Special Issue

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A new proposal for Thumbtack needle treatments

● Keyword/Thumbtack needle, Three-point acupuncture needling, cervical spine deformity

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We conducted a comparative clinical study of thumbtack needle acupuncture versus sham acupuncture applied to shoulder stiffness to investigate the effectiveness of a thumbtack needle. The result proved positive. Meanwhile, we could not obtain sufficient effects with cases attributed to organ disorders. Therefore, we examined the clinical effects of a thumbtack needle with a case accompanied by a disorder such as cervical spine deformity. We stimulated three-acupuncture points, which will be the corners of a triangle around the tender point and nodule after acupuncture and moxibustion previously practiced. The symptoms already relieved by the therapies were further reduced ($p < 0.05$). We also examined the needle's clinical effects according to the differences of angle velocity based on the total amount of isokinetic movements. As a result, the total amount of them with thumbtack needles was lower than that with sham needles at 240 degrees. This trial suggests that appropriately specified dose of stimulation could achieve intended clinical effects.

1. Diffusion of Thumbtack needles

The Thumbtack needle was brought into Japan as a souvenir from China in the 1970s. The needles were provided in a small glass bottle with a cork stopper in 10 or 20 needle units, and required sterilization prior to their use in treatment. The instructions for use were not provided, in which there was a sequence of events that led to these being used as indwell-type acupuncture needles for Tender Point treatment or auricular acupuncture. Although there were Intradermal acupuncture needles, represented by indwell-type acupuncture needles, in Japan at that time, the Thumbtack needle quickly became popular. Sterilized Thumbtack needles were approved as a medical device by the Ministry of Health and Welfare (at that time) and were sold by an acupuncture needle manufacturing company in 1978. They provided 10 Thumbtack needles individually attached to a plastic plate. When using the Thumbtack needle, it is detached from the plate by peeling the tape off, so that it can be utilised directly on the patient who is to be treated. The shape of a Thumbtack needle in those days was such that the needle tip protruded from the centre of the ring-shaped wire, which was formed by the coiling-up of a steel wire. The length of the needle shaft was over 2mm, but it seldom equalled the depth of the insertion itself due to the spring action of the ring part. Moreover, the pain experienced upon needle insertion (penetrating the epidermis) or a pricking pain experienced during needle insertion could easily occur. Since then, the individual packaging style with one Thumbtack needle per pack became the standard due to measures based on a hygienic perspective; however, the shape of the Thumbtack needle was still the same as when it was imported from China.

Subsequently, the ring shape of the Thumbtack needle was improved and the needle shaft was formed into an L-shape and embedded in a plastic spindle, from which the needle tip was slightly exposed.

The unpleasant feeling accompanied with needle insertion (penetrating the epidermis) was improved and thus it became much easier to use this Thumbtack needle as an insertable needle without pain. At present, a 0.6mm main shaft length is being provided for acupuncture treatment.

The Thumbtack needle is unique in the way that the entire length of the established needle shaft length is inserted making the needle insertion depth constant. It can be said that this is a new acupuncture needle configuration that was developed for this approach. The Thumbtack needle has an innovative shape that is unprecedented in the long history of acupuncture treatment. It is completely different from the fine needle that requires a timely adjustment of the insertion depth.

Then, what is the origin of the Thumbtack needle? The idea that the insertion depth is made constant is demonstrated with an acupuncture needle of 1 to 1.5 inches, which was introduced in "A Treatise on Acupuncturation" that was written by J. M. Churchill in 1821[1)]. The shape resembled the shape of a fencing sword. It is particularly noteworthy that the needle is equipped with a saucer-shaped guard in between the needle shaft and the needle handle. It is believed that the acupuncture treatment performed in England at that time was strongly influenced by Japanese and/or Chinese acupuncture. The acupuncture needles used during the early 17th century in Japan were round, sharp needles (meridian needle and percussion needle), which resembled an ice pick. In general, they were integrally configured with the needle handle, needle shaft, and needle tip. It seems that this needle shape was transmitted to England, where the sword guard was attached for further innovation in order to serve as a stopper to maintain a constant insertion depth.

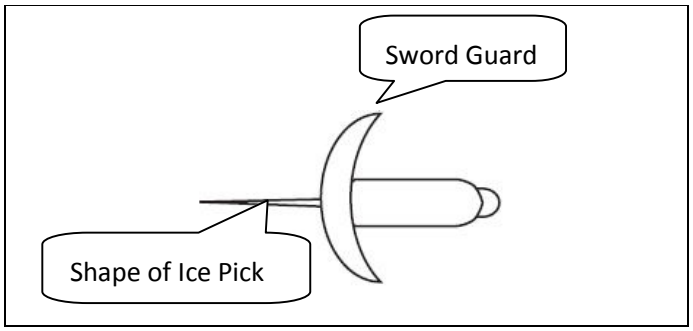

Fig. 1 Schematic Drawing of the Acupuncture Needle Used by J. M. Churchill.

