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RESEARCH ARTICLE

Effects of Trigger Point Acupuncture Treatment on Temporomandibular Disorders: A Preliminary Randomized Clinical Trial

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Abstract

We compared the effects of trigger point acupuncture with that of sham acupuncture treatments on pain and oral function in patients with temporomandibular disorders (TMDs). This 10-week study included 16 volunteers from an acupuncture school with complaints of chronic temporomandibular joint myofascial pain for at least 6 months. The participants were randomized to one of two groups, each receiving five acupuncture treatment sessions. The trigger point acupuncture group received treatment at trigger points for the same muscle, while the other acupuncture group received sham treatment on the trigger points. Outcome measures were pain intensity (visual analogue scale) and oral function (maximal mouth opening). After treatment, pain intensity was less in the trigger point acupuncture group than in the sham treatment group, but oral function remained unchanged in both groups. Pain intensity decreased significantly between pretreatment and 5 weeks after trigger point ($p < 0.001$) and sham acupuncture ($p < 0.050$). Group comparison using the area under the curve demonstrated a significant difference between groups ($p = 0.0152$). Compared with sham acupuncture therapy, trigger point acupuncture therapy may be more effective for chronic temporomandibular joint myofascial pain.

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1. Introduction

Myofascial pain is the most common temporomandibular disorder (TMD) [1]. This condition has also been called facial arthralgia, temporomandibular joint (TMJ) dysfunction syndrome, myofascial pain dysfunction syndrome, craniomandibular dysfunction, pain dysfunction syndrome, and myofascial pain dysfunction. The etiology of myofascial pain is multifactorial [2]. Consequently, many different therapies—some conservative, reversible, or irreversible—have been advocated for patients with myofascial pain. A number of successful treatments have been reported such as physiotherapy [3] and pharmacologic interventions [4].

TMD is basically treated using conservative approaches such as occlusal splints, occlusal adjustment, jaw exercise, and counselling, but other options have been used with good clinical results [5–7]. Acupuncture has been reported to have a beneficial role in the management of TMD [5,8–10]. Five randomized controlled trials found that the beneficial effects of acupuncture were similar to those of stabilization splint therapy in the management of TMD [11]. However, a systematic review found no trials with controls for the possible placebo effects of acupuncture, although studies suggest that acupuncture is effective in the treatment TMJ pain and dysfunction [11]. Therefore, due to lack of adequate controls for the placebo effect of acupuncture, the true efficacy of acupuncture has yet to be ascertained.

Our main aim in this study was to determine whether acupuncture at trigger points (compared with sham acupuncture treatment) is an effective treatment for chronic TMJ myofascial pain.

2. Methods

2.1. Patients

Students of an acupuncture school in Kyoto, Japan (Meiji University of Integrative Medicine), who had been clinically diagnosed as having TMD were recruited. Inclusion criteria were (a) orofacial pain lasting for 6 months or longer, (b) a Helkimo clinical dysfunction index of I or III, (c) no acupuncture in the previous 6 months, and (d) failure to respond to the medications prescribed by a specialist. Exclusion criteria were (a) major trauma or systemic disease, and (b) other conflicting or concurrent treatments. A total of 16 patients (five women, 11 men aged 19–24 years) who gave written informed consent were enrolled and randomly allocated to a trigger point acupuncture (TrP) group or sham (SH) group by use of a computerized randomization program. Ethical approval for this protocol was given by the ethics committee of Meiji University of Integrative Medicine.

2.2. Design

This clinical trial was a single-blinded, randomised, sham-controlled trial that used block randomisation to allocate patients to receive one of the two different acupuncture treatments. Each patient received a total of five treatments, one per week, each lasting 30 minutes, and follow-up

measurements were taken at 10 weeks after the first treatment.

2.3. Blinding

Patients were blinded to their treatment assignment. They were told before randomization that they would be allocated to one of two groups. The measurements were performed by an independent investigator who was not informed about the treatment sequence or the treatment the patient received before each measurement. Prior to treatment, the patients covered their eyes with an eye mask to ensure that they did not know which treatment they were receiving.

2.4. Treatment

2.4.1. TrP group

The TrP group received treatment at myofascial trigger points. The correct application of the technique requires experience in palpation and localization of taut muscle bands and myofascial trigger points. Precise needling of active myofascial trigger points provokes a brief contraction of muscle fibers. This local twitch response should be elicited for successful therapy, but it may be painful and post-treatment soreness is frequent [1,12]. In this study, the most important masticatory and cervical muscles were examined for myofascial trigger points (Table 1).

