

Original Article

The effect of a short term conservative physiotherapy versus occlusive splinting on pain and range of motion in cases of myogenic temporomandibular joint dysfunction: a randomized controlled trial

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Abstract. [Purpose] This study compared the effects of a short-term conservative physiotherapy program versus those of occlusive splinting on pain and range of motion in cases of Temporomandibular Joint Dysfunction. [Participants and Methods] This study included 112 male and female participants with ages ranging from 15–27 years. Outcome measures were pain assessed by the visual analogue scale and Temporomandibular Joint Range of Motion measured with the Temporomandibular joint opening index. Patients were randomly assigned to one of two groups. Conservative physiotherapy was provided to one group 3 days weekly while the other group received standard occlusive splinting. Splinting was used daily for the total period of treatment. Any adjustments for splints were done by the treating dentist. Both groups were treated for a total period of 6 weeks. [Results] Between group statistical analysis revealed a significant reduction in pain intensity and Temporomandibular joint opening index in favor of the conservative physiotherapy group. [Conclusion] Over a treatment period of 6 consecutive weeks, conservative physiotherapy could be a better initial treatment than occlusive splint in relieving pain and improving range of motion in cases of myogenic temporomandibular dysfunction.

Key words: Physiotherapy, Temporomandibular joint, Occlusive splinting

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INTRODUCTION

The number of patients suffering from temporomandibular joint dysfunction (TMD) has been increased dramatically¹⁾. It has been reported that 8 out of 10 patients seek health care primarily from a dentist complaining of symptoms that are diagnosed as bruxism or TMD²⁾. TMD is known as a group of disorders that affect the temporomandibular joint (TMJ), the masticatory system, or both, and may even extend to involve the surrounding related structures³⁾. TMD has been considered a major public health concern as a main cause of chronic orofacial pain with a major negative impact on activities of daily living and quality of life⁴⁾. Affected surrounding regions and structures include the head and neck leading to symptoms of headache, muscle spasm, ringing or fullness in the ear, cervical spine dysfunction^{5, 6)}, and an altered craniovertebral angle seen as a forward head posture⁷⁾.

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Physical Therapy treatments are non-invasive interventions comprising therapeutic exercises, electro-physical modalities, electro-analgesic modalities and manual therapy (MT) including TMJ mobilization, manipulation, or treating the surrounding soft tissues. The objective of physiotherapy is to reduce pain and improve strength, mobility, coordination, proprioception, range of motion (ROM), and to breakdown adhesion and stimulate the production of synovial fluid⁸.

On the other hand, therapy with an occlusal splint is commonly used as a basic dental treatment⁹. Occlusal splints have been reported to alter afferent activity from intra-oral tissues by applying pressure to these tissues and covering teeth. Furthermore, an occlusal splint alters the position of the TMJ by increasing the mouth vertical dimension. The splint changes activity patterns of the jaw closing muscles during clenching^{10, 11}.

Splint therapy is not specific, and the mechanisms underlying its effectiveness are not well understood^{12, 13}. Meanwhile, the quality of the evidence for physiotherapy studies is not certain and low⁵⁻¹⁴. Therefore, the purpose of this study was to conduct a randomized control trial to compare the effects of a short term conservative physiotherapy treatment versus occlusive splinting on pain and ROM in cases of myogenic TMD.

PARTICIPANTS AND METHODS

This is a single-blinded randomized controlled trial. An external assessor blinded to both treatment and results was recruited to deliver the conservative physiotherapy program. The external assessor had more than 10 years clinical experience. All procedures were explained and discussed clearly with participants prior to the start of the study and a 112 participants (50 males and 62 females) provided their signed consent to participate. Participants were randomly assigned to two treatment conditions: Conservative Physiotherapy (CPT) (n=56) and Occlusive splinting (n=56) groups. Participants were assigned randomly by an independent participant choosing one of the sealed envelopes containing numbers chosen by a random number generator. Randomization was restricted to permuted blocks of different sizes to ensure that equal numbers will be allocated to each group. Each random permuted block was transferred to a sequence of consecutively numbered, sealed, opaque envelopes stored in a drawer kept locked until required. As each participant formally entered the trial the next envelope was opened by the researcher in sequence in the presence of the patient. Study participants were blinded to the study hypothesis. This study was approved by the local research Ethical Committee of the faculty of physical therapy, Cairo University, approval number P.T/REC/017/00865.

