

Analysis of a Questionnaire on the Characteristics of Palpable Hardenings: a Survey of Experienced Japanese Acupuncturists

KAWAKITA Kenji¹⁾, OKADA Kaoru¹⁾, KAWAMURA Hirosada²⁾

1) Department of Physiology, Meiji University of Oriental Medicine

2) Working-Group of Acupuncture Research, The Japan Society of Acupuncture and Moxibustion (JSAM)

Abstract

[Aim] To investigate the characteristics and clinical usefulness of so-called "kouketsu: palpable hardenings" which the Japanese acupuncturists frequently use as the sites of diagnosis and acupuncture treatment.

[Methods] A questionnaire about palpable hardenings was prepared and the answers were collected from sixty experienced Japanese acupuncturists who attended a workshop on palpable hardenings. The responses to each item of the questionnaire were simply summarized as a basis for detailed descriptions.

[Results] The characteristics of the palpable hardenings reported by the experienced Japanese acupuncturists were quite interesting. The changeability of their shape, size, hardness and location were clearly demonstrated; they are distributed mainly in subcutaneous tissues but are not restricted to the muscle itself. The temperature, wetness, conformation, smoothness and sensitivity of the skin over the palpable hardenings were also different from the surrounding areas. The palpable hardenings were considered to be similar to the acupuncture and tender/trigger points, closely related to patients' symptoms, and their clinical importance in acupuncture treatment was also clearly demonstrated.

[Conclusions] The present survey clearly demonstrated that the palpable hardenings detected by careful palpation were considered a useful object for acupuncture diagnosis and treatment among Japanese acupuncturists. Their close relationship to acupuncture, tender and reaction points suggests that their pathogenic processes might be the similar. Inflammation in the subcutaneous tissues and sensitization of the nociceptors were suggested as a possible mechanism of the development of palpable hardenings and tender/trigger and acupuncture points.

Key words: *palpable hardenings, questionnaire, Japanese acupuncturists, trigger points, acupuncture points, palpable band, tender points, reaction points*

I. Introduction

Acupuncture points have been considered as the key concept for understanding the mechanisms of acupuncture and moxibustion treatment, although their essential characteristics are still unclear. Numerous morphological studies have found only nerve bundles and vessels under the acupuncture points^{1,2)}, although several specific structures have been proposed without concrete evidence³⁾. Various functional properties of acupuncture

points, such as the skin resistance^{4,5)}, afferent discharges⁶⁾ and local electrical activity⁷⁾ have been investigated. Finally, tenderness has become widely recognized as the important feature of acupuncture points.⁸⁻¹⁰⁾

Physiological investigations strongly suggested that sensitization of nociceptors in the peripheral tissues is the major cause of tender point formation¹¹⁾. The polymodal receptors, one kind of nociceptor, responsive to mechanical, thermal and chemical stimuli, are easily sensitized by various inflammatory substances¹²⁾, and

are proposed as a possible candidate for tender point formation¹³). The characteristics of polymodal receptors can also explain why acupuncture and moxibustion applied to similar loci produce similar effects although the physiologic qualities of the two stimuli are quite different. The reason may be simply because both stimuli can stimulate the polymodal receptors as the common receptors¹⁴). This fact is very important for understanding the rationale of the mechanism of acupuncture, as moxibustion was the original form of stimulus in ancient Chinese medicine from the archeological view point¹⁵).

On the other hand, western medical doctors have described a similarity of trigger points to acupuncture points in patients with myofascial pain syndromes¹⁶). Trigger points are characterized by their location on a palpable taut band, and their particular pattern of referred pain provoked by the stimulation of the tender region. The distribution of trigger points was completely in accordance with acupuncture points⁸), and the palpable band seems to be similar to the *kouketsu*: palpable hardenings (PH), that the Japanese acupuncturists tend to use in their acupuncture treatment.

Palpable hardenings as well as tender points were considered clinically by Japanese acupuncturists to be very important sites for acupuncture treatment¹⁷), but their characteristics and their relationship to acupuncture points, tender/trigger points and so-called "reaction" points have not been clarified yet.

