deficiency should be treated by supplementation, specifically, the five transport points (the well, brook, stream and meridian uniting points) are massaged with spoon needles.

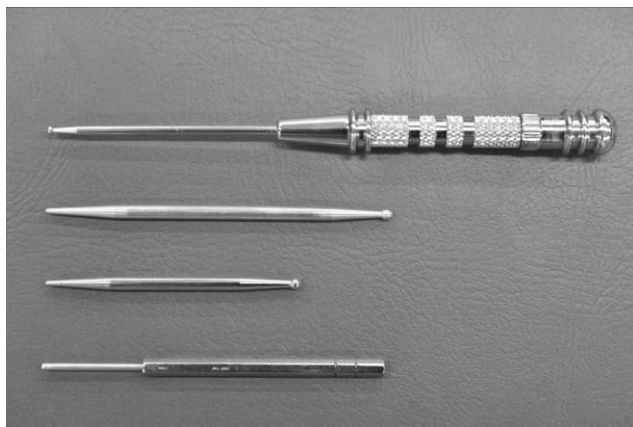
The Ichushi Web site recently returned 23 items for the term ‘teishin (鍤鍼[針], spoon needle)’ (9 December 2011). Most of these results were case reports.

The spoon needle (designed by the Classical Acupuncture and Moxibustion Research Association) that Inoue and Honma devised is fitted with a spring that enables the needle to be retracted or extended according to the patient’s sensitivity. The round needle, another needle that does not puncture the skin, also has a spring fitted into the tip of the needle handle, and can be used in combination. Its use is quite widespread, and is also called ‘spring spoon needle.’

Katsuyuki Kozato subsequently devised a spoon needle (Kozato spoon needle) with two differently shaped tips, either of which can be used according to the circumstance.

Shoji Kobayashi emphasizes that spoon needles should not be pressed strongly against the skin, and that when there is a need to press needle firmly, a filiform needle (毫鍼) would be better. Kobayashi designed a 5 g spoon needle, taking into account the feel and pressure of the needle from the patient's viewpoint during treatment.

Therapists can now choose from a variety of spoon needles of differing shapes and materials devised by both therapists and manufacturers.



[**Photo**] Spoon needles designed by the Classical Acupuncture and Moxibustion Research Association (古研式鍔鍼): Second and third from the top is the Kozato spoon needles. The fourth is Shakuju Association spoon needle.

While spoon needles have become widespread in Japan, no information regarding them was published until Miyuki Kishida released “*Sasanai Hari Teishin Nyumon* (刺さないハリていしん入門),” in 2009.

Translations of literature regarding spoon needles include “*Japanese Acupuncture*,” which delves in detail into the work of Inoue and Honma as well as Kozato, while “*Acupuncture Core Therapy*,” a translation of Kobayashi's work “*Shakuju Chiryō*”, also presents information on spoon needles. A clinical report on spoon needles appears in the *North American Journal of Oriental Medicine*.

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Treatments using permeating heat moxibustion (透熱灸, *Tonetsukyu*)

In permeating heat moxibustion (透熱灸, *Tonetsukyu*), the therapist forms a cone of well refined moxa about the size of a rice grain and applies it directly to the skin at treatment points such as acupuncture points or tender points. This is the long and commonly practiced method in Japan.

Moxibustion therapy is broadly classified into two types: scarring and non-scarring. Scarring moxibustion is the generic term for moxibustion methods that leave a scar, as the name indicates, and involves the therapist applying moxa directly to the skin. Non-scarring moxibustion leaves no scar: the stimulus is usually pleasant to patients. Therapists expect effective biological reactions from this method.

Permeating heat moxibustion is classified as a type of scarring moxibustion method, along with cauterizing (灼熱灸) and suppurative moxibustion (打膿灸). According to Sorei Yanagiya, Isamu Tominaga formulated this classification and refers to it in his writings.

Today, therapists use an incense stick to light moxa, but an illustration of moxibustion techniques from the end of the Heian period (794–1192) shows special chopsticks being used to apply the moxa. Gensaku Manase also mentioned moxa chopsticks, in 1631 (“*Nichiyo Kyūho* [日用灸法, Everyday Moxibustion]”). In 1713, Ekken Kaibara described a method of lighting moxa with a lamp before placing on body surface, and another method using a paper lamp for lighting moxa cone on body surface, but makes no mention of incense sticks (*Yojokun* [養生訓]). Toyokuni Utagawa (1769–1825) illustrated an incense stick being used for moxibustion in an *ukiyo-e* print of the time.

Lighting methods are thought to be related to the size of the moxa cone, yet “*Shinkyū Igaku Kyōkashō* (鍼灸医学教科書, Advanced Acupuncture and Moxibustion Medicine)(1929)” mentioned the currently-used rice-grain size. The dimensions were later specified as 4 mm high, 2 mm in diameter, and weight 3 mg. In

1936, *Toho Igaku* (東邦医学) described the half rice grain size, and in 1940, Bunshi Shirota wrote, ‘The appropriate size is a half rice grain or a sesame seed. Excessively large moxa will cause harm.’

The representative methods of permeating heat moxibustion are the Sawada and Fukaya moxibustion methods.

Ken Sawada devised the *Taijyoku Ryoho* (太極療法, *TaiChi* therapy) based on research into the 14 meridians and collaterals after he discovered that the ‘vital spots’ of *jujutsu* (柔術) correspond to the acupuncture points used in moxibustion therapy. He discussed this therapy in his many immortal works, as did his pupils such as Shirota, Seizo Nakagawa, and Kamezo Horikoshi, in their writings. These include Shirota’s “*Shinkyu Shinzui* (鍼灸真髓),” which was translated and published in China in 1958.

Fukaya moxibustion is an important method devised by Isaburo Fukaya, the ‘moxibustion master of the Showa era (1926–1989),’ and was born out of his more than 40 years of clinical experience. The list of Fukaya’s writings is long, and includes important titles such as “*Okyu Ryoho no Jissai* (お灸療法の実際, Moxibustion Therapy Practice),” “*Meika Kyu Senshakugi* (名家灸選釈義, A Commentary on Moxa Selection by an Expert),” “*Kotei Meido Kyukei no Katsuyo* (黄帝明堂灸経の活用, Applying the Kotei Myodo Kyukei),” and “*Okyu de Byoki wo Naoshita Hanashi* 1–10 (お灸で病気を治した話 1–10, Moxibustion Cures Disease – Cases 1~10)”.

When discussing the Fukaya moxibustion method, reference is made to Fukaya’s Ten Basics of Moxibustion, as follows:

1. Meridian points themselves do not have an effect; it is through them that an effect is achieved.
2. The textbooks give only rough location/area of meridian point sites.
3. Meridian points are not static, but kinetic.
4. Improve effectiveness by making free use of the best-known acupuncture points.
5. Improve effectiveness with small number of acupuncture points.
6. Acupuncture points with little response are not highly effective (Work to improve the effectiveness of ineffective acupuncture points.)
7. It is not effective to apply moxa to a part of the body where disorder is suffered.
8. Even the best-known acupuncture points require specific skill and tips for successive treatment.
9. Match moxa cone size and number to the patient’s constitution. (Absence of heat sensation at the points where moxibustion is applied is usually considered as circulation disorder of qi (Ki) and blood in the patients. In such cases, additional moxa cones are placed and burnt until the patients feel heat.)
10. Use your skills well when selecting meridian points.

Seiji Irie, one of Fukaya’s top pupils, recorded 159 illnesses and the most effective acupuncture points from the many moxibustion therapies within Fukaya style moxibustion (*Fukaya Kyuho* [深谷灸法]). He broadly classified them as respiratory disease; gastrointestinal disease; circulatory disease; neurological and psychiatric disease; urological and genital disease; motor organ disorder; metabolic disorder; ocular, aural, nasal, and oral (dental) disease; obstetric and gynecological disease; pediatric disease; and skin diseases such

as sore and ulcer.