The needle insertion depth is made constant due to the sword guard attached to the acupuncture needle.
This needle can be widely accepted as the origin of the Thumbtack needle.

2. Efficacy of the Thumbtack Needle for Upper Back Muscle Stiffness

Treatment using the Thumbtack needle involves application at the points that are identified by the evocation of pain when pressed, which is to say, the "tender points". The tender point treatment method has its origin in “The Meridians” of ““Huang Di Nei Jing Ling Shu”, which states that “the painful location shall be the treatment point,” describing a treatment for the reaction points identified on the 12 Tender-muscle Energy Channels. Since the Tender-muscle Energy Channels go around the muscles and joints, where the Meridians go, as well as manage the functions, the modern interpretation regards them as the general term for locomotor systems. “Performing treatment on the areas causing pain” is effective for the symptoms appearing in the motor systems. The authors conducted the study3) on the effects of the Thumbtack needle

compared to a sham needle on upper back muscle stiffness, which is one of the symptoms that is characteristic of Japanese people, to verify the effects of Thumbtack needle treatment. The Thumbtack needle that was used for this tender point treatment was a 0.6 mm-long Pyonex acupuncture needle (made by Seirin Co., Ltd.). The treatment was conducted on the pressure painful point regardless of whether it was a meridian point location or not. The Tender Point was detected at four or fewer locations per individual who were complaining of subjective upper back muscle stiffness. The sham needles provided were packed in a package and attached to a tape in the same way as the real ones, although their tips were cut off. Thus, the study allowed us to verify the acupuncture treatment effect while ruling out the placebo effect.

In order to investigate the subjective symptoms of the stiffness, we used one of the question items: “Positive stiffness in upper back muscle”, which was included in questionnaire III: “Physical disintegration” proposed by the Industrial Fatigue Research Committee of the Japan Society of Industrial Health. The Thumbtack needles and sham needles were randomly assigned to the subjects, in which the subjective upper back muscle stiffness was compared after 3 days. As a result, 12 of the 28 subjects in the Thumbtack needle group had subjective upper back muscle stiffness, while it was 23 of the 25 subjects in the sham needle group. These changes in the Thumbtack needle group and the sham needle group were statistically significant ($p<0.01$). In a comparison of the levels of upper back muscle stiffness, which was attributed to organic diseases diagnosed as cervical disc hernia, cervical spondylosis, or thoracic outlet syndrome suspected according to manual test findings, and the so-called upper back muscle stiffness left undiagnosed or with no positive findings investigated in a manual test for cervicobrachial pain, we examined the visual analogue scale (VAS) values before, immediately after, and 3 days after the application of Thumbtack needles. As a result, the so-called upper back muscle stiffness demonstrated that the VAS value decreased ($p<0.01$) 3 days after application; whereas, the upper back muscle stiffness that was caused by organic disease did not demonstrate asufficient effect.

3. The efficacy of the Thumbtack needle "Three-point acupuncture needling" on the upper back muscle stiffness was attributed to organic disease.

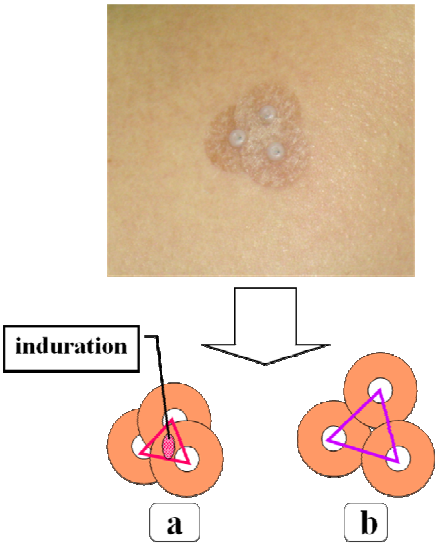

Fig.2 Three-Point Needling by Means of the Thumbtack Needle

Three Thumbtack needles were inserted in turn forming a triangular shape in order to cover the induration. This was called Three-point needling. The needle tip is inserted so that it does not touch the tape that anchors the Thumbtack needle. The length of one side of the triangle formed by the needle tips of the Thumbtack needles corresponds to the size of the induration, in which it was decided from there that the edge of the tape would slightly cover the spin top (Photograph and Schematic drawing a) to the extent that the edges of the needle- attached tapes are slightly overlapped (Schematic diagram b).