In this survey we intended to investigate the characteristics and their perceived clinical usefulness by use of a questionnaire. This survey was undertaken in 1985 and the main results were briefly reported¹⁸). In this first issue of the Online Journal of J Jpn Soc Acupunct (Japanese Acupuncture and Moxibustion; JAM), with permission of the editorial board, we have prepared a revised English manuscript to report information on the charac-

teristics of Japanese acupuncture treatment with discussions on recent developments in trigger point research.

II. Method

A questionnaire about PH was prepared to clarify the characteristics of the PHs and their clinical usefulness. Table 1 summarizes the items of questionnaire. Multiple responses were allowed. Sixty well-experienced Japanese acupuncturists were asked to answer the questionnaire. The mean age and clinical experience as licensed acupuncturists were 40.2+9.4 and 17.7+8.6 years, respectively. They were attending a workshop held at the annual meeting of the Japan Society of Acupuncture and Moxibustion in 1985. The main theme of the workshop was "Discussion on the characteristics of so-called *kouketsu*". The term *kouketsu* has been widely used among Japanese acupuncturists as one of the characteristics of the site of diagnosis and acupuncture manipulation. In this report the term "palpable hardenings", which was proposed in the workshop, was used instead of *kouketsu*. The responses were simply summed and graphs constructed. Statistical analysis was not performed, as the major purpose of this survey was to describe the characteristics of so-called PHs in detail.

III. Results

The present survey confirmed the existence of so-called PHs, and their variable characteristics. Only two out of 60 acupuncturists denied the existence of PHs (answers to question a; see Appendix). The changeable characteristics of PHs and their close relationship to acupuncture/trigger points were clearly confirmed by the majority of acupuncturists. Their importance in clinical

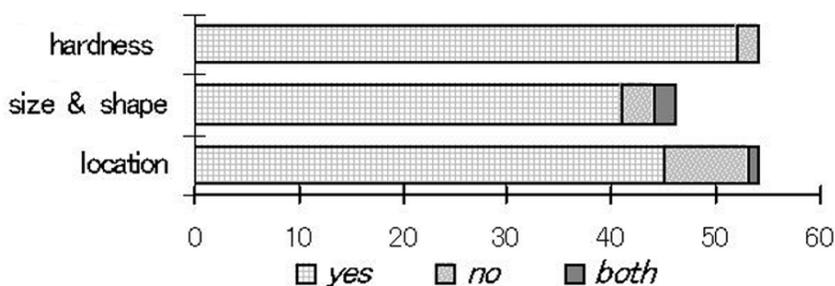


Figure 1. Changeable nature of PHs
PH: Palpable Hardenings

Table 1. Questionnaire about palpable hardenings

-
-
- I. Changeability of the palpable hardenings
- 1) Is the hardness changeable? (yes, no, both)
 - 2) Is the size and shape changeable? (yes, no, both)
 - 3) Is the location changeable? (yes, no, both)
- II. Location of the palpable hardenings
1. Where does the palpable hardening exist?
 - 1) intra-dermis
 - 2) subcutaneous connective tissues
 - 3) inter-fascial space
 - 4) intra-muscle
 - 5) others
- III. Characteristics of the skin over the palpable hardenings
1. Temperature of the skin
 - 1) higher than surrounding region
 - 2) lower than surrounding region
 - 3) normal, similar to surrounding region
 2. Conformation of the skin
 - 1) protuberance
 - 2) pit
 - 3) normal, similar to surrounding region
 3. Wetness of the skin
 - 1) more dry than surround region
 - 2) more wet than surrounding region
 - 3) normal, similar to surrounding region
 4. Smoothness of the skin
 - 1) more smooth than surrounding skin
 - 2) more rough than surrounding region
 - 3) normal, similar to surrounding region
 5. Sensibility of the skin
 - 1) more sensitive than surrounding region
 - 2) less sensitive than surrounding region
 - 3) normal, similar to surrounding region.
- IV. Relationship between the symptoms and the palpable hardenings
1. Do the palpable hardenings exist in the healthy subjects? (yes, no, unclear)
 2. Does the number of the palpable hardenings change with age? (yes, no, unclear)
 3. Does the number and location of the palpable hardenings reflect the degree and location of illness? (yes, no, unclear)
 4. Does the location of the palpable hardenings relate to the position of the illness? (yes, no, unclear)
- V. Relationship between palpable hardenings, tender point, acupuncture point, and reaction point
1. locations of the palpable hardenings and tender point are similar? (yes, no)
 2. location of the palpable hardenings and reaction point are similar? (yes, no)
 3. location of the palpable hardenings and acupuncture point similar? (yes, no)
- VI. Clinical usefulness of the palpable hardenings
1. the palpable hardenings are more effective locus than other sites (yes, no)
 2. Which locus do you use as acupuncture point in your clinical treatment?
 - 1) classical acupuncture points
 - 2) palpable hardenings
 - 3) both
 3. Which locus do you consider the most useful in your clinical treatment?
 - 1) palpable hardenings
 - 2) reaction points
 - 3) acupuncture points
 - 4) tender points
 - 5) pleasantly tender points
 - 6) others
-

diagnosis and usefulness in acupuncture treatment were also supported.

The changeable hardness, location and size

The shape and size of PHs varied from string or rope-like to pear or ball-like shape, and their sizes were from sesame seed to apricot kernel. The hardness and location were also changeable with time. Figure 1 summarizes the results of responses. The majority of Japanese acupuncturists considered PHs to be unstable structures, changeable in their shape, size and hardness. Their variable characters were striking features.

Location of distribution of the palpable hardenings

Figure 2 summarizes the location of PHs in the tissue. The subcutaneous tissue is the most frequent site followed by muscle and inter-fascia structures. The majority of PHs are found in subcutaneous and muscular tissues, although some are detected in the skin. Others are found in nearby ligaments, periosteum, nerve bundles and vessels.

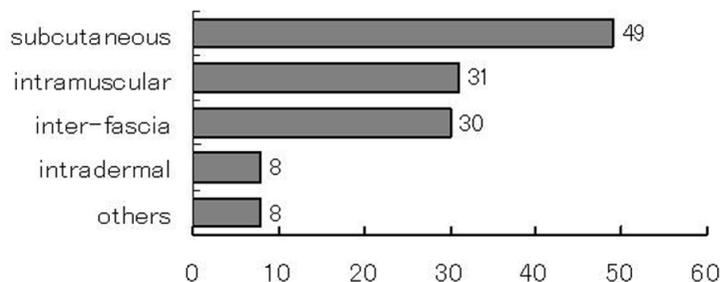


Figure 2. Location of palpable hardenings

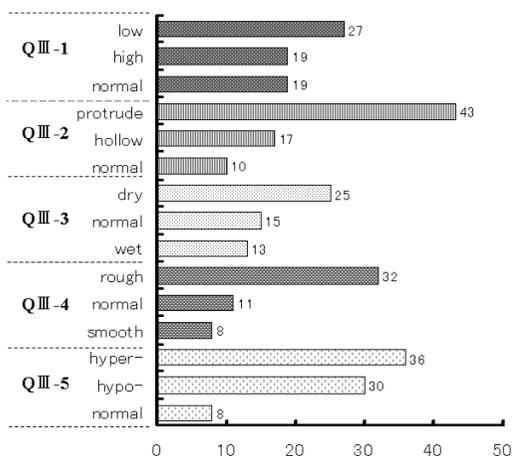


Figure 3. Various differences of the skin over the PHs

The characteristics of skin over the palpable hardenings

Figure 3 shows the summary of the answers to the Question III in Table 1, which demonstrates the apparent changes in the skin over the PHs.

The skin temperature, configuration, wetness, smoothness and sensitivities were strongly influenced by the existence of the PHs. Decrease of skin temperature is the major characteristic. Protuberances of dry and rough skin with hypersensitivity to stimuli were the most frequent characteristics of the skin. Variability was also apparent, and the opposite features were not rare. So it is not easy to conceive of a common underlying mechanism for such changes in the skin.

Relationship between the symptoms and the palpable hardenings

Figure 4 is a summary of the answers to question 4. The respondents consider that PHs are closely related to he symptoms of patients, although PHs are detected in the healthy subjects (Q IV -1). The number of PHs changed with age (Q IV -2), and was dependent on the

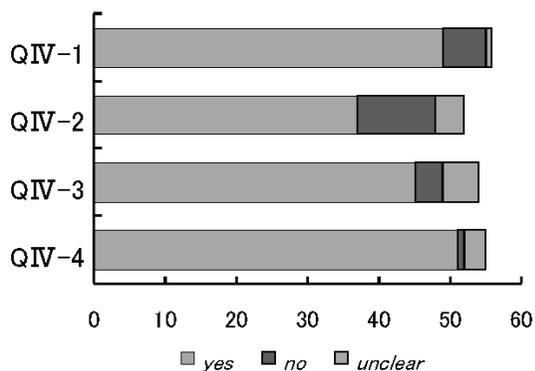


Figure 4. Relations between symptoms and PHs

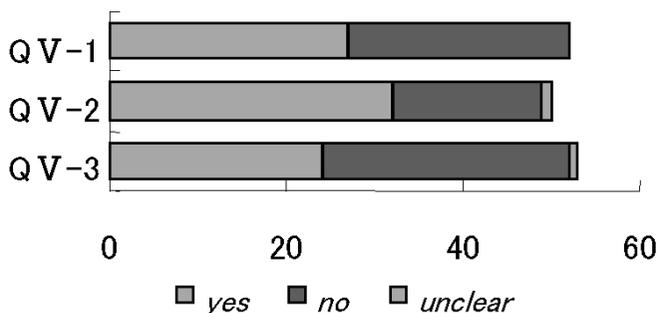


Figure 5. Relation among PHs, APs and RPs
PHs:Palpable Hardenings; APs: Acupuncture points; RPs: Reaction Points;

severity of illness (Q IV-3). Moreover, the location of the PHs also related to the site of illness. That is, the detection of the PHs is considered to be a useful indicator of diagnosis in acupuncture treatment.

Similarity of the palpable hardenings to the tender, reaction and acupuncture points

The similarities of the PHs to the tender points (Q V-1), reaction points (Q V-2) and acupuncture points (Q V-3) are summarized in Figure 5.

The results suggest close similarities of PHs to reaction or tender points, but less to acupuncture points. It should be noted that there were a moderate number of negative answers. Question V asked whether PHs are at a similar (identical) locus to the tender, reaction or acupuncture points or not, so if the question is asking about the co-existence or relationship between PHs and such points, the positive responses might have been higher.

Clinical usefulness of PHs as the stimulating sites of acupuncture manipulation

As Figure 6 A clearly demonstrates, PHs are considered to be more effective sites for acupuncture than other sites. A very surprising result was also found in Figure 6 B. Japanese acupuncturists chose the PHs instead of classical acupuncture points when they planned to treat a acupuncture point selected as a result of theoretical considerations. That is, the actual acupuncture treatment was performed on PHs instead of so-called acupuncture points in the classical textbook.

Selection of stimulating sites for acupuncture and moxibustion

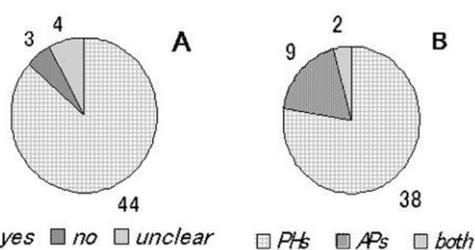


Figure 6. Importance and usefulness of PHs

Figure 7 summarizes the selection of stimulating sites that the acupuncturists considered to be the most important. In this question, pleasantly tender points were summed separately from tender points (see table 1 for detail).

Tender and pleasantly tender points together were the most frequently selected points for treatment, but other PHs, reaction points and acupuncture points were selected with similar frequency.

IV. Discussion

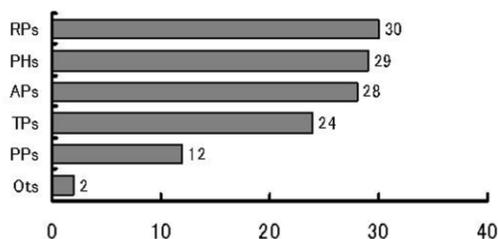


Figure 7. Preference of site of stimulation
TPs: Tender Points; PPs: Pleasantly Tender Points;
OTs: others

The results of the present survey clearly demonstrate the variable characteristics of PHs. Their size, shape, hardness, and location are quite changeable, and they are closely related to acupuncture points and trigger points. They are used as one of the important simulating sites for acupuncture treatment.

The variety of the features of HPs might suggest that different things are being detected by palpation, with different pathogenesis. Therefore, it is not easy to summarize the general characteristics of PHs, but they do suggest that the possible mechanisms for development of structures such as PHs should be considered.

The changeable characteristics of PHs and their location

The changeable characteristics of PHs clearly deny the possibility that histological change is the major cause of the PHs. They are easily changed in their size, shape and hardness so dynamic changes in the subcutaneous tissues should be considered. A possible phenomenon that induces dynamic changes in subcutaneous tissues might be edema induced by tissue inflammation. It can explain the changes in the size and shape of the PHs with time. The hardness of PHs seemed to be the result of the contraction or contracture of the muscle, however the muscle was not the major position where PHs develop. Edema in the subcutaneous tissues might be detected by palpation as a hard structure and changes in inflammation over time may alter the hardness of the palpated structures¹⁶⁾.

Changes in the skin over the PHs

Various changes were observed in the skin over the PHs. The majority of these changes might be explained as the result of different levels of sympathetic nerve activity. The decrease of skin temperature, the rough feeling to touch and wetness of the skin might be the results of vasoconstriction of the peripheral vessels and also the results of the pilomotor activity, and could also be considered as a result of hyper-activity of the sweat glands. These changes might occur from facilitation of the sympathetic nerve activity, and inhibition of sympathetic nerve activity might induce the opposite changes in the skin.

The relationship between the existence of the PHs and local changes of sympathetic nerve activity is not clear. If PHs are the results of inflammatory process, sensitization of the nociceptors at the PHs might occur

and their afferent discharge could modify the sympathetic nerve activity and induce various changes in the skin by the somato-sympathetic reflex¹⁹⁾ or axon reflex²⁰⁾. The hypersensitivity of the skin may also be explained as sensitization of the receptors by various chemical mediators²¹⁾.

The conformational changes of the skin were also interesting phenomena. The Chinese characters that indicate acupuncture points strongly suggest the existence of pits along the meridians, but in this survey protuberances rather than pits of the skin were found more frequently. Protuberance of the skin might be explained, at least in part, as the results of edema in the subcutaneous tissues.

Relationship of palpable hardenings to tender, reaction and acupuncture points

The HPs were assumed to be a similar object to tender, reaction and acupuncture points by half the respondents. They believed there was a close relationship between PHs and these points, although their characteristics were not always the same. The higher incidence of reaction points than tender points suggests that various changes in the skin over PHs occur frequently, and these changes were detected as a feature of reaction points in this questionnaire. The pathologic mechanism of the development of PHs and their relationship to the formation of such points were still unknown from this survey. However the features of trigger points may help to understand PHs and tender, reaction and acupuncture points.

Relationship between the palpable hardenings and the trigger points

The close relationship between the PHs and tender points strongly suggests that PHs have similar characteristics to palpable bands around trigger points. Trigger points are characterized by their tenderness to palpation and the existence of the palpable band, a ropy structure under the skin in the patients with the myofascial pain syndrome. Disorders of sympathetic nerve activity were well noted¹⁶⁾, so various changes observed in the skin over the PHs could be explained as similar phenomena to those observed in trigger points.

The pathogenic mechanisms of the trigger points are still under discussion. Recently, hyperexcitability of muscle endplates has been proposed as the major cause of the trigger points^{22,23)}, based on the facts that a characteristic electrical activity similar to the endplate poten-

tial is recorded from the trigger points. On the other hand, the electrical activity recorded from the palpable band has been considered to be intrafusal muscle activity²⁴). Another possible mechanism is sensitization of nociceptors (polymodal receptors) induced by inflammatory changes in the subcutaneous tissue, with the fascia as the major site of formation of the trigger points²⁵). The electrical activity recorded from the trigger points was considered to be the result of reflex activity evoked by afferent volleys from the nociceptors in the fascia.

As mentioned in the previous section, the changeability of the PHs is explained by the edema of the subcutaneous tissues, and the close relationship of PHs to tender reaction and classical acupuncture points can be explained as the results of inflammatory process and sympathetic responses evoked by afferent inputs from the inflamed tissues. The polymodal receptors might be possible candidates for trigger point formation.

Clinical usefulness of PHs and other stimulating points for acupuncture

The preference for the use of PHs in acupuncture treatment rather than the classical acupuncture points suggest that PHs are sites of high sensitivity to external stimuli such as acupuncture or moxibustion. In other words, the location of the classical acupuncture points indicates the site where PHs, reaction points and tender points developed frequently.

The participants of the present survey were the attendants at a workshop on PHs, so we should be aware of the possibility of strong bias in their responses. The importance of PHs in acupuncture treatment in the present results might be exaggerated. However, a previous survey conducted on over ten thousand Japanese acupuncturists also demonstrated their preference for PHs and tender points in diagnosis and treatment¹⁷).

The present survey clearly demonstrated that, in actual situations of acupuncture treatment, PHs, tender points and reaction points detected by careful palpation were used by Japanese acupuncturists in preference to acupuncture points described in the classic textbooks. That is, reporting the precise, detailed description of the sites of acupuncture stimulation seems to be more important than listing the acupuncture points used.

V. Conclusions

The present survey clearly demonstrated the importance of the PHs and tender points in acupuncture diagnosis and treatment among Japanese acupuncturists. The close relationship of PHs to tender /trigger points was demonstrated, and the preference for using PHs and tender points instead of classical acupuncture points in their daily clinic strongly suggest that it is important to detect the actual presence of PHs occurring under the skin, by careful palpation.

Acknowledgements

The authors wish to express their thanks to Drs. Gotoh Kazuhiro, Ueda Yoshihiro and Oda Hirohisa for their valuable comments on the results of this questionnaire, and to all attendee of the workshop for their kind cooperation.

References

- 1) Dornette WHL. The anatomy of acupuncture. Bull NY Acad Med. 1975; 51: 895-902.
- 2) Plummer JD. Anatomical findings at acupuncture loci. Am J Chin Med. 1980; 8: 170-80.
- 3) Niboyet JEH. Les caracteristiques morphologiques des points chinois. In: Nouveau Traite D'Acupuncture. Maisonneuve. 1979: 249-77. (in French)
- 4) Nakatani Y. On the acupuncture points and the channels. J Jpn Oriental Med. 1953; 3: 39-49. (in Japanese)
- 5) Reichmanis M, Marino AA, Becker RO. Electrical correlates of acupuncture points. IEEE Trans Biomed Eng. 1978; 22: 533-55.
- 6) Xian Med Coll. Studies on the afferent fibers and receptors which correlate to the teh-chi sensation elicited from Hoku point. In: Basic and Clinical Studies on Acupuncture Anesthesia. Hong Kong. Era Book Co Ltd. 1978: 316-23.
- 7) Shanghai Inst Physiol. Electromyographic activity produced locally by acupuncture manipulation. Chin Med J. 1973; 53: 532-5. (in Chinese)
- 8) Melzack R, Stillwell DM and Fox EJ. Trigger points and acupuncture points for pain: correlations and implications, Pain 1977; 3: 3-23.
- 9) Baldry PE. Acupuncture, trigger points and musculoskeletal pain. Edinburgh. Churchill Livingstone. 1993.