Disposable stainless steel needles (0.2 mm × 50 mm, Shizuoka-shi, Shizuoka, Japan, Seirin) were inserted into the skin over the trigger point to a depth of 5–15 mm, appropriate to the muscle targeted, and the ‘sparrow pecking’ technique was used to elicit a local muscle twitch response. After the local twitch response was elicited or a reasonable attempt made, the needle was retained for a further 15 minutes. The mean number of insertions was 4.2.

2.4.2. SH group

The SH group also received treatment at myofascial trigger points. The methods of choosing trigger points were the same. Similar stainless steel needles (0.2 mm × 50 mm, Shizuoka-shi, Shizuoka, Japan, Seirin) were used, but the tips were cut off to prevent the needle from penetrating the skin. The cut ends were manually smoothed with sand paper under clean conditions [13]. The acupuncturist

Table 1 Muscles treated in the two trigger point acupuncture groups.

Muscle	Trigger point group	Sham group
Temporalis	4	5
Masseter	7	8
Lateral pterygoid	7	8
Digastricus	2	2
Sternocleidomastoideus	4	4
Trapezius	5	4
Splenius capitis	1	3
Other	1	4

pretended to insert the needle and to use the 'sparrow pecking' technique, then removed the needles. A simulation of needle extraction was performed after 10 minutes by touching the patient and noisily dropping needles into a metal case. The mean number of insertions was 4.8.

The acupuncture was performed by an acupuncturist with 4 years of acupuncture training and 3 years of clinical experience.

2.5. Evaluation

Primary outcome measures were pain intensity during daily activities such as eating and talking, quantified on a 10-cm visual analogue scale [(VAS) 0–100 mm], and oral function assessed by measuring maximal mouth opening (MMO). The pain VAS score was assessed immediately before the first treatment and at 1, 2, 3, 4, 5, and 10 weeks after the first treatment. The MMO was measured before the first treatment and 5 and 10 weeks after the first treatment. The VAS and MMO measurements were completed by participants immediately before each treatment.

To examine the efficacy of the blinding technique used in the study, the participants were asked to select an answer to the question, "How did you feel when the acupuncture needle was inserted?" This question was asked at the end of the first phase. The available answers were: (1) "Needles were inserted into the muscle"; (2) "Needles did not penetrate the skin"; or (3) "I could not tell the difference."

2.6. Statistical analysis

The data are reported as mean \pm standard deviation (SD). Dunnett's multiple comparison test was applied to detect significant changes within each group. To compare the results of two groups, the area under the curve (AUC) of pain VAS was calculated from the summation of the time-response curves for individual patients. The AUC data (arbitrary units) for each group were used for group comparison by one-way analysis of variance followed by post-hoc multiple comparisons using the Bonferroni correction.

The assessment of the success of blinding was analyzed by the chi square test. SPSS (ver 11.0, SPSS Japan Inc., Shibuya, Tokyo, Japan) software for Windows or SYSTAT 11 (SYSTAT Software Inc., Washington, Chicago, USA) was used for the statistical analysis. A p value < 0.050 was defined as statistically significant.

3. Results

3.1. Patient characteristics

No between-group differences were found in age, pain duration, pain intensity (VAS), and drug use, all of which were measured at baseline (Table 2).

A flow chart describing patient progress through the trial is shown in Fig. 1. One patient in the TrP group dropped out due to adverse effects (worsening of symptoms). There was no between-group difference in drop-out rate ($p = 0.390$;

Table 2 Characteristics and baseline values of patients in the two groups.

	Trigger point acupuncture	Sham acupuncture
Sample size	7	8
Age (y)	21.7 \pm 2.1	21.4 \pm 1.4
Pain duration (y)	5.1 \pm 1.8	5.0 \pm 3.7
VAS (mm)	67.1 \pm 19.1	65.6 \pm 15.2
MMO	48.3 \pm 11.9	43.6 \pm 9.9
Drug user	0	0

MMO = maximal mouth opening; VAS = visual analogue scale.

Kruskal-Wallis test). The analyses were performed on the 15 patients who completed the study.

3.2. VAS score

Pain intensity decreased at Weeks 2–10 in the TrP group and Weeks 4–5 in the SH group when compared with pretreatment levels, respectively. These improvements persisted 5 weeks after the cessation of treatment in the TrP group. The mean VAS score decreased significantly in both groups ($p < 0.001$ in the TrP and $p < 0.050$ in the SH groups by repeated measures of analysis of variance). This is shown in Fig. 2.

The AUCs for pain intensity (VAS score) are shown in Fig. 3. The score was significantly lower in the TrP group than in the SH group ($p = 0.003$).

3.3. Functional impairment

The MMO measurements for all patients were almost in the normal range (men, 45–60 mm; women, 40–55 mm); therefore, they did not significantly increase in either group (Fig. 4).