Assuming a mean baseline level of pain intensity of 30.6 mm on a 100 mm VAS for TMD, a SD of 19.0, and a reduction of the mean level of 35%, an estimated sample size of at least 50 patients in each group was needed to achieve a power of 0.80 at a type I error level of 5%¹⁵.

Participants were referred from the dental clinic as myogenic TMD including masticatory muscle spasm or bruxism. Exclusion criteria were TMD with structural changes in the TMJ due to arthritis, rheumatoid disease, ankylosing spondylitis, disc degeneration or Bell's palsy.

For the CPT group, physiotherapy treatment was delivered by an experienced physiotherapist for 15 min per session, two times per week for 6 weeks. The treatment plan included:

a. Relaxed jaw position:

Placing the tongue lightly on the top of the mouth behind the upper front teeth, allowing the teeth to come apart and relaxing the jaw muscles¹⁶.

b. Stretching:

▪ Masseter stretching

Starts with a closed mouth and relax the jaw as much as possible. Slowly and gently beginning to open the mouth as wide as possible. Maintaining the position for 20–30 sec and repeat 3–5 times¹⁷.

▪ Medial Pterygoid stretching

With the patient supine, two fingers are placed behind the lower incisor teeth with the thumb under the chin, pulling the mandible forward and down so that the jaw should be fully open. To stabilize the head and neck the other hand is placed on the forehead. The medial pterygoid responds well to ischemic compression and stretching. Maintaining this position for 20–30 sec and repeat 3–5 times^{17, 18}.

The other group received standard occlusive splinting for a period of 6 weeks as prescribed by the dentist¹⁹. Splinting was used daily for the total period of treatment. Any adjustments for splints were done by the treating dentist.

The primary outcome measure was pain intensity measured with the VAS. The VAS is a one-dimensional measure of pain intensity. The pain VAS is a continuous scale using either a horizontal or vertical line, the length is usually 10 cm (100 mm), with verbal descriptors at each end describing symptom extremes. The VAS is a paper and pencil measurement only and cannot be recorded verbally or by phone. No training is required other than the ability to use a ruler to measure distance to determine a score²⁰.

The secondary outcome of this study was ROM assessed by the TMJ opening index (TOI) using the following formula²¹:

$$100 \times \frac{\text{passive opening} - \text{maximum voluntary opening}}{\text{passive opening} + \text{max voluntary opening}} = \text{TOI}$$

Table 1. Baseline participant demographics

Variable	Conservative physiotherapy (n=56)	Occlusive splinting (n=56)
Age (years)	21.8 ± 2.2	21.6 ± 2.4
Weight (kg)	73.2 ± 1.9	71.5 ± 1.6
Gender (%)		
Male	23 (41.07%)	27 (48.2%)
Female	33 (58.9%)	29 (51.7%)
BMI (kg/m ²)	20.5 ± 1.7	21.3 ± 1.3
Outcome measures		
VAS	5.1 ± 0.9	4.7 ± 0.7
TOI	14.4 ± 1.12	12.6 ± 3.1

The values are presented as mean and standard deviation (SD) for age, weight, BMI, visual analog scale (VAS), TMJ opening index (TOI).

Passive opening was measured for each patient using the Electronic Digital Caliper, CE Company, Japan. All measurements were taken before treatment and 6 weeks later.

Data analysis was performed using the Statistical Package for Social Sciences program (SPSS, Inc. Chicago, IL, USA, version 18 for Windows). Within group and between group difference were assessed with the paired t-test and unpaired t-test, respectively. Pearson's chi-squared test (χ^2) was used to assess categorical variable (male and female). All analyses were statistically significant at alpha ($p < 0.05$). The sample size was calculated to yield an 80% power and $\alpha = 0.05$. Prior to final analysis, data were screened for normality assumption and presence of extreme scores with Kolmogorov-Smirnov test showing normal distribution of the data ($p > 0.05$) lending to parametric methods for significance testing.