"Three-point needling"[4] was devised as an application method of the Thumbtack needle for upper back muscle stiffness that is caused by organ disease. In this method, three Thumbtack needles are used to surround the tender induration that is detected by palpation. Here, the "Three-point needling" conducted immediately after acupuncture and moxibustion treatment shall be elucidated as a clinical application. The change in the VAS values was used as the parameter for evaluating the extent of the subjective upper back muscle stiffness, in which an evaluation was conducted before acupuncture and moxibustion treatment, after treatment, and after "three point needling". The 11 examined cases diagnosed as organ disease by a medical institution included 9 cases of cervical spondylosis, 1 case of cervical hernia, and 1 case of thoracic outlet syndrome. The subjects consisted of 4 males and 7 females, with an average age of 56.5 ± 9.5 years. The location for applying the "Three-point needling" was the single most sensitive Tender Point where subjective symptoms had remained following acupuncture and moxibustion treatment. As a result, the VAS values decreased between post-acupuncture and moxibustion treatment and post-Three-point needling ($p<0.05$). It was proved that the effects of acupuncture and moxibustion on upper back muscle stiffness that was caused by organ disease were more enhanced by the “Three point needling.” "Three-point needling" is the method of surrounding an induration with three acupuncture needles.

Even if the Thumbtack needle is a minute stimulation, additive effects generated by simultaneously stimulating multiple points create an area of stimulation, which is not the case with one-point stimulation. It is believed that this is the result of facilitation, which is one of the interactions between excitation and sedation in the synaptic transmission of the central nervous system. This characteristic of synaptic transmission, which is also recognised in the autonomic nerve ganglion, impacts the local vessels, sweat glands, and erector pili muscles under sympathetic innervation, and is believed to contribute to improving local symptoms through autonomic nerves.[5]

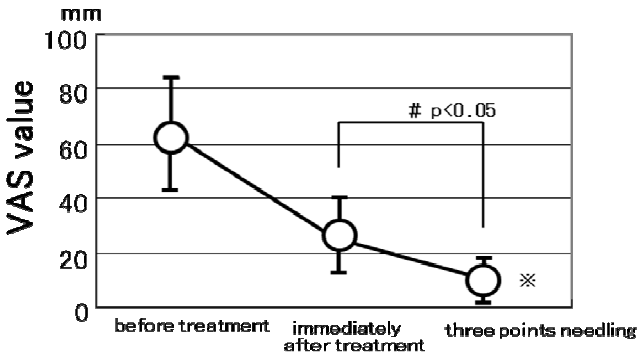

Fig.3 Efficacy of Three-point Acupuncture Needling

The ordinate shows the VAS in mm, and the abscissa shows the stages of the treatment process: before and immediately after acupuncture and moxibustion treatment, and after Three-point acupuncture needling during the process of treatment. The VAS values, demonstrating the level of upper back muscle stiffness, decreased from 62.6±19.7mm (before acupuncture and moxibustion) to 25.2 ±9.1mm (after acupuncture and moxibustion) and further to 9.5± 6.5mm (after three-point acupuncture needling). The one-way analysis of variance showed that the levels were significantly different (※p<0.01), whereupon a multiple comparison was also conducted, in which the decrease was recognised in the VAS values (#p <0.05) between post acupuncture and “Three-point acupuncture needling.”

4. Effects of Thumbtack Needle Stimulationon Isometric Exercise

I am hereby introducing the effects of the Thumbtack needle on motor function. I have reported that a Thumbtack needle stimulation 1 cm lateral to the spinous processes of the cervical vertebra, C5 ～ Th1, on the posterior cervical regions, which are on the same side as the upper extremity being exercised, will recover

from the declined muscle output.[6]. In this discussion, we are introducing a comparison of the effects of the total amount of knee joint flexion and extension exercise work at angular velocities of 60° and 240° with the Thumbtack needle and the sham needle during isometric exercise using the Biodex system 3. It was decided that the stimulus area for the Thumbtack needle or sham needle would be BL23 to BL 32, on the same side of the lumbar region as the lower extremity movement, from the L2 to S1 area innervated by the posterior branch of the cutaneous branch at the same spinal nerve level as the sciatic nerve that controls the movement of the lower extremities. Thumbtack needle stimulation was performed in advance, and the stimulation was continued during the entire cycle of movement. As a result, there was no difference between the Thumbtack needle group and the sham needle group in the angular velocity of the knee joint extension exercise.

There wasn't a difference in the total amount of work during the flexion movement between the groups at an angular velocity of 60°, but the Thumbtack needle group decreased more than the sham needle group did at an angular velocity of 240° ($p<0.05$). Thumbtack needle stimulation demonstrated different results according to the type of exercise (speed and power), such as the angular velocity of 60° (slow type exercise) and the angular velocity of 240° (fast type exercise).

