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Comparison of three treatment options for painful temporomandibular joint clicking

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Abstract: A randomized clinical trial was performed to evaluate the efficacy of three treatment options, including anterior positioning splint therapy, physical therapy, and physical therapy in addition to splint therapy, in terms of treatment outcome, in patients with painful temporomandibular joint clicking. Sixty patients suffering from acute pain and dysfunction were divided randomly into three treatment groups. Twenty patients underwent anterior positioning splint therapy (group I), 20 patients received solely physical therapy (group II), and 20 subjects received physical treatment in addition to splinting (group III). All patients were examined before and after the treatment using a visual analogue scale (VAS) and digital palpation of joint sounds. The data were analyzed using the Kruskal-Wallis, one-way ANOVA and Tukey tests at a significance level of $P < 0.05$. In comparison with the baseline, subjective pain was decreased significantly ($P < 0.05$) in all three groups. A significant difference was observed between groups I and II ($P < 0.05$), whereas no significant difference was detected between groups II and III. Six patients in group III did not continue the treatment after physical therapy. The numbers of pain-free patients were 12 in group I, 5 in group II and 9 in group III. We observed a reduction in the frequency of joint sounds across the entire sample ($P < 0.05$). Anterior positioning splint therapy appears to be the best treatment method for reduction of pain and joint sounds in patients with TMD, compared with the other two methods studied. (J Oral Sci 53, 349-354, 2011)

Keywords: temporomandibular disorders; physical therapy; anterior positioning splint; pain; clicking.

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Introduction

The signs and symptoms of temporomandibular disorders (TMDs) involve the masticatory muscles, temporomandibular joint (TMJ), or both. Patients suffering from TMD frequently have pain on palpation in the region of the TMJ and the masticatory muscles. Joint sounds such as clicking or crepitus, and restricted jaw motion, are also present. The etiology of TMD is little understood, but has been associated with several factors including malocclusion, trauma, emotional stress, and parafunctional habits (clenching or bruxing) (1). As a consequence of the multifactorial pathogenesis, therapeutic concepts must be interdisciplinary. Reversible conservative therapy such as cognitive behavioral therapy, physical therapy, pharmacological therapy and intraoral appliances should be considered for the first-line management of TMD (2). Splint therapy is performed using various types of stabilization, anterior positioning or bite plane appliances (3). Moreover, numerous forms of physical therapy intervention, including ultrasound (US) and transcutaneous electrical nerve stimulation (TENS), can be potentially effective for management of TMD. These interventions are commonly employed to

reduce pain and improve the mandibular range of motion (4). Evidence for the effect of electrophysical modalities is insufficient, according to a recent review article (5).

Prospective studies evaluating the outcome of physical therapy in an interdisciplinary setting have been rare. Therefore, the purpose of the present study was to investigate the efficacy of three treatment options (anterior positioning splint therapy, physical therapy, and anterior positioning splint therapy combined with physical therapy) in patients suffering from painful temporomandibular joint clicking.

Materials and Methods

Selection of patients

Sixty subjects were selected from among consecutive patients who presented at the Department of Prosthodontics, Mashhad Dental School, Iran, between 2008 and 2009 with TMJ pain and clicking. Inclusion criteria were a chief complaint of acute pain (duration <6 months) in the joint on at least one side, and the presence of joint clicking during jaw opening that was eliminated on protrusive opening. Exclusion criteria were the presence of systemic diseases (i.e. rheumatic diseases), history of recent trauma, wearing of full dentures, and therapeutic co-interventions during treatment.

All study participants were well informed about the aim and method of this study before giving their consent. All aspects of the study were approved by the Ethics Committee of Mashhad University of Medical Sciences.

Therapeutic intervention and evaluation of treatment outcome

Before treatment, all patients were clinically examined according to the RDC/TMD criteria by an experienced blinded prosthodontist (6). We included patients with a RDC/TMD Axis I diagnosis of disc displacement with reduction (Group IIa).

The patients were randomly divided into three treatment groups. Those in group I (n = 20) underwent anterior positioning splint therapy, those in group II (n = 20) underwent physical therapy, and those in group III (n = 20) were given physical treatment in addition to an anterior positioning splint.

The anterior positioning splints were used at night (at least 10 hours a day) for three months, and then gradually converted into stabilization splints (1). The degree of protrusion was the minimum necessary to eliminate joint clicking.

The physical therapy protocol consisted of two modalities, US and TENS. The US appliance employed (Sonopulse 490, Delf instruments, ENRAF-Nonius B.V., Netherlands) had an output of 2 W/cm^2. The US was site-specific, and applied via a small probe directly over the skin through a gel medium (Aquasonic100, Parker Laboratories, Fairfield, NJ, USA). The TENS appliance employed (ENS, 931, ENRAF-Nonius, Netherlands) was a high-frequency (HF) type with a pulse width of 25 mA. The frequency was set to 100 Hz, while the stimulus intensity was adjusted to patient tolerance and continuous sensation. Patients were administered alternate-day treatment sessions (3-5 min for US, 30 min for TENS), each week continuously for four weeks, by the same physical therapist.