RESULTS

There were no significant differences in the demographic data of both groups regarding age, height, weight, body mass index, and gender variables ($p > 0.05$). Also, at the beginning of the study, there were no significant differences between both groups for both TOI and VAS ($p > 0.05$) (Table 1). The mean values of TOI for the conservative physiotherapy group were 14.4 ± 1.12 and 3.5 ± 1 , initially and at 6 weeks, respectively. While the mean values for the occlusive splint group were $12.6 \pm 3.1\%$ and 1.4 ± 1.9 , initially and at 6 weeks, respectively. The mean values of VAS for the conservative physiotherapy group were 7.3 ± 1 and 2.4 ± 0.4 , initially and at 6 weeks, respectively. While the mean values for the occlusive splint group were 7.7 ± 1.4 and 4.7 ± 1.2 , initially and at 6 weeks, respectively. The significant improvements were in favor of the conservative physiotherapy group for both ROM and the pain level ($p < 0.05$) at 6 weeks post intervention.

DISCUSSION

This study compared the effect of short term physiotherapy with that of occlusive splinting for the ability to reduce pain and improve ROM in cases of myogenic TMD. The results showed significant improvement in pain and ROM following a 6-weeks conservative physiotherapy program.

In this controlled clinical trial, the results obtained after 18 treatment sessions over a period of 6 consecutive weeks with 2 different treatments were compared in patients diagnosed with myogenic TMD. The patients treated with a short term conservative physiotherapy treatment showed a greater reduction in pain and more improvement in TMJ movement than patients treated with an occlusive splint as measured with VAS and TOI.

The efficacy of physiotherapy treatment for TMD has been controversial throughout literature. Treatments that included exercises for the jaw only or in combination with neck exercises were examined by Craane et al.¹⁹⁾ as well as Kraaijenga et al.²²⁾ with no significant differences reported between both treatment techniques.

Tuncer et al.²³⁾ studied the effect of MT for the orofacial and cervical regions combined with stretching exercises for the neck and masticatory muscles compared with exercises for the jaw and neck alone and home physical therapy.

Von Piekartz and Ludtke²⁴⁾ compared the effect of orofacial physical therapy and neck exercises and MT for orofacial and cervical regions added to home exercises compared with treatment of the cervical spine in patients with mixed TMD.

Comparing the findings of studies with similar interventions, outcomes, and diagnoses, revealed that MT directed to the orofacial region or in combination with cervical treatment showed more improvement than home exercises for the jaw and neck or treatment directed only to the cervical spine for improving mouth opening^{5, 23, 25)}.

On the other hand, Maloney et al.²⁵⁾ reported significant and clinically meaningful effect when comparing splint therapy and exercises.

Regarding evidence based practice, systematic reviews by Armijo-Olivo et al.⁵⁾ and McNeely et al.¹⁸⁾ indicated high uncertainty about the effectiveness of exercise and MT for treatment of TMD due to the high risk of bias, low effect size or inappropriate randomization. The overall quality of evidence for most comparisons of previous studies was low to moderate²⁶⁾.

Armijo-Olivo et al.⁵⁾ reported that evidence for previous studies was downgraded for the risk of bias, level of inconsistency, and imprecision surrounding the effect estimate.

Still, it was reported that MT alone or combined with exercises showed promising effects⁵⁾ supporting our findings.

Studies designed for long term follow-up also reported improvements within the short term.

A systematic review by Medlicott and Harris²⁷⁾ reported that active exercises, manual mobilization, postural correction and relaxation exercises may decrease pain and impairment and increase vertical mouth opening in the short term in TMD patients. One of the review criteria for that study was long term follow-up (6 months or greater).

Our study attempted to increase the quality of evidence by using a blinded randomized design with an appropriate effect size.

The results of our study suggest the use of conservative physiotherapy as an initial treatment. Exercises and MT are simple and safe interventions that could potentially be beneficial for patients with myogenic TMD⁵⁾. Over a treatment period of 6 consecutive weeks, conservative physiotherapy could be a better initial treatment than occlusive splints in relieving pain and improving ROM in cases of myogenic TMD.

Limitations of the study include the lack of a follow up period and the inability to blind the patient groups to treatment due to the nature of the study.

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Conflicts of interest

None.

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