The AUCs of the MMO score of the two groups are shown in Fig. 5. Although higher in the TrP group than the SH group, the MMO scores were not significantly different ($p = 0.236$).

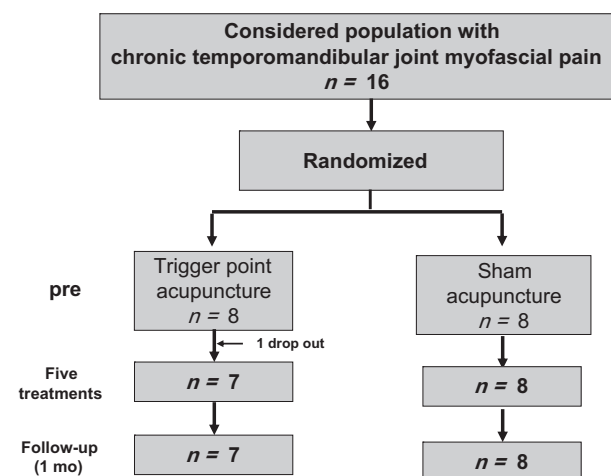


Figure 1 Participation flow in the study. One patient was excluded after she dropped out.

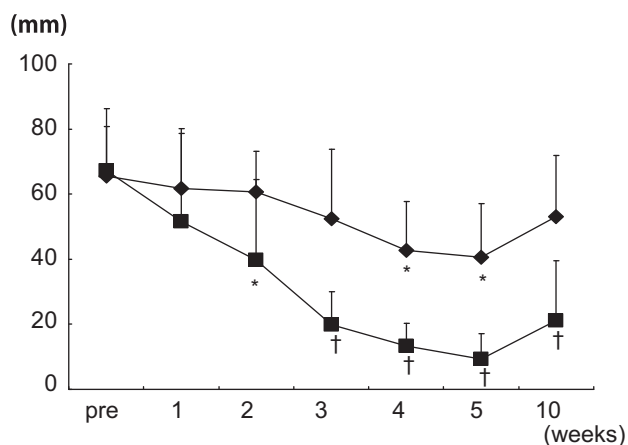


Figure 2 This shows the effect of acupuncture on VAS score for chronic temporomandibular joint myofascial pain. The pain intensity was lower at Weeks 2–10 in the trigger point acupuncture group and Weeks 4–5 in the sham group when compared with pretreatment scores. * $p < 0.05$. † $p < 0.01$. ■ = trigger point acupuncture group ($n = 7$); ◆ = sham acupuncture group ($n = 8$). VAS = visual analogue scale.

3.4. Assessment of the blinding technique

All patients regardless of treatment stated that they had received needle insertion to the muscle.

4. Discussion

In the present study, there was a statistically significant difference in pain relief between the TrP acupuncture and SH acupuncture treatments. The results suggest that trigger point acupuncture treatment may be more effective than sham acupuncture treatment for chronic TMJ myofascial pain.

TMD is a major medical and social problem that causes severe discomfort and reduced ability to eat. In many cases, pain is related to deformation of the TMJ and muscle

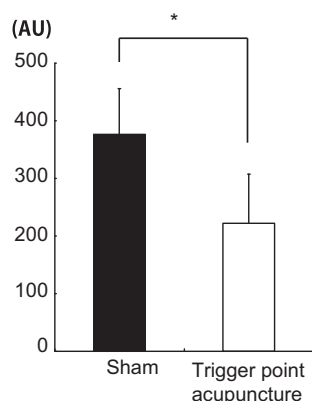


Figure 3 The columns indicate the AUC for changes in the pain VAS score in the two groups. During the observation period, improvement was greater in the trigger point acupuncture group than the sham group ($p = 0.003$). * $p < 0.01$. AUC = area under the curve; VAS = visual analogue scale.

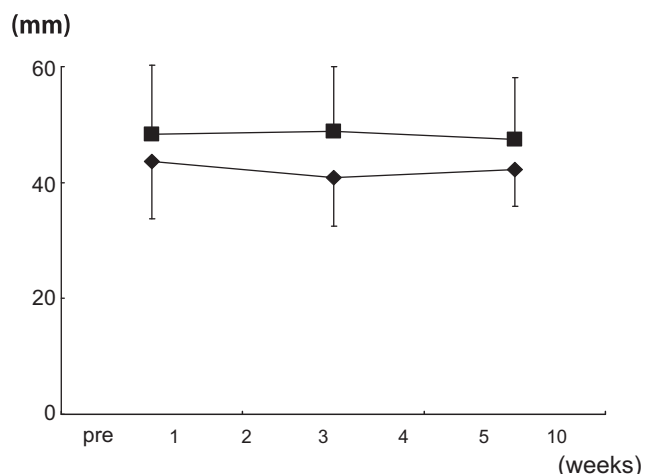


Figure 4 The effect of acupuncture on MMO score indicating oral function. The mean MMO score showed no significant increase both in the sham and in the trigger point acupuncture groups; $p > 0.05$. ■ = trigger point acupuncture group ($n = 7$); ◆ = sham acupuncture group ($n = 8$). MMO = maximal mouth opening.