Research

The Ichushi web site recently returned 31 items for the search term ‘Tonetsukyu (透熱灸, permeating heat moxibustion)’ (4 March 2012). These included case reports as well as articles such as “*A Measurement of Direct Moxibustion Temperature -The Influence of density and height of moxa cones-*”, and “*Influence of direct moxibustion with moxa cones the size of a ‘rice grain’ on cell count and proportion of leukocytes in rabbit and human peripheral blood.*”

Fukuya stated that countless people have long experienced the rapid therapeutic effects of moxibustion on various intractable diseases. However, those with no experience of moxibustion often fear it, finding the heat painful, and many of those who are sensitive to heat but try it are repelled by the intense burning sensation and never return to the moxibustion therapist. He identified this as the greatest obstacle to the popularization of moxibustion therapies. Thus, he began using a far more comfortable way of applying moxibustion (around 1938), using a method involving strong pressure with a tube to reduce the heat sensation: he had created a device to alleviate moxibustion heat. Fukuya found that bamboo tubes were the most useful. The bamboo tubes feel comfortable on the skin and are comfortable in the hand when gripping the tube to apply this technique.

Shichiro Okita discussed the merits of moxibustion in “*Kyutenshi (Kyunetsu Kanwashi) ni tsuite (灸点紙[灸熱緩和紙]について, Moxibustion point paperboard — Alleviation of moxibustion heat with paper board)*” (1974), in which he also suggests that patients’ dislike of heat and scarring, while being a perfectly natural human response, is a problem prior to moxibustion achieving effectiveness. His book also introduced a proposal to promote the dissemination of moxibustion therapy, ‘moxibustion point paperboard,’ which is a 15 mm-diameter fire-resistant paperboard with a thin metal film and a needle-tip sized hole in the center. The paperboard has subsequently been developed as a new kind of moxibustion product that does not scar and can be applied to the face.

Similarly, therapists have recently been applying shiunko to the moxa application site before placing and lighting the moxa, to eliminate scarring and burning, and to make moxibustion a more pleasant experience.

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Treatments using heat perception moxibustion (知熱灸, *Chinetsukyu*)

Outline

Heat perception moxibustion (知熱灸, *Chinetsukyu*) is a method devised by Keiri Inoue, in which the therapist applies a moxa cone the size of the tip of the index or little finger, then removes the cone once the patient senses the heat. Inoue considered about three to five 1-cm diameter moxa cones per location suitable when inducing light crimson skin coloration (“*Moxibustion stimulus quantity* [灸の度量に就いて]”). He warned that the patient must always be protected from heat pain, and considered that the treatment achieves efficacy once the patient begins sensing the burning of the moxa cone more quickly following repeated application, even without local coloration. Cone-shaped moxa is now partly used for heat perception moxibustion.

Inoue termed this heat perception moxibustion as ‘Inoue heat perception moxibustion,’ after having been alerted to confusion with a moxibustion method involving application of moxa until the heat is sensed. Nevertheless, the term is now broadly recognized, and when mentioned among members of the Classical Acupuncture and Moxibustion Research Association (古典鍼灸研究会) (where Inoue was a past president), it is taken to mean the method announced by Inoue.

The moxa used for heat perception moxibustion may be of higher or lower (coarser) quality, depending on the therapist’s purposes.



[Photo] (From left to right) tetrahedron heat perception moxibustion; cone heat perception moxibustion; permeating heat moxibustion (rice grain), permeating heat moxibustion (half rice grain)

Indications

Inoue identified inflammatory pain disease as the primary indication for heat perception moxibustion in his article, “*Moxibustion stimulus quantity*,” and mentioned that the method is applicable to diseases associated with extreme pain but without inflammation, in addition to acute rheumatism, acute neuralgia (dermatalgia), gingivitis, acute conjunctivitis, acute gastric catarrh, acute appendicitis, etc.