More specifically, although these were particular conditions of isometric exercise, it was supposed that the Thumbtack needle does in fact show an inhibitory response to fast type exercise. The comparison has shown rather impressive results that, according to an objective, the detailed settings such as the amount and area of stimulation are necessary because the suitability of Thumbtack needle stimulation varies depending on the type of movement.

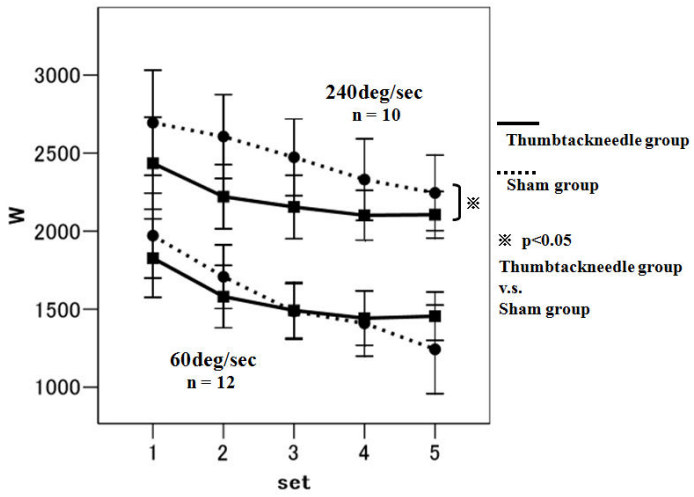

Fig. 4 Effects of Thumbtack Needle on the Total Amount of Work

The ordinate shows W (Watts) of the total amount of work, and the abscissa shows the number of sets of the exercise load. In the entire process of knee joint flexion movement, although a two-way analysis of the variance testing resulted in there not being any difference between the Thumbtack needle group and the sham needle group at an angular velocity of 60° (n=12), a difference was recognised between the Thumbtack needle group and the sham needle group at an angular velocity of 240° ($p<0.05$), whereupon the Thumbtack needle group reduced the total amount of work in contrast to the sham needle group.

5. Adverse Event Caused by the Thumbtack Needle

The occurrence of adverse events due to the Thumbtack needle was discussed in a study entitled “The Effects of Thumbtack Needle on Upper Back Muscle Stiffness.” According to the study, 4 subjects experienced “itchiness” and 1 subject was “annoyed by the inserted needle” in 28 subjects of the Thumbtack needle group; 3 subjects had “itchiness” and 1 subject experienced a “sense of discomfort” in 25 subjects of the sham needle group during the continuous application for 3 days. The rate of occurrence was: "Itchiness" 13.2%; "Uneasy about the Needle Being Inserted" 1.9%; and "Sense of Discomfort" 1.9%. In the study[7] on the effects of the Thumbtack needle in a triathlon race: 1 out of 79 subjects in the Thumbtack

needle group responded "Felt Uneasy about the Needles", and 1 subject out of 70 subjects in the sham needle group responded "Felt Uneasy about the Needles during the Race". The rate of occurrence was 1.3%. Each phenomenon was promptly improved by withdrawing the Thumbtack needle and removing the adhesive tape. Thus, the problem due to the continuous dwelling of Thumbtack needles is “itchiness” that was caused by the gluing agent of the adhesive tape. In daily clinical practice, however, the Thumbtack needles with which patients are allowed to return home are generally left attached until their following treatment. Although the Thumbtack needle is an indwelling type, its placement period as a medical device is limited to 24 hours. It is important that practitioners should pay further attention to this important point. Excluding this particular issue, the continuous application of the Thumbtack needle can be said to be a comparatively safe method, which does not relate to the restriction of physical movement.

6. The Future of the Thumbtack Needle Treatment Method

Overseas, they are trying to verify the effects of acupuncture by inserting a needle into the muscle to provide stimulus. Papers on seeking “Qi perception” are found here and there. The sham needling for the control group for comparison is required not to perceive Qi with a shallow insertion such as Penetration in the epidermis. It has become clear that the Thumbtack needle can obtain such effects as a therapeutic action or an enhancing action of a biological function with stimulation, even though the needle insertion depth is shallow. That “there is no effect without Qi perception” is too simplistic of an approach, which should be changed in daily clinical activities and among researchers.

The Thumbtack needle can obtain high evaluation marks because its needle insertion depth is extremely shallow, and continuous indwelling for the long-term is possible. Moreover, it contributes to relieving pain and improving motor function without affecting physical activities. The clinical application of the Thumbtack needle should gain a solid position as a means of acupuncture treatment in the future. Needle stimulation will be applied to the improvement of competitive ability in sporting activities and to exercise therapy in rehabilitation. We have just begun to review the methods of treatment and stimulation for the Thumbtack needle, in which further research should be conducted with enthusiasm in order to keep this effort moving forward.

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