Combination of Physical and Acupuncture Therapy: Acupoint Stimulation Physical Therapy (ASPT)

Regular Paper

Toshiaki Suzuki1,2,*, Makiko Tani1,2, Chieko Onigata2, Yoshibumi Bunno1 and Sohei Yoshida1

1 Graduate School of Health Sciences, Graduate School of Kansai University of Health Sciences
2 Clinical Physical Therapy Laboratory, Faculty of Health Sciences, Kansai University of Health Sciences
* Corresponding author E-mail: suzuki@kansai.ac.jp

Received 5 Feb 2013; Accepted 5 Mar 2013

© 2013 Suzuki et al.; licensee InTech. This is an open access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/3.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Abstract We introduced Acupoint Stimulation Physical Therapy (ASPT) as a combination of physical and acupuncture therapy. The characteristics of ASPT were as follows. We pressed acupoints on the meridians running through the affected muscles. The magnitude and duration of acupressure stimulation were maximized to alter muscle tonus and not cause pain to the patient. We demonstrated its effects by scientific research using EMG and clinical evaluation in patients with knee contracture. In the future, we would like to develop ASPT as a novel physical therapy for all patients with disorders of muscle tonus.

Keywords Acupoint Stimulation Physical Therapy, Electromyography, Digital Acupressure Stimulation, Muscle Tonus

1. Introduction

We developed a new concept in acupuncture therapy for patients with cervical dystonia [1-4]. It is important to identify affected muscles using clinical evaluation and electromyography (EMG) findings derived from motion analysis. Retaining needles on acupoints based on the meridian concept was used to treat abnormalities in muscle tonus. For the retaining needle technique, pre-sterilized disposable acupuncture needles (0.2mm in diameter, 50mm in length) were inserted ipsilaterally into LI4 (Hegu) in the affected sternocleidomastoid muscle (SCM), TE5 (Waiguan) in the trapezius and SI3 (Houxi) in the splenius muscle (SPL), based on the meridian concept of typical distal acupoints on the meridians running through the affected muscles (Figure 1).

Figure 1. Relationship between affected muscles and acupoints. Acupoints were LI4 for affected sternocleidomastoid muscle (SCM), TE5 for affected trapezius and SI3 for affected splenius muscle (SPL).
If the affected muscles included trunk flexor muscles or extensor muscles, pre-sterilized disposable acupuncture needles were inserted into ST42 (Chongyang) and BL60 (Kunlun), respectively (Figure 2).

Using this acupuncture concept, we developed Acupoint Stimulation Physical Therapy (ASPT) as a new concept in physical therapy.

In addition to introducing ASPT, we demonstrate our research using the EMG method for the scientific basis of ASPT and clinical use for contracture with muscle shortening.

2. ASPT method

Using the meridian concept, we developed a new physical therapy strategy ASPT for patients with cervical dystonia. Details of the technique are as follows.

First, we evaluated the disorder based on clinical findings from motion analysis and muscle tonus tests. We then applied digital acupressure stimulation to alleviate the disorders. We pressed acupoints based on the meridian concept of typical distal acupoints on the meridians running through the affected muscles. The magnitude and duration of acupressure stimulation were maximized to alter muscle tonus and not cause pain to the patient. Acupressure was applied vertically to decrease muscle tonus and obliquely to increase it (Figure 3). Specific points of ASPT were mild acupressure and the direction of acupressure. In particular, it was noted that a difference in direction of acupressure changed muscle tonsus.

3. EMG findings for the SCM by ASPT on LI4 (Hegu)

The subjects of this study included 2 healthy adults who had provided informed consent (A: male, 44 years old, hypertonus of the SCM; B: female, 42 years old, no hypertonus of the SCM).

We investigated integrated EMG of the SCM by ASPT on LI4 (Hegu). This study aimed to determine the following two points: 1) whether ASPT with the inhibition technique on right LI4 (Hegu) inhibited integrated EMG of the right SCM in subject A and 2) whether ASPT with the facilitation technique on the right LI4 (Hegu) facilitates integrated EMG of the right SCM in subject B.

At first, both subjects were seated while we conducted integrated EMG on the right SCM. Next, we applied digital acupressure stimulation to change the tone of the SCM. The magnitude and duration of the acupressure stimulation were maximized to alter muscle tonus and not cause pain to the patient. Acupressure was applied vertically to decrease muscle tonus and obliquely to increase it. EMG testing (duration of 20 seconds) of the right SCM was performed 3 times during ASPT and 15 times after ASPT. As the baseline was set as that recorded immediately prior to the initiation of ASPT, we measured relative data during and after ASPT.
In subject A, relative EMG data for the right SCM decreased during ASPT and this tendency continued for 5 minutes after ASPT (Figure 4). In subject B, relative EMG data for the right SCM slightly decreased during ASPT, but increased after ASPT (Figure 5).

From this study, it is suggested that the application of ASPT to LI4 alters the muscle tonus of the ipsilateral SCM and is highly dependent on the direction of acupressure.