All the patients were examined prior to, and at the end of treatment, by one blinded examiner. The baseline data were recorded at an initial examination before the start of treatment. The outcome data were collected immediately at the termination of all modalities (four months for group I, four weeks for group II, and five months for group III). A subjective pain evaluation was made by the patient using a visual analogue scale (VAS), with ratings between 0 for pain-free and 100 for maximum pain (7). The presence of clicking sounds was detected by bilateral palpation of the TMJ, with the left index finger positioned on the right TMJ and the right index finger on the left TMJ in the preauricular area, anterior to the auricular tragus.

Statistical analysis

Documentation and evaluation of the data were performed using a data processing program, SPSS/PC Version 16.0 for Windows (SPSS Inc., Chicago, IL,

Table 1 Comparison of baseline characteristics

Baseline characteristics	Group I	Group II	Group III	significance
Age (years)	27.2 ± 12.43	23.15 ± 5.69	22.43 ± 6.02	NS
Gender	5 males 15 females	1 male 19 females	1 male 13 females	NS
Pain intensity (VAS)	59 ± 20.75	61 ± 21.74	53.57 ± 27.63	NS

NS: Not significant

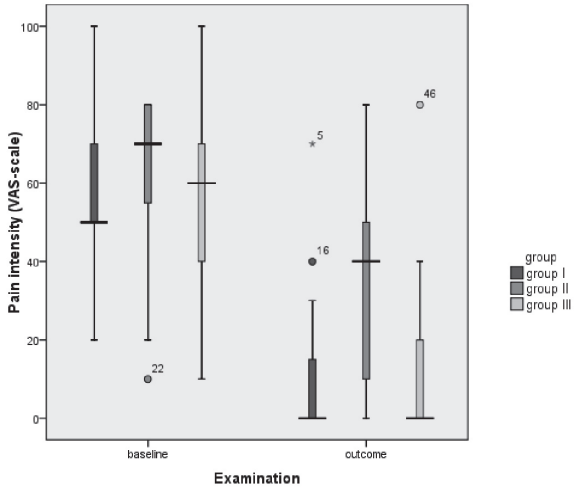

Fig. 1 Amelioration of pain intensity.

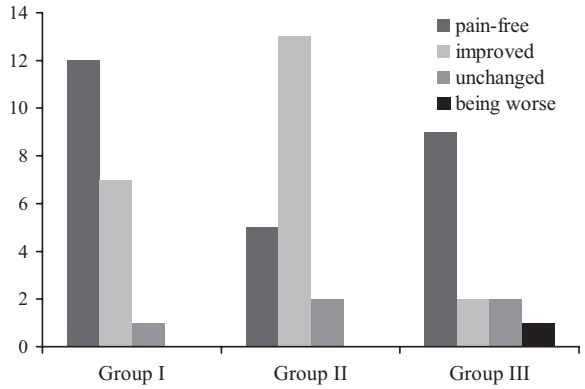

Fig. 2 Numbers of patients reporting alterations of subjective pain intensity after treatment.

Table 2 Joint sounds detected at baseline and after treatment

Group	Baseline	Treatment outcome
Group I	20 (100%)	9 (45%)
Group II	20 (100%)	16 (80%)
Group III	14 (100%)	7 (50%)

USA). All the data were analyzed by a single blinded researcher. Categorical variables at the baseline (gender) were compared using Fisher's exact test. Age and VAS at the baseline were analyzed using one-way ANOVA. One-sample *t* test was used to compare treatment outcome with the baseline in each group. In order to assess the statistical significance of differences in treatment outcome among the studied groups, Kruskal-Wallis test was applied. Treatment outcome in the three groups in comparison with the baseline was analyzed using one-way ANOVA and the Tukey test. The level of statistical significance was set at $P < 0.05$.

Results

Group I included 5 males and 15 females, with an average age of 27.20 ± 12.43 years. Group II included one male and 19 females, with an average age of 23.15 ± 5.69 years. In group III, all the patients except one were females, and the average age was 22.43 ± 6.02 years. Six patients in group III did not continue the treatment after physical therapy. Comparison of baseline characteristics including age, gender and VAS score revealed no significant differences among the groups (Table 1).

A significant decrease in the VAS score was observed in all of the studied groups ($P < 0.05$). In group I, the mean initial VAS score was 59 ± 20.75 mm and the final score was 11 ± 18.61 mm. In group II, the mean initial VAS score was 61 ± 21.74 mm and the final score was 36.50 ± 27.20 mm. In group III, the mean initial and final VAS scores were 53.57 ± 27.63 mm, 12.86 ± 23.01 mm, respectively.

As measured in terms of the VAS score, the mean improvement was 48 ± 25.26 mm (81.35%) for group I, 24.50 ± 21.46 mm (40.16%) for group II, and 40.71 ± 34.30 mm (75.99%) for group III. We found a significant difference between groups I and II ($P < 0.05$). Although a difference between groups II and III was observed, it did not reach a significant level. In fact, our intragroup analysis demonstrated a significant improvement relative to the baseline for the sample as a whole ($P < 0.05$), regardless of the individual group (Fig. 1).

