Acupuncture and Sham Acupuncture Reduce Muscle Pain in Myofascial Pain Patients

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Aims: *To compare the effectiveness of dry needling in classically recognized acupuncture points ("acupuncture") with dry needling in skin areas not recognized as acupuncture points ("sham acupuncture") in reducing masseter muscle pain in a group of patients with myofascial pain of the jaw muscles.* ***Methods:*** *Eighteen patients were randomly assigned to 1 of 2 experimental groups: Ten patients received acupuncture and 8 received sham acupuncture. A visual analog scale (VAS) was used to measure changes in masseter muscle pain evoked by mechanical stimulation of the masseter muscle before and after the experiment.* ***Results:*** *Both groups showed a statistically significant reduction in VAS pain scores (P = .001). Seven out of 10 acupuncture subjects had a 10 mm or greater VAS reduction in pain, while 4 out of 8 of the sham acupuncture subjects had that great a pain reduction. There was no significant difference between the 2 groups.* ***Conclusion:*** *Both acupuncture and sham acupuncture reduced pain evoked by mechanical stimulation of the masseter muscles in myofascial pain patients. However, this reduction in pain was not dependent on whether the needling was performed in standard acupuncture points or in other areas of the skin. These results suggest that pain reduction resulting from a noxious stimulus (ie, needling) may not be specific to the location of the stimulus as predicted by the classical acupuncture literature.*
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Key words: acupuncture, VAS pain rating, dry needling, myofascial pain, masseter muscle

Acupuncture has been used for the treatment of temporomandibular disorders, as well as for other musculoskeletal pains.[1–5] Molsberger and Hille[6] showed a statistically significant relief of chronic tennis elbow pain. List and Helkimo[7] used acupuncture to reduce chronic facial pain. Jensen and Jensen[8] found that in addition to decreasing the number of headaches, acupuncture significantly reduced urinary excretion of adrenaline and noradrenaline. In a meta-analysis of 14 randomized controlled trials of acupuncture for chronic pain, Patel et al[9] found most results favored acupuncture.

Acupuncture has also been shown to produce short-term analgesia. Lao et al showed that acupuncture increased the pain-free postoperative period after surgery for lower wisdom teeth.[10] Others, such as Chapman et al,[11] found that tooth pain threshold to electrical stimulation can be significantly raised by acupuncture.

The US National Institutes of Health (NIH), in its consensus statement on acupuncture of November of 1997, states that promising results have been shown for postoperative dental pain.[12] The NIH stated that in other situations such as myofascial

pain, acupuncture may be useful as an adjunct treatment or an acceptable alternative treatment.

Despite a number of positive findings in managing chronic pain by the use of acupuncture, very few studies have met the rigorous scientific methods that are today's standard.[13]

The purpose of the present study was to evaluate the efficacy of a standardized protocol of acupuncture in patients with myofascial pain of the jaw muscles. Subjects were randomly assigned to 1 of 2 groups: those receiving a standardized protocol of acupuncture applied at classically recognized acupuncture points, and those receiving a sham acupuncture treatment. We hypothesized that acupuncture would significantly reduce the pain induced by stimulation pressure of the masseter muscles compared to sham acupuncture.

Materials and Methods

Target Population

Eighteen subjects (15 females, 3 males; age range 22 to 52 years) were recruited from the University of California at San Francisco Center for Orofacial Pain. They all responded to advertisements placed on campus and on the Internet. They were given informed consent to procedures approved by the University's Committee on Human Research. They were all paid $50 for completing the study.

Inclusion Criteria

Subjects were screened to meet the following inclusion criteria:

1. Men or women age 18 and over who are seeking treatment
2. Chief complaint of frequent pain (at least 4 times/week) in the jaw muscles of at least 12 weeks' duration
3. Pain of jaw muscle origin, including a complaint of pain as well as pain associated with localized areas of tenderness to palpation in muscle

   (a) Report of pain or ache in the jaw, temples, face, preauricular area, or inside the ear at rest or during function

   (b) Pain reported by the subject in response to palpation of 3 or more of the following 20 muscle sites (right side and left side count as separate sites for each muscle): posterior temporalis, middle temporalis, anterior temporalis, origin of masseter, body of masseter, insertion of masseter, posterior mandibular region, submandibular region, lateral pterygoid area, and tendon of the temporalis. At least 1 of the sites must be on the same side as the complaint of pain.

