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Original Article

Acupuncture for Temporomandibular Joint Muscular Disorder: A Prospective Clinical Assessment of Its Therapeutic Effectiveness

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ABSTRACT

This clinical study aimed to evaluate the effect of acupuncture therapy on pain associated with TMJ muscular disorder. A total of 15 participants, aged between 14 and 50 years, who experienced pain around the TMJ without any radiographic abnormalities, were included. The selected acupoints—Ting Hui, Ting Gong, Ermen, Fengchi, Baihui, and He Gu—were targeted using sterile 32-gauge, ½-inch stainless steel needles, which were manually inserted to depths ranging from 3 to 7 millimeters. The needles were stimulated with alternating clockwise and counterclockwise rotations for 30 seconds at 10-minute intervals during three treatment sessions before being removed. The therapy was performed once a week for six months. Pain intensity was measured using the visual analog scale, and statistical analysis was performed using repeated ANOVA and post hoc tests (Bonferroni). The findings showed a reduction in pain scores by 2 units after three months and 4.13 units following 6 months of acupuncture treatment. At the end of the treatment period, TMJ muscular pain had significantly decreased, and mouth opening had improved to near-normal levels.

Keywords: Acupoints, Acupuncture, Orofacial pain, Temporomandibular joint disorder, Masticatory muscles, Splint therapy

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Introduction

Temporomandibular joint disorders (TMD) are among the most frequent complaints reported by patients to general dental practitioners. The pain associated with TMD is often non-odontogenic in origin and can radiate to the masticatory muscles, periauricular region, teeth, head, and ears. Additionally, some patients experience otologic symptoms for example vertigo, tinnitus, and ear fullness [1, 2].

Epidemiological data indicate that TMD predominantly affects women around the age of 30 years and impacts approximately 10% of the population [1, 2]. Several factors contribute to the development of TMD, including psychological stress, occlusal discrepancies, trauma, orthodontic procedures, joint laxity, systemic health conditions, malnutrition, and exposure to exogenous estrogen [3-5].

TMD is classified into two primary categories: intraarticular and extraarticular, with musculoskeletal conditions being the leading cause, accounting for at least 50% of cases [6-8]. Various treatment modalities are available for managing masticatory muscle pain, including therapeutic exercises, splint therapy, drug therapy, surgical intervention, injection therapy, and acupuncture [9].

Acupuncture has been recognized as an adjunct therapy for local anesthesia and is commonly recommended for conditions such as TMJ clicking and locking, Vitamin B12 deficiency, orofacial pain, dental anxiety, trigeminal neuralgia, xerostomia and gag reflex [10]. This treatment involves stimulating specific acupoints

using fine needles, alongside other techniques such as heat application, suction cups, and electrical stimulation [11].

Acupoints are distributed across the skin's surface, with historical observations suggesting that certain health conditions could be alleviated when specific points were accidentally injured or exposed to heat. In cases of internal organ diseases, disturbances in qi travel along the corresponding meridians, manifesting as soreness at related acupoints. These acupoints not only serve as diagnostic indicators but also as pathways for external elements to enter the body [12].

Given these principles, this study aimed to evaluate the effectiveness of acupuncture in reducing muscular pain associated with TMD over a treatment period of three and six months. The hypothesis proposed that acupuncture therapy would lead to a significant reduction in TMD-related muscular pain.

Materials and Methods

Our study was conducted on individuals seeking treatment at the outpatient unit of the Department of Prosthodontics, Tamil Nadu Government Dental College, Chennai, for persistent bilateral TMJ pain lasting three months.

Participant selection

Inclusion criteria

Patients eligible for participation ranged in age from 14 to 50 years and had experienced TMJ discomfort for a minimum duration of three months. Symptoms such as restricted or deviated mouth opening and clicking sounds were considered. Only individuals with stable vital signs and no signs of neurological impairment were included.

Exclusion criteria

Exclusion was applied to individuals with conditions such as neurological disorders, psychiatric illnesses, or reliance on insulin therapy. Other disqualifying factors included excessive dental wear, Bechet's disease-related oral ulcers, and TMJ deformities [13], a history of TMJ or orthognathic surgery, radiological evidence of TMJ osteoarthrosis, malignancies, condylar resorption, or fractures. Patients who were pregnant, lactating, or using corticosteroids, narcotics, nonsteroidal anti-inflammatory drugs, herbal medications, or muscle relaxants were also excluded from the study.