In the splint therapy group, pain symptoms had disappeared in 12 patients by the end of the treatment. Seven other patients showed some degree of improvement, and in one, the pain intensity was unchanged. No patient treated with a splint reported worsening at the end of the study relative to the baseline. In group II, 5 patients were asymptomatic by the end of treatment, 13 reported improvement, and in two there was no change. In group III, 9 patients were asymptomatic at the end of treatment, two showed improvement of symptoms, two showed no change, and one reported worsening of the symptoms relative to the baseline (Fig. 2).

We observed a reduction in the frequency of joint sounds across the entire sample ($P < 0.05$) (Table 2). Although the reduction was more pronounced in groups I and III, no significant differences were evident among the groups.

Discussion

Arthralgia and joint clicking are the most common

complaints in patients seeking treatment for TMD. The joint pain originates from elongation of the discal and capsular ligaments and/or compression of the retrodiscal tissues (1). TMJ clicking seems to be related to ligament problems and condyle-disc assembly alterations during jaw movement (8,9). In this randomized controlled trial, only patients with joint pain and clicking were included. As recapturing the disc on the condyle was not the goal of treatment, the authors did not use magnetic resonance imaging (MRI) for determining the disc position.

The patients in our three study groups showed a significant improvement of subjective pain intensity. The percentage of pain-free patients as higher in groups I and III than in group II. Physical therapy modalities did not seem to be as effective as splint therapy for the management of TMD symptoms. Although the results of this study suggested that physical therapy could be used as a first-line low-cost treatment for amelioration of pain and dysfunction, the best results were observed for night-time use of anterior positioning splints.

Anterior positioning appliances are designed for treatment of patients with internal derangements of the TMJ. Protrusion of the mandible may decrease overload on the retrodiscal tissues, allowing adaptive changes to occur. Several studies have revealed the short-term efficacy of this modality for reducing TMD symptoms (10-14), in agreement with our present results.

TENS has been applied clinically for the management of both acute and chronic pain, including pain of myofacial, neurologic, and articular origin (15). This modality has been regularly employed in patients with TMD, in view of its analgesic and muscle-relaxing effect, giving positive results (16-19). Therapeutic US has been used in the treatment of TMD because of its ability to increase the range of joint motion, improve tissue healing and collagen tissue extensibility, reduce muscle spasm, relieve pain, and resolve inflammation (15,20).

In a prospective randomized study, Ismail et al. demonstrated that, as well as splint therapy, physical therapy in combination with splint therapy was able to improve the VAS score and mandibular mobility of patients with arthrogenic TMD (21). Another study demonstrated a significant reduction of myofacial pain after 4 and 6 weeks of physical therapy including heat application, massage, ultrasound and muscle stretching (22). Multidisciplinary treatment (splint therapy, physical exercise and TENS) in patients with craniomandibular disorders (CMDs) has been reported to eliminate CMD symptoms (23). On the other hand, Stiesch-Schoz et al. obtained better results in a group of patients with splints and supplementary medical therapy than in another group with splints and physical therapy (24). It has been suggested that splint therapy can significantly relieve pain in patients with disc displacement without reduction, in comparison with TENS (25).

Full-time use of anterior positioning appliances may be associated with adverse effects such as posterior open bite, occlusal alterations, and myostatic contracture of the inferior lateral pterygoid muscle (1,26). Conti et al. reported that long-term partial use of these appliances had no adverse effects (9). In the present study, no such side effects were observed in the groups treated with splints after three months. Okeson suggested that part-time use of an anterior positioning splint is the final definitive treatment for disc displacements and disc dislocations with reduction (1). As an anterior positioning splint can change the position of the mandible temporarily to enhance adaptation of the retrodiscal tissues with no side effects, this appliance was selected for the present study.

Findings from a recent investigation using magnetic resonance imaging have indicated that a clicking sound within the TMJ is not an accurate predictor of disc displacement with reduction (27). Au et al. suggested that a physiotherapeutic exercise regimen could be used for treatment of TMJ clicking in young adults, thus confirming a neuromuscular cause for many joint disorders characterized by abnormal sounds (28). In our present study, reduction of joint clicking in the physical therapy group appeared to support the theory of Au et al., whereas the better results in the two other groups, in terms of total improvement, could have been related to adaptive changes in the joint structures.

The results of the present study indicate that anterior positioning splints can provide better improvement of TMD than other modalities, and that therefore it is a useful approach for reduction of pain levels and joint sounds. As significant improvement was also observed in the physical therapy group, this modality can be used as a conservative low-cost intervention. As this study lacked a volunteer control group, the present findings were admittedly limited. Further multicenter investigations involving a control group and a greater sample size will be needed in order to evaluate more accurately the effectiveness of these modalities for eliminating the acute symptoms of TMD.

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