4. Premotor time for the SCM by alteration of pressure duration in acupoint stimulation of LI4

To investigate the excitability of the central nervous system by ASPT in healthy subjects, we assessed the effect of changing pressure duration during ASPT on premotor time (PMT), which was used as the index of central neuron excitability.

The subjects included 9 healthy adults (7 males and 2 females; mean age 33.8 years) who had provided informed consent. Using the left SCM, we tested PMT (time from sound trigger to onset of EMG) during rightward rotation of the neck before applying ASPT by the facilitation technique and 0, 10, 20 and 30 minutes after ASPT (acupoint: left LI4) under different pressure durations (1, 3 and 5 minutes). PMT of the left SCM during neck rotation was measured 10 times and the data was averaged to yield individual data.

PMT after ASPT on the left LI4 with 5 minutes of pressure was shorter than that before ASPT, particularly that measured after 30 minutes (paired t-test: p < 0.05). No significant difference was observed between PMT values after 1 and 3 minutes of pressure application in ASPT. Typical PMT of the left SCM during neck rotation before ASPT and 0, 10, 20 and 30 minutes after ASPT (pressure time 5 minutes) on the left LI4 is shown in Figures 6 and 7.

![Figure 6](https://example.com/figure6.png)

**Figure 6.** Relative premotor time (PMT) from left sternocleidomastoid muscle (SCM) during neck right rotation after by Acupoint Stimulation Physical Therapy (ASPT). These data were described as relative data that PMT before ASPT was 1. PMT after ASPT on left LI4 with 5 min pressure application were shorter than those before ASPT. PMT after ASPT was gradually shorter until after 30 min. No significant difference was observed between PMT with 1 and 3 min pressure applications in ASPT.

5. Clinical effect of ASPT on flexion contracture of the knee joint in a patient with chronic hemiplegia secondary to cardiovascular disease

We investigated the effect of ASPT by altering the range of motion (ROM) in a patient with contracture and muscle shortening. The patient was an 89-year-old female with flexion contracture of both knee joints due to chronic hemiplegia secondary to cardiovascular disease. The flexion factors of contracture in both knee joints were hypertonus and shortening of the hamstring muscle.

We applied ASPT to either BL60 or KI3 to decrease muscle tonus of the hamstring (Figure 8) and monitored the effect by measuring ROM of knee extension before and after ASPT. Next, we evaluated the effect of ASPT on two non-acupoints, one on the kidney meridian and the other not on any meridian (Figure 8). Acupoint stimulation was maintained for 3 minutes in a vertical direction.

![Figure 8](https://example.com/figure8.png)

**Figure 7.** Typical premotor time (PMT) of left sternocleidomastoid (SCM) during neck right rotation before by Acupoint Stimulation Physical Therapy (ASPT) and 0, 10, 20, and 30 min after ASPT (pressure time, 5 min) on left LI4. PMT after ASPT on left LI4 with 5 min pressure application were shorter than those before ASPT. PMT after ASPT was gradually shorter until after 30 min.

LI4 is the acupoint on the large intestine meridian, which passes through the SCM. PMT evaluation of ASPT was used as an index of excitability of central nervous function. In this study, ASPT on LI4 with 5 minutes of pressure application increased the excitability of the central neurons regulating ipsilateral SCM activity.

![Figure 8](https://example.com/figure8.png)

**Figure 8.** Acupoint for pressured by Acupoint Stimulation Physical Therapy (ASPT) and the point for pressure to non-acupoint. We applied ASPT to either BL60 or KI3 to decrease muscle tonus of the hamstring. Next, we evaluated the effect of ASPT on two non-acupoints, one on the kidney meridian and the other not on any meridian.
The ROM of knee extension was significantly improved by ASPT on BL60, KI3 and the non-acupuncture point on the kidney meridian, with the first two being improved more than the last. Pressure on the fourth point did not affect the ROM of knee extension (Figures 9 and 10).

Figure 9. Changes in range of motion (ROM) of left knee extension before and after pressure. ROM of left knee extension was significantly improved by Acupoint Stimulation Physical Therapy (ASPT) on BL60, KI3, and the non-acupuncture point on the kidney meridian, with the first two being improved more than the last. Pressure on the fourth point did not effective ROM of knee extension.

Figure 10. Changes in range of motion (ROM) of right knee extension before and after pressure. ROM of right knee extension was significantly improved by Acupoint Stimulation Physical Therapy (ASPT) on BL60, KI3, and the non-acupuncture point on the kidney meridian, with the first two being improved more than the last. Pressure on the fourth point did not effective ROM of knee extension.

From our findings, it is suggested that stimulation of acupoints related to affected muscles by ASPT is very effective in improving the ROM of knee extension.

6. Summary

We introduced ASPT as a combination of physical and acupuncture therapy and demonstrated its effects by scientific research using EMG and clinical evaluation in patients with knee contracture. In the future, we would like to develop ASPT as a novel physical therapy for all patients with disorders of muscle tonus.

7. Declaration of Interest

The authors have no conflicts of interest to declare.

8. References