- 10) Pomeranz B. Scientific basis of acupuncture. In: Stux G, Pomeranz B (eds). *Acupuncture textbook and atlas*. New York. Springer-Verger. 1987: 1-34.
- 11) Kendall DE. A scientific model for acupuncture. *Am J Acupunct*. 1989; 17: 251-68.
- 12) Kumazawa T, Mizumura K. Thin fibre receptors responding to mechanical, chemical and thermal stimulation in the skeletal muscle of the dog. *J Physiol. (Lond.)* 1977; 273: 179-94.
- 13) Kawakita K, Gotoh K. Role of polymodal receptors in the acupuncture-mediated endogenous pain inhibitory systems. In: Kumazawa T, Kruger L, Mizumura K (eds). *The Polymodal Receptor-A Gateway to Pathological Pain*. Vol 1. Amsterdam. Elsevier. 1996: 507-23.
- 14) Kawakita K. Polymodal receptor hypothesis on the peripheral mechanisms of acupuncture and moxibustion. *Am J Acupunct*. 1993; 21: 331-8.
- 15) Harper D. *Early Chinese medical literature- the Mawangdui medical manuscripts*. The Sir Henry Wellcome Asian Series. London. Kegan Paul International. 1998.
- 16) Travell JG, Simons DG. *Myofascial pain and dysfunction, The trigger point manual*. Batimore. Williams and Wilkins. 1983.
- 17) Debata A, Ogawa T. Survey on the questionnaire for Japanese acupuncturists, Ido-no-Nihon 1979; 423: 9-45. (in Japanese)
- 18) Kawakita K. Palpable hardenings-reports of the questionnaire-. *J Jpn Soc Acupunct*. 1986; 36: 36-41. (in Japanese)
- 19) Sato A. Somato-sympathetic reflex discharges evoked through supra-medullary pathways. *Pflugers Arch*. 1972; 332: 117-26.
- 20) Sann H, Pierau FK. Efferent functions of C-fiber nociceptors. *Z Rheumatol*. 1998; 57 Suppl 2: 8-13.
- 21) Koda H, Mizumura K. Sensitization to mechanical stimulation by inflammatory mediators and by mild burn in canine visceral nociceptors in vitro. *J Neurophysiol*. 2002; 87: 2043-51.
- 22) Hong CZ, Simons DG. Pathophysiologic and electrophysiologic mechanisms of myofascial trigger points. *Acta Phys Med Rehabil*. 1998; 79: 863-72.
- 23) Simons DG. Clinical and etiological update of myofascial pain from trigger points. *J Musculoskeletal Pain*. 1996; 4: 93-121.
- 24) Hubbard DR, Berkoff GM. Myofascial trigger points show spontaneous needle EMG activity. *Spine*. 1993; 18: 1803-7.
- 25) Itoh K, Kawakita K. Effect of indomethacin on the development of eccentric exercise-induced localized sensitive region in the fascia of the rabbit. *Jpn J Physiol*. 2002; 52: 173-80.

Appendix

Question (a): Do you think that palpable hardenings exist?

Question (b): How do you detect palpable hardenings?

Question (c): How do you think about the mechanisms of kouketsu formation?

Palpable hardenings: It has been called "kouketsu" in Japanese, and it means simply something hard to touch or palpate.

Reaction points: Various features were included in the term "reaction points" in the present survey. Low impedance is one of the major features, and the presence of differences in their characteristics of the skin compared with surrounding region was assumed as their indicator.

Tender points: Tender points are the sites where tenderness occurs by pressure application. Characteristics of the sensation were dull pain sensation.

Pleasantly tender points: This point indicates that pressure application to the point produce painful sensation but it is not unpleasant and comfortable feelings provoked although the characteristics is painful.