tension around the joint [9–11]. A wide range of treatments are used, including drugs, physical therapies, and manual treatments [3,4]. Acupuncture treatment has been used for pain relief for a long time. Several studies have examined the efficacy of acupuncture treatment for such conditions [9–11]; however, due to confounding methodology and lack of adequate methods of acupuncture control, the true efficacy of acupuncture has yet to be ascertained [11]. Although a high-quality controlled trial has provided evidence for relief of TMJ pain [14], there remains a need for good quality placebo controlled trials in this area.

The importance of the sham-controlled randomized clinical trial to control for the strong placebo effects of acupuncture has been debated [13,15–17]. Nabeta and colleagues [13] reported that various control groups have

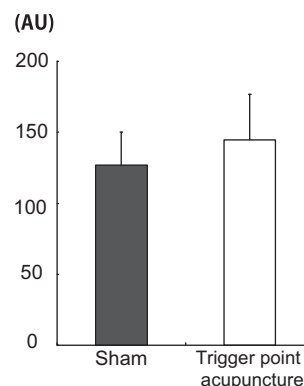


Figure 5 The columns indicate the AUC for changes in oral function in the two groups. The trigger point acupuncture group score was higher than the sham group score, but the difference was not statistically significant ($p = 0.236$). AUC = area under the curve.

been employed in acupuncture randomized controlled trials, such as no-treatment controls [18], mere pricking (without penetration) [19], minimum acupuncture (shallow and weak needling) [20], and mock transcutaneous electrical nerve stimulation [(TENS) without current pulse] [21,22]. However, in most previous studies, results were positive in studies that used a nonacupuncture control group [18,23] and negative in studies that used sham acupuncture or mock TENS as the control [24,25]. Therefore, the choice of control might have important consequences. The sham acupuncture technique used in this study was very simple. We used needles with blunt tips. The practitioner applied the same procedure for both the real and sham acupuncture treatments. Blinding in this study appears to have been successful.

Although one patient withdrew from the study, we considered that the influence of this withdrawal on the results would be small. In fact, if the data from the patient who withdrew because of deterioration of symptoms were included in the analysis, they would have reduced the overall effect in that group. This must be regarded as a limitation of the study. Another limitation to this study is its small sample size. Moreover, previous experience with acupuncture and confidence in acupuncture may influence the measurement of efficacy [13]. Therefore, another limitation of the present study is that the subjects were acupuncture school students, who had considerable knowledge of acupuncture and the special sensation of *deqi*, as well as those who had confidence in the efficacy of acupuncture.

4.1. Effectiveness of myofascial trigger points as sites of acupuncture treatment

The myofascial trigger points have often been used in the treatment of myofascial pain syndrome. The myofascial trigger point has been defined as a highly localized and hyperirritable spot in a palpable taut band of skeletal muscle fibers [1]. Important characteristics of myofascial trigger points include local pain or tenderness, referred pain or referred tenderness, and local twitch response [1,12]. Acupuncture or dry needling of a myofascial trigger point appears to provide immediate relief of pain related to that myofascial trigger point [26,27]. However, the effects of trigger point acupuncture on chronic TMJ myofascial pain are still unclear.

In this study, clinical results suggested that the analgesic effect of trigger point acupuncture is better than that of sham acupuncture. Myofascial active trigger points are supposed to be sites where nociceptors, such as polymodal-type receptors, have been sensitized by various factors [28,29]. In particular, sensitized nociceptors might be a possible cause of localized tenderness, referred pain, and local twitch response [30,31]. Moreover, the trigger point insertion of the needle (but not always acupuncture point insertion) affects sensitized nociceptors [31–33]. Thus, acupuncture stimulation of myofascial active trigger points may produce greater activation of sensitized polymodal-type receptors, resulting in greater pain relief.

Trigger point acupuncture provides significantly more relief on chronic low back pain and neck pain as compared

with standard acupuncture [26,34] but not of chronic knee pain [35]. These findings suggest that the myofascial pain near joints in contrast to other types of chronic pain may depend on different factors such as inflammation and joint pain. Therefore, the effects of standard acupuncture on chronic TMJ myofascial pain may be as effective as trigger point acupuncture. However, the limited sample size and poor quality of these studies highlights and supports the need for large scale, good quality, placebo-controlled trials in this area [36].

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