The Inoue’s another work, “*Myaku kara Mieru Sekai (脈から見える世界)*” identifies additional indications, including sore throat associated with common cold, mumps, rheumatism, atopic dermatitis, dizziness, eye disease, ear disease, diarrhea, gout, bruising and sprains, cervico-omo-brachial disorder, tendonitis, coxalgia, gonarthrosis, and uterine myoma.

Current and future research

Inoue also mentioned in the preface of “*Moxibustion stimulus quantity*” that what presented the greatest difficulties in such simple treatments as acupuncture and moxibustion was determining quantities of stimulus (*Doze*). The therapist was faced with determining the location for treatment, the depth of insertion, the thickness of the needle, the needling technique after insertion, the number of moxa cones to use, the firmness of the moxa cone, as well as the quality of all these and the differences among the various manufacturers. He stated treatment was further complicated by the differences among patients’ diseases, their degree of experience with the treatment, their age and gender, as well as their physical constitution. Thus, in the article he provided a partial description of treatment using the one method, the criterion being the patient’s sensitivity to the moxa heat (or, heat perception moxibustion), and called on his colleagues to try the method. He concluded in “*Moxibustion stimulus quantity*” that the limitation of treatment with heat perception moxibustion was its use for the sole symptom of pain, and that further research would be required for its application to radical treatment of disease.

The Ichushi web site recently returned 17 items for the term ‘*Chinetsukyu (知熱灸, heat perception moxibustion)*’ (9 February 2012). They were mainly case reports, such as “*A case of atopic dermatitis with improved symptoms by moxibustion treatment to the affected area (Menjo Y, 患部への灸治療が奏功したアトピー性皮膚炎の1症例)*,” and there was no information returned regarding Inoue’s ‘radical treatment for disease.’

“*Nihon Shinkyu Igaku — Keiraku Chiryō Kisoheh (Traditional Japanese Acupuncture: Fundamentals of Meridian Therapy)*” dealt with the concept of supplementation and draining, and described heat perception moxibustion as a draining method. It identified the ability of moxibustion to remove heat by inducing sweat as a sign of its effectiveness in draining, and it identified the sites for application as points that show heat, induration, tension, or edema.

Eiki Kaneko presented his ideas on the distinction between supplementation and draining in his article, “*Chintsukyu no Hoshō Ikko (知熱灸の補瀉一考)*.” He states that supplementation and draining have

generally been distinguished by the number of moxa cones used, with three or more cones corresponding to supplementation (補, *Ho*), and one or two cones to draining (瀉, *Sha*). He himself uses supplementation and draining differentially, by matching his application of the open-closed supplementation and draining method to the patient's degree of heat sensitivity (warm, somewhat hot, hot): he regards warm as suitable for supplementation, and somewhat hot for draining method. For example, if acupuncture points show deficiency (flaccidity) in a patient whose constitution requires supplementation, he immediately closes the moxibustion site with a deft movement of the thumb or index finger of the other hand while removing the moxa. If the draining method is applied to a meridian sinew to relieve myalgia, the site is not closed.

Heat perception moxibustion is described in translated works such as “*Traditional Japanese Acupuncture*” as ‘cone moxibustion (*Chinetsukyu*),’ ‘*Chinetsukyu – cone moxa*’ in “*Japanese Acupuncture*,” and ‘warming moxa’ in “*Acupuncture Core Therapy*.” “*Thoughts on Using Chinetsukyu in Meridian Therapy*” is particularly detailed regarding heat perception moxibustion (Hayden R., *North American Journal of Oriental Medicine*). Menjo has published case reports on eczema, ankle swelling (after spraining), chapped hands, and stomatitis (aphthous) in *North American Journal of Oriental Medicine*.

Heat perception moxibustion is a non-scarring method representative of Japanese moxibustion techniques. It is expected to become more widespread across the world.

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