These criteria are in accordance with Bell's[14] criteria, which are accepted by both the American Dental Association[15] and the American Academy of Craniomandibular Disorders (now called The American Academy of Orofacial Pain).[16] They also correspond to the recent category of myofascial pain within the Research Diagnostic Criteria for temporomandibular disorders.[17]

Exclusion Criteria

Subjects were excluded if they presented with 1 or more of the following conditions:

1. Clinical (eg, crepitation) and/or radiographic evidence of organic changes in the temporomandibular joints (eg, patients with signs and symptoms similar to the ones described for the categories "disc displacements" and "arthralgia, arthritis, arthrosis" in the Research Diagnostic Criteria for temporomandibular disorders[17])
2. Metabolic disease (eg, diabetes, hyperthyroidism)
3. Neurological disorders (eg, dyskinesia, trigeminal neuralgia)
4. Vascular disease (eg, migraine, hypertension)
5. Neoplasia
6. Patients who reported a history of psychiatric disorders, history of drug abuse, and/or recent facial or cervical trauma (eg, whiplash)
7. Patients currently receiving prescription medication or other treatments (eg, physical therapy) that cannot be stopped before and during the study
8. Patients who have been treated with acupuncture in the previous 3 months

Experimental Design

Randomization. A random table was generated and subjects were assigned to 1 of 2 groups: standard acupuncture treatment (n = 10) or sham treatment (n = 8).

Blinding. Subjects were blinded to group assignment. The experimenter who performed the algometer readings and collected the pain ratings on a visual analog scale (VAS; see below) was also blinded to the subject's group assignment.

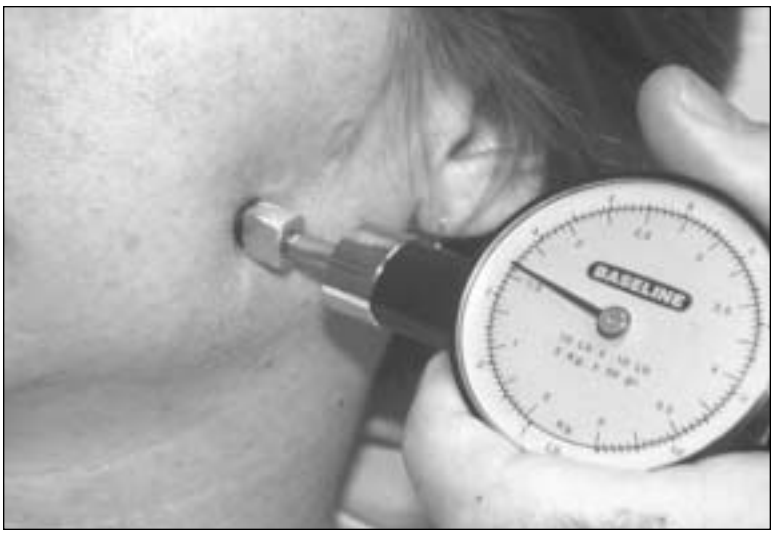

Fig 1 Pressure algometer recording made from the masseter muscle.

Interventions

The acupuncture group had 4 needles inserted to a depth of 10 to 30 mm at both right and left Hoku points (Large intestine 4) as well as at the right and left Stomach 6 points. The same certified dental acupuncturist inserted the needles until a "chi" reaction was reported by the acupuncturist. "Chi" reaction is typically a deep ache or electrical shooting pain. The needles were left in for 30 minutes, and twirled once for 5 seconds at the halfway point of the 30-minute period.

