The Effectiveness of Occlusal Splint Therapy in Treatment of Iraqi Temporomandibular Disorder (TMD) Patients

Wajnaa F. Qasim

Abstract

The effectiveness of an occlusal splint as a conservative non-invasive treatment modality of temporomandibular joint disorders evaluated clinically with the design of full coverage, flat, maxillary occlusal splint. Twenty-eight temporomandibular disorder treated patients were evaluated with the Temporomandibular Joint scale (TMJ Scale) before and after treatment. A group of twenty-six similar patients identified as having temporomandibular disorders, but they did not obtained treatment, were used as a control group. It was found that this splint design had a significant effect on improvement of physical signs related to temporomandibular disorder, but it had no significant effect on the elimination of temporomandibular joint clicking at the end of final evaluation period. Accordingly, its indication was limited for myogenic facial pain and not for repositioning purposes.

Keywords: Occlusal-Splints, Splint-Therapy, Temporomandibular-Joint-Scale, Temporomandibular-Joint-Disorders-Treatment.

(J Med J 2006; Vol. 40 (4): 1-)

Received	Accepted
July 13, 2005	February 14, 2006

Introduction

Temporomandibular Disorders (TMD) are principally musculoskeletal, orthopedic, and neurological pain conditions that affect the Temporomandibular Joint (TMJ) and/or the muscles of mastication.[1] These disorders typically run a recurrent or chronic course. The successful management of a patient with a temporomandibular complaint, like the treatment of other bodily ailments, consists of seven general principles,[2] namely:

1) Diagnosis.
2) Helping process.
3) Palliative therapy.
4) Natural resolution.
5) Cause-related therapy.
6) Specific therapy.
7) Rehabilitation.

Good therapy suggests that these principles be followed in the proper order. To apply specific therapy by jumping over the first five steps is to invite failure, and to ignore the last step is to leave the patient only partially treated. Use of a combined approach has been found by some authors to result in more rapid symptom relief, decreased treatment time and overall superior therapeutic outcome. [3, 4]

Department of Oral Diagnosis, College of Dentistry, Baghdad University.
*** Correspondence should be addressed to:**
Wajnaa F. Qassim, B. D. S., M. Sc., Ph.D.

One form of specific therapy in the management of patients with a temporomandibular disorders are interocclusal appliances known commonly as "occlusal splints", these are usually used to provide temporary alteration in occlusal relationship and often used in conjunction with other forms of treatment such as physiotherapy or medication. [5]

Occlusal splinting as a treatment method for different types of temporomandibular disorders which is used to accomplish different objectives, are:

- Occlusal disengagement.
- Temporary correction of occlusal disharmony
- Repositioning the mandible.

Different splints accomplish different purposes.

History of splinting

Early evidence of the use of splints can be seen in ancient civilizations, but the concept of splinting teeth to support and immobilize teeth, by joining several teeth together continues to be a topic of controversy. Splints can be classified based on their purpose and duration of use, the way of fabrication, and the location of the splinted teeth in the jaw. The biomechanical mechanism of splint is related to the mechanism of tooth mobility.(6) The indications for splint usage in the healthy and diseased periodontium are variable, among they are:

- Prevention of mobility after acute trauma.
- For occlusal therapy.
- To allow function.
- To allow periodontal repair.
- In case of occlusal trauma.
- To prevent teeth drifting after orthodontic treatment or when a tooth is missing.
- In splinting teeth and implants.
- In treatment of Obstructive Sleep Apnea (OSA) syndrome [sleep splint]. [7,8,9]
- Used in haematostatic technique to control oral bleeding. [10]
- Used as habit breaker.

Assessment of treatment outcome

Several approaches to assessment of treatment outcomes in TMD are generic to the assessment of treatment outcomes for any recurrent or chronic pain condition. Assessment of TMD outcomes relating to physical signs and symptoms, also makes use of approaches specific to TMD. [11] More sophisticated symptom assessment tools are now available and are being widely used.

Various tests have been introduced during the past several years. One such test, the "TMJ Scale", is a psychometric assessment tool supported by a large body of published validation data,[12,13] including three independent studies. [14-16]

This test assesses clusters of physical symptoms (joint dysfunction, pain, range of motion limitation) and psychosocial symptoms (stress, psychological distress) and predicts overall clinical significance of a TMD. The TMJ Scale's sensitivity and specificity in new published research has been reported to be near or over 90 %. [17,18]

The aim of this study was to measure the effectiveness of occlusal splint in the treatment of TMD, using the TMJ Scale as the symptom outcome measure.

Materials and Methods

From 194 patients having complaints of temporomandibular dysfunction, who sought treatment at Dental College Hospital of Baghdad University were evaluated as having TMD on the basis of history and physical examination, the treatment plan was suggested. The group who were confirmed as needing splint therapy as part as from their treatment plan, was re-evaluated with the TMJ Scale, [19] this group was represented by 54 patients, 28 patients were received splint therapy and 26 patients were not prospered to receive therapy, so they served as control group.

The age (mean and range), sex and diagnosis of myogenic facial pain versus it with internal derangement were illustrated in table (1).

Table (1): A Comparison of Age, Sex and Diagnosis between Control and Treatment Groups.

Items	*Treatment group*	*Control group*
Age		
Mean (years)	*25.5*	*26.04*
Standard deviation	*13.42*	*8.76*
Range	*13 to 65*	*18 to 60*
Sex		
Male	*32.1%*	*57.7%*
Female	*67.9%*	*42.3%*
Diagnosis		
Myogenic Facial Pain only	*21.4%*	*15.4%*
Myogenic Facial Pain with Internal Derangement	*78.6%*	*84.6%*

Splint design and fabrication

After impression of both maxillary and mandibular arches, and bite registration, fabrication of maxillary full coverage occlusal splint was carried out with hot-cured, clear, hard acrylic resin, by indirect laboratory technique, which minimized dental chair time, could be more accurate, and well finished in comparison to direct technique. The splint was fit to the maxillary teeth with total stability and retention, splint thickness not exceed the interocclusal clearance (free way space). The occlusal surface of the splint was flattened and polished. All the posterior mandibular buccal cusps were kept in centric occlusion.

Patients were asked to wear the splint full time except during eating and brushing their teeth. No other combined therapies were prescribed for these patients during splint therapy. Measurements of subscales were taken before and after one month of treatment.

TMJ Scale

Is a sophisticated, diagnostic test, screening several physical symptoms pschycometrically. [20] TMJ Scale was developed and published by Pain Resource Center. [21]

It is powerful, comprehensive, highly accurate, dependable and reliable assessment guide. [22] It was used as diagnostic measure [23] and for assessment of treatment outcomes, [24] and for other different things. It is not recommended for those below the age of 13 years, it take about 15-20 minutes for testing.

The 10 scales that comprise the TMