

# Acupuncture as a Treatment for Temporomandibular Joint Dysfunction

## A Systematic Review of Randomized Trials

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**Objective:** To summarize the data from randomized controlled trials of acupuncture for temporomandibular joint dysfunction.

**Methods:** Four independent computerized literature searches were performed. Only randomized trials were admitted in which acupuncture was tested vs sham acupuncture, standard therapy, or no treatment at all. Data were extracted in a predefined, standardized fashion.

**Results:** Six reports met the inclusion and exclusion criteria, representing 3 distinct trials. Overall, their

results suggest that acupuncture might be an effective therapy for temporomandibular joint dysfunction. However, none of the studies was designed to control for a placebo effect.

**Conclusion:** Even though all studies are in accordance with the notion that acupuncture is effective for temporomandibular joint dysfunction, this hypothesis requires confirmation through more rigorous investigations.

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**T**EMPOROMANDIBULAR joint dysfunction (TMJD) is a condition with a complex, multifactorial cause that is not fully understood at present. Occlusal interference, systemic musculoskeletal disorders, myofascial pain and dysfunction, emotional disturbances, and general ill health all seem to play a role.<sup>1-3</sup> Many forms of treatment have been tried, none with fully convincing results.<sup>2,4-7</sup>

Acupuncture is a treatment modality that, in the West, is often used to alleviate pain.<sup>8</sup> Preliminary, uncontrolled, or inadequately controlled studies suggested that acupuncture might play a role in the treatment of TMJD.<sup>9-11</sup> This systematic review is aimed at summarizing the data from randomized clinical trials.

### RESULTS

Six reports, pertaining to 3 trials, met the above inclusion criteria.<sup>12-17</sup> One trial was reported twice, the second report presenting further analysis of the same outcome measures<sup>16,17</sup>; the second report was excluded from the review. Another trial was reported 3 times<sup>12-14</sup> (see above).

### OVERALL DESCRIPTION OF STUDIES

The key data of the included studies are summarized in the Table. In all studies, subjects were referred by their general dental surgeon or family physician to hospital departments of stomatognathic physiology in Scandinavia for treatment of TMJD or craniomandibular disorder. In 2 studies<sup>12,15</sup> subjects were selected for presence of muscle tenderness and absence of extreme malocclusion or abnormality of the TMJ. In the remaining study,<sup>16</sup> consecutive patients referred for treatment of TMJD were included. Details of randomization were insufficient to determine whether an appropriate method was used and whether allocation was concealed at the time of determining a subject's inclusion in the study. Both subjective and objective end points were used in all studies, the latter being the clinical dysfunction index in all cases.<sup>18</sup> No study was subject blind, and clinicians assessing the dysfunction index were not reported to be masked to subjects' allocation. Withdrawals and dropouts were reported in detail in 1 study.<sup>12</sup> In 1 study, individual data are presented and indicate that no subjects dropped

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**METHODS**

The following electronic databases were searched from their respective inception through 1997: MEDLINE, Cochrane Library, EMBASE, and CISCOM. The search terms used were acupuncture, dental pain, and temporomandibular joint (TMJ). In addition, our own extensive database on acupuncture was searched and several other experts in this field were asked to contribute further references. The bibliographies of all articles thus located were searched for further relevant articles.

Clinical trials were included if they were randomized and dealt with TMJD in humans. The control intervention had to be sham acupuncture, standard treatment, or no treatment at all. There were no restrictions as to the language of publication. All articles were read in full by both of us. Disagreements were settled through discussions. Data were extracted in a standardized, predefined fashion (**Table**). One trial was reported 3 times,<sup>12-14</sup> each report concerning a different end point or measurement point. Since different groups were analyzed, the 3 reports were presented separately in this review for convenience only, but the results were considered as 1 study.

out.<sup>15</sup> In the third study, no information on dropouts is available.<sup>16</sup> No study commented on adverse effects of treatment. In all studies, acupuncture was given to sites chosen according to the patient's symptoms with the use of local points and points in the limbs. Acupuncture needles were stimulated manually, but in 1 study, additional electrical stimulation at 2 Hz was given to 2 needles from the third treatment onward, producing local muscle contraction.<sup>12</sup>

Raustia and colleagues<sup>16</sup> compared acupuncture with standard stomatognathic treatment, including any combination of counseling, occlusal adjustment, muscle exercises, and occlusal splints. The subjects' mean ages were 27.8 years in the first group and 26.4 years in the second group. Seventy-eight percent were female. The 2 treatment modalities had a similar marked effect on the dysfunction index: stomatognathic treatment was significantly better 1 week after treatment ( $P = .04$ ) but not at 3 months' follow-up ( $P = .12$ ). There was also a significant difference between the effects on mouth opening ( $P = .05$ ), with acupuncture proving superior with low initial opening values, and standard therapy superior at high initial values. There was no difference between the subjective patient estimates of the results of the 2 treatments.