The sham acupuncture group had 4 needles inserted to a depth of 2 to 4 mm at 4 sham points: the right and left hand 1 cm distal of the Hoku point (and not on the acupuncture meridian), and 1 cm dorsal to the Stomach 6 point. Sham acupuncture points were used in a protocol similar to that described by Vincent.[18] For the sham condition the same certified dental acupuncturist inserted the needles, which were left in place for 30 minutes, and twirled once for only 5 seconds at the halfway point of the 30-minute period.

The needling experience for the sham acupuncture group was exactly the same as the acupuncture group, except the needles were in a nonacupuncture point and penetrated the skin only 2 to 4 mm. As noted above, both groups had 4 needles inserted, which were left in for 30 minutes, and were twirled for 5 seconds after 15 minutes.

Measures

Five minutes prior to the experiment, participants were instructed to use a 100-mm VAS to rate the pain evoked by a maximally tolerable mechanical stimulus. The subjects were instructed to raise their hand when the pressure caused "the most pain you can stand." The stimulus consisted of application of a pressure algometer tip to a known sensitive area of the masseter muscle (Fig 1). The point of application was marked with indelible ink. "Maximal tolerance" was determined by increasing the pressure until the subject's hand was raised. Upon completion of the acupuncture or sham procedure, an identical amount of pressure (as determined by the algometer) was applied to the same masseter location, and the subject again rated perceived pain intensity on a VAS. The average pressure that the subjects tolerated was 2.8 pounds. The change in pain was measured as the difference between the 2 VAS ratings for the identical mechanical stimuli.

This testing procedure was used in a pilot study of 18 nontreated, healthy participants to determine if the resulting VAS scores were valid and reliable. VAS ratings taken 30 minutes apart did not differ, indicating that this test procedure has test-retest reliability. Intraclass correlation coefficients (r) of the VAS pain scores among sessions were 0.81 for the right masseter and 0.84 for the left masseter muscle. In general, (r) values of 0.75 and above represent excellent reliability.[19]

Statistical Analysis

VAS data were analyzed with repeated measures ANOVA. There was 1 between subjects factor (group), with 2 levels (acupuncture and sham acupuncture), and 1 within subjects factor (time),

Table 1 Age and Gender Distribution

	Acupuncture		Sham acupuncture			
	Mean	SD	Mean	SD	*t* value	*P* value
Age (years)	35.49	10.63	34.53	6.78	0.222	.827
	N	%	N	%	chi-square	*P* value
Male (N)	2	20.0%	1	12.5%	0.180	.671
Female (N)	8	80.0%	7	87.5%		

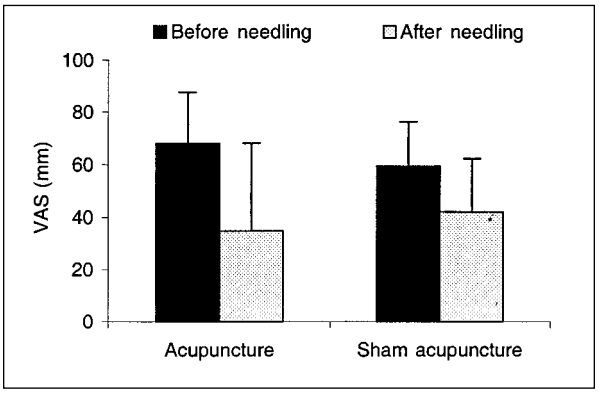

Fig 2 Visual Analog Scale (VAS) scores (mean and SD) for algometer pressure before and after accupuncture needling in each group.

with 2 levels (before needling and after needling). This design allowed for testing the main effect of group, the main effect of time, and the interaction of group by time.

Results

There was no significant group difference in age or gender (Table 1). The acupuncture group had a mean change in the VAS pain score (SD) of -30.20 (24.71) compared to the sham acupuncture group score of -17.25 (20.95). The repeated measures ANOVA of the VAS showed a nonsignificant main effect of the group [F (1,16) = 0.03, P = .865]. Both groups had a statistically significant decrease in pain perception from the same amount of pressure applied at both time points before and after needling [F(1,16) = 18.689, P = .001].The decrease in pain after needling was not significantly different between the 2 groups [F(1,16) = 1.392, P = .255] (Fig 2).