Study procedure

Before commencing treatment, patients underwent a comprehensive medical history review and clinical assessment. Written informed consent was obtained from each participant, ensuring they had ample time to evaluate their involvement. Institutional ethical clearance was granted before initiating the study (TNDrMGRMU/TNGDCH/2002/PG/001). The study included 15 participants (8 males and 7 females) presenting with TMJ-related discomfort without radiographic anomalies. Acupuncture treatment was administered by a qualified dental practitioner trained in acupuncture techniques.

The following acupoints were selected for the procedure: Ting Hui (GB2), situated in front of the ear at the posterior margin of the mandibular condylar process near the inter-tragic notch; Ting Gong (SI 19), positioned in the depression anterior to the tragus and behind the condylar process, which becomes prominent when the mouth is opened; and Er Men (TW 21), also located in the preauricular region **(Figure 1)**. Additionally, the study incorporated Fengchi (GB 20), found in the depression at the base of the skull where the sternocleidomastoid and trapezius muscles attach near the mastoid process; Baihui (DU 20), positioned at the top of the head along the midline, approximately 5 cm behind the anterior hairline **(Figure 2)**; and He Gu (LI4), located on the dorsal aspect of the hand, between the thumb and index finger at the midpoint of the second metacarpal bone **(Figure 3)**.

Figure 1. Acupoints GB2,SI 19,TW21

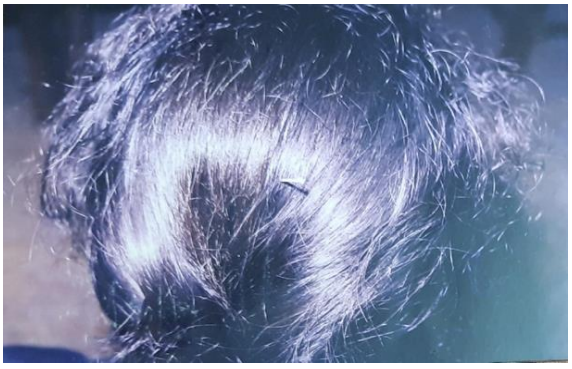

Figure 2. Acupoint DU 20 Baihui

Figure 3. Acupoint LI4

A sterile 32 gauge stainless steel needle, measuring ½ inch in length, was carefully inserted into the selected acupoints to a depth of three to seven millimeters. The needles were manually stimulated by alternating clockwise and counterclockwise rotations for 30 seconds. They remained in place for 30 minutes before being removed. This procedure was performed once per week for a continuous period of six months.

Pain levels were evaluated at baseline, after three months, and again at the end of six months using the visual analog scale (VAS). The scale ranged from 0, indicating no pain, 1 to 3 for mild pain, 4 to 6 for moderate pain, 7 to 9 for severe pain, and 10 for the worst possible ache.

Statistical analysis

The collected pain scores were analyzed statistically using repeated ANOVA with SPSS Statistics version 23 (IBM, Armonk, New York, United States). The comparison of pain scores at three and six months of acupuncture treatment was performed using the Chi-Square test, while multiple group comparisons were conducted through the Post hoc test (Bonferroni).

Results and Discussion

A total of fifteen patients participated in this study, comprising 8 males (53.3%) and 7 females (46.7%). Pain scores were recorded before treatment and again at three and six months following acupuncture therapy to assess changes over time. The accuracy of these measurements was verified, and a comparison was conducted between pre and post-treatment pain scores. Mauchly's test of sphericity yielded statistically significant results **(Table 1)**. Since the assumption of sphericity was not met, and the epsilon value exceeded 0.75, the Huynh-Feldt correction was applied **(Table 2)**. Statistical analysis revealed a significant reduction in pain scores after three and six months of acupuncture treatment, with a P-value of less than 0.05.

Further analysis using the Post hoc test (Bonferroni) demonstrated a progressive decline in pain intensity at each treatment stage. Specifically, pain scores showed a reduction of 2 units after three months of treatment and a further decrease of approximately 4.13 units by the six-month mark, confirming statistical significance **(Table 3)**.

Table 1. Mauchly's test for sphericity

Within-subject factor	Mauchly's W	Approx. chi-square	df	Significance (sig.)	Epsilon (Huynh-Feldt)
Pain	0.622	6.173	2	0.046	0.788

Table 2. Huynh-Feldt correction using repeated measures ANOVA

Source	Type III sum of squares	df	Mean square	F-value	Significance (sig.)
Pain	128.178	1.576	81.356	399.762	0.000

Table 3. Post Hoc (Bonferroni) test for multiple pairwise comparisons

Comparison (I)	Comparison (J)	Mean difference (I-J)	Standard error	Significance (sig.)	95% confidence interval
Before treatment	After 3 months of treatment	2.000*	0.169	0.000	1.541–2.459
Before treatment	After 6 months of treatment	4.133*	0.091	0.000	3.886–4.380
After 3 months of treatment	After 6 months of treatment	2.133*	0.165	0.000	1.684–2.582

Temporomandibular disorders (TMD) are often characterized by pain localized in the masseter muscle, preauricular region, or temporal region, especially during activities such as chewing, as well as opening and closing the mouth. Diagnosis is established based on patient history, clinical evaluation, and radiographic findings. While sounds like crepitus and clicking are frequently associated with TMD, they are also observed in about 50% of individuals without symptoms [14].

A review of existing literature highlights that the most prevalent clinical symptoms include facial pain (96%), ear discomfort (82%), headaches (79%), and jaw pain (75%) [15]. Additional symptoms reported in some cases include pain in the eyes, neck, arms, and back, and instances of dizziness. Chronic TMD is generally diagnosed when these symptoms persist for more than three months [16].

In this study, patients diagnosed with muscular TMD, a recognized indication for acupuncture treatment, were selected [17]. Acupuncture, a widely practiced therapeutic method in China, involves the insertion of fine needles into specific acupoints. This process stimulates small myelinated nerve fibers within muscles, triggering neural signals that travel to the spinal cord, midbrain, and pituitary-hypothalamic system. Research indicates that this stimulation leads to the release of endogenous substances such as beta-endorphins, noradrenaline, enkephalins, and serotonin, which play a role in pain modulation [18].

Trigger points located in contracted muscle bands or fascia contribute to referred pain, tenderness, motor dysfunction, and autonomic symptoms. These points develop at the neuromuscular junction of injured muscles, where excess acetylcholine is released from presynaptic nerve terminals, leading to damage at the postsynaptic sarcolemma receptors. This heightened neural activity results in a sustained calcium release from the sarcoplasmic reticulum, causing prolonged muscle fiber contraction [19].

The Visual Analog Scale (VAS), a widely recognized pain assessment tool introduced by Bond and Pilowsky, is commonly used to quantify pain levels [20]. Prior research has demonstrated that individuals undergoing acupuncture treatment experience a huge reduction in facial and neck pain [21]. In a study stimulation at acupoint ST7 was found to improve pain intensity, and jaw mobility, and reduce tenderness in the lateral pterygoid muscle [22].

The reduction in pain intensity was observed to be fivefold, accompanied by an increase in mouth opening from 36.95 mm to 42.35 mm following acupuncture therapy [23]. When comparing acupuncture treatment with occlusal splint therapy for temporomandibular disorders (TMD), the former demonstrated superior results in improving mouth opening among female patients. This effect is attributed to the ability of acupoint stimulation to relax the masticatory muscles [24, 25]. Additionally, both acupuncture and splint therapy were found to alleviate pain severity, but acupuncture provided better subjective outcomes compared to splint therapy alone [26].

The findings of this study revealed that before treatment, a pain score of 8 was recorded nine times. After three months of acupuncture therapy, a pain score of six was noted 15 times, and after six months, a pain score of four was observed nine times. This pattern indicates a progressive reduction in pain intensity following acupuncture treatment. Bonferroni corrections were applied to intra-group comparisons, yielding a significance value of $P < 0.05$. This confirms statistical significance and aligns with the findings of previous studies, thereby supporting the hypothesis in this research.

Acupuncture appears to be a viable different way to conventional treatment approaches. However, it might not be effective in addressing structural causes of TMD, such as degenerative changes and disc displacement. Its primary benefit lies in alleviating pain and discomfort associated with muscular TMJ disorders. Acupuncture has also been found to promote muscle relaxation and relieve spasms [27].

This study has certain limitations, including a small sample size and the absence of a control group to evaluate long-term treatment effects. Given the variability in patient responses to acupuncture, determining the exact number of sessions required for complete recovery remains challenging. Future research should focus on randomized controlled studies with larger sample sizes to better assess the long-term efficacy of acupuncture therapy.

Clinical application

Due to its affordability and non-invasive nature, acupuncture therapy can be suggested for public healthcare services to manage muscular TMJ pain in patients without radiological changes in the TMJ and with symptoms persisting for less than three months.

Conclusion

Acupuncture therapy has been shown to significantly alleviate pain associated with muscular TMJ disorders, as supported by statistical analysis. Clinically, it has demonstrated a gradual reduction in symptoms, proving to be an effective approach for managing pain intensity. Additionally, acupuncture is a safe procedure with minimal risks. Therefore, it can be considered a viable alternative to conventional treatment methods for addressing muscular TMD and facial pain.

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