The same workers presented individual dysfunction index scores for individual subjects, analyzing the components of the index (such as muscle pain and TMJ pain) for subgroups with high and low initial scores.<sup>17</sup> There were no clear differences between the 2 treatments for any component.

Johansson and colleagues<sup>15</sup> compared acupuncture to 3 to 7 local points and 1 distant point (LI 4) with maxillary full-coverage occlusal splints made of acrylic resins and an untreated control group. Patients who had previously experienced either acupuncture or occlusal splints were excluded. The age and sex distribution of the subjects was not stated. Ninety percent of the acupuncture group and 86% of those who received occlusal therapy improved, and both the subjective symptom scores and objective clinical examination scores were significantly better for both treatment groups compared with the untreated controls ( $P < .01$ ), with no significant difference between the 2 active groups.

List and colleagues<sup>12</sup> described the short-term results of a large trial involving 110 subjects selected by

**Randomized Controlled Trials of Acupuncture for Temporomandibular Joint Dysfunction: Description and Results of Studies**

Source, y	Indication	Main Exclusion Criteria	Design	Sample Size	Interventions (No. of Sessions)
Raustia et al, <sup>16,17</sup> 1985, 1986	Temporomandibular joint dysfunction	Incomplete dentition	2 parallel groups	50	A. Acup* (3) B. Standard stomatognathic treatments
Johansson et al, <sup>15</sup> 1991	Craniomandibular disorders	Absence of muscle tenderness, incomplete dentition	2 parallel groups	45	A. Acup (6) B. Occlusal splints (2) C. No treatment
List et al, <sup>12</sup> 1992	Craniomandibular disorders >6 mo	Removable complete dentures, extreme malocclusion	3 parallel groups	110	A. Acup (6-8) B. Occlusal splints C. Untreated, 3-mo waiting list
List and Helkimo, <sup>13</sup> 1992	Craniomandibular disorders >6 mo	Removable complete dentures, extreme malocclusion	2 parallel groups	80	A. Acup (6-8) B. Occlusal splints
List et al, <sup>14</sup> 1993	Craniomandibular disorders >6 mo	Removable complete dentures, extreme malocclusion	3 parallel groups (2 groups at 6 mo)	55	A. Acup (6-8) B. Occlusal splints C. Untreated, 3-mo waiting list

\*Acup indicates traditional needle acupuncture.

applying inclusion and exclusion criteria to the department's waiting list of 950 patients. Patients were not excluded for previous occlusal splint or acupuncture therapy. Twenty-three were male and 87 female, with median ages of 39 and 45 years, respectively. Median duration of pain was 4 years. Occlusal splints were full-coverage hard acrylic resin appliances constructed to fit the maxillary arch. Only in 3 patients with loss of molar support in the mandible was the splint applied there instead. A battery of 7 outcome measures was used: anamnestic index, subjective evaluation, activities of daily living, pain visual analog scale, pain frequency, use of medication, and clinical dysfunction index. Results were presented for 96 patients, although it was stated that there were no dropouts. Acupuncture was significantly superior ( $P < .05$ ) to occlusal therapy and waiting list in anamnestic index, subjective evaluation, and activities of daily living. Acupuncture and occlusal therapy were significantly superior to the waiting list control in pain visual analog scale ( $P < .01$ ) and clinical dysfunction index ( $P < .05$ ). There was a statistically significant reduction in pain frequency in the acupuncture group only ( $P < .01$ ); there were no significant changes in medication in any group.