Table 2 shows the change in perception of pain after needling in each to group.

Discussion

Unexpectedly, the sham acupuncture group had a statistically significant decrease in pain to pressure not unlike the acupuncture group. There was no placebo control group in our study; therefore, the effect of placebo was not measured. There is some evidence that any noxious stimulation can cause a significant analgesic effect. In studies conducted on experimental animals, noxious stimulation has been effective in triggering inhibitory influences within the brain; this phenomenon has been labeled diffuse noxious inhibitory controls (DNIC).[20–23] A common feature to all these studies has been the inhibition of nociception at the level of the spinal cord dorsal horn and trigeminal nuclei. Superspinal structures, particularly in the brain stem, have been implicated in these endogenous nociceptive systems.

Gear et al[24] showed that injecting capsaicin into the paw of rats gave an analgesic response equal to a moderate dose of morphine. Godfrey and Morgan[25] showed that 60% of musculoskeletal pain patients had reduced pain, whether or not theoretically correct acupuncture points or nontheoretically correct points were used. In a more recent study, Bing et al[22] compared the effect on

Table 2 Percentage of Decreased Pain Before and After Needling

Case No.	Pre-needling VAS (mm)	Post-needling VAS (mm)	% of decreased pain	Case No.	Pre-needling VAS (mm)	Post-needling VAS (mm)	% of decreased pain
A1	72	33	54.2	SA1	78	62	20.5
A2	93	92	1.1	SA2	60	36	40.0
A3	84	30	64.3	SA3	67	63	6.0
A4	86	77	10.5	SA4	47	43	8.5
A5	65	33	49.2	SA5	63	65	–3.2
A6	62	2	96.8	SA6	33	35	–6.1
A7	42	28	33.3	SA7	53	15	71.7
A8	73	3	95.9	SA8	75	19	74.7
A9	63	59	6.4				
A10	35	16	54.3				

convergent nociceptive neurons in the trigeminal nucleus caudalis of acupuncture performed at the Zusanli point and at a nonacupuncture point as well as noxious thermal stimulation. The 3 different stimulations produced similar strong inhibitory effects on the C-fiber evoked responses of the trigeminal convergent neurons, and these inhibitions were significantly reduced by systemic administration of naloxone. The authors concluded that some effects of acupuncture are sustained at least in part by DNIC and involve endogenous opioids. Conversely, in a follow-up study, Bing et al[23] recorded activities of subnucleus reticularis dorsalis neurons in rats and monitored the effect of acupuncture performed at different classical Chinese locations, including Zusanli, as well as at a nonacupuncture point adjacent to Zusanli. They found that the majority of neurons responded to stimulation of all acupuncture points and nonacupuncture points, particularly when the stimulation was applied to the contralateral or midline part of the body.

Furthermore, long before the introduction of acupuncture into the United States, Travell and Simons[26] recognized that referred pain may be relieved by stimulation of trigger points. Dry needling, placing needles into trigger points of the involved sore muscle, has been shown to be effective. Dry needling is very similar to inserting acupuncture needles in both acupuncture points and nonacupuncture points. Lewit[27] found that good relief was obtained from dry needling patients with chronic myofascial pain.

In our study, there was no significant difference in the decrease in pain between the 2 groups. Our hypothesis that acupuncture would significantly reduce the pain compared to sham acupuncture was not supported. There was only a tendency in the acupuncture group responding more favorably than in the sham group. Seven out of 10 acupuncture subjects had a 10 mm or greater VAS reduction in pain, while only 4 out of 8 of the sham subjects had that great a pain reduction (Table 2). Our results compare with other studies that have shown that acupuncture produces short-term analgesia.[10,11]

The pain reduction in this study was not dependent on whether the acupuncture was performed in standard acupuncture points, or in other areas of the skin. These results suggest, in agreement with other studies,[20–22] that pain reduction from a noxious stimulus (ie, needling) may not be specific to the location of the stimulus as predicted by the classical acupuncture literature.

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