The results in the 2 treatment groups of the above study after 6 months and 1 year were presented separately by the same authors.<sup>13</sup> Overall, 21 (53%) of patients in the acupuncture group and 25 (63%) of those treated with occlusal splints remained improved on subjective evaluation at 12 months without additional treatment. (These percentages have been recalculated from the data by means of an intention-to-treat analysis.) Patients whose condition had not improved were offered the alternative treatment or another therapy; they are not considered further here. Of the 40 subjects who initially received acupuncture, 22 were studied; of the 40 who initially received occlusal splints, 25 were studied. Long-term improvements were noted in both groups assessed by anamnestic index and activities of daily living at the significance level of  $P < .01$ .

Pain visual analog scale, pain frequency, and clinical dysfunction index improved at the significance level of  $P < .001$ . Changes in medication were not reported. There were no significant differences between the groups for any end point.

In the third article from this group, pressure pain threshold of the masseter muscle on each side was measured with a pressure algometer applied to the muscle bellies.<sup>14</sup> It is not clear how the subgroup of 55 patients was selected from the total 110 subjects. There were significant increases in the threshold immediately after treatment, which were significantly different from the changes in the untreated control group ( $P < .05$ ). There were further small increases in the thresholds after 6 months that were not significant.

## REVIEW OF RESULTS

Without exception, the results of the 3 studies suggest that acupuncture is effective. The benefit of acupuncture seems to be comparable with that of combinations of standard therapy or occlusal splint therapy alone. Both pain and joint function (these variables are obviously interrelated) seem to respond. According to these data, the effect seems to be sustained and noticeable even 1 year after therapy.<sup>13</sup> No trials were found that controlled for possible placebo effects of acupuncture.

## COMMENT

The overall message that seems to emerge from these data favors acupuncture as a symptomatic treatment of TMJD. However, these results should be interpreted with caution. None of the trials was performed with blinded evaluators, details of randomization are not given, and therefore all studies are subject to important bias. It is notable that all studies come from Scandinavia. To increase the reliability, one would therefore wish to see further confirmatory studies from other areas.

Main End Points	Follow-up	Main Result
Subjective evaluation + dysfunction index	1 wk, 3 mo	Marked improvement in both groups; subjective evaluation: no difference between groups; index: B significantly better than A 1 wk after treatment ( $P = .04$ ); no difference at 3 mo ( $P = .12$ )
Symptom score + dysfunction index	2 mo	Symptom score: A and B significantly better than C ( $P < .01$ ); no differences between A and B; index: A and B better than C ( $P < .01$ )
Subjective evaluation + dysfunction index	A and B: last treatment session; C: 3 mo	Subjective evaluation: A better than B and C ( $P < .001$ ); index: A and B better than C ( $P < .05$ )
Subjective evaluation + dysfunction index	6 mo and 1 y	Subjective evaluation: A, 53% and B, 68% benefited ( $P < .001$ ); index: both groups better ( $P < .001$ ); no differences between groups
Tenderness threshold of masseter muscle (algometer)	A and B: last treatment session and 6 mo; C: 3 mo	A and B significantly greater rise in threshold than C ( $P < .05$ ); effect was maintained at 6-mo follow-up

More important, none of the studies was designed in a way that a placebo effect of acupuncture can be excluded as the underlying mechanism of action. Acupuncture is most certainly associated with a powerful placebo effect.<sup>19</sup> This could be because it is invasive, often slightly painful, exotic, and time consuming. One way to account for this is to introduce a control group treated with sham acupuncture: typically needles placed superficially at nonacupuncture points.<sup>20</sup> This procedure is usually indistinguishable from real acupuncture. Thus, patients can be blinded and their expectation of the treatment accounted for. It is difficult to understand why such a trial, which is ethically more justifiable than one with no-treatment controls,<sup>17,18</sup> has not yet been performed. We suggest that a trial with such a design be a precondition for a valid assessment of acupuncture for TMJD.

If one accepts that acupuncture is an effective treatment of TMJD, one might ask by what mechanism this is achieved. Possible mechanisms of short-term pain relief include descending inhibitory control involving the release of endogenous opioids centrally together with norepinephrine and serotonin in the dorsal horn of the spinal cord.<sup>21</sup> Sustained relief may involve different mechanisms, such as increased blood supply through local secretion of calcitonin gene-related peptide.<sup>22</sup> Improved blood flow may aid the recovery of dysfunctional muscles, as signified by their reduced tenderness.<sup>14</sup>

In conclusion, the trial data available suggest that acupuncture is a useful symptomatic treatment of TMJD. Whether acupuncture has any specific effects or acts through nonspecific effects should be investigated with rigorously sham-controlled and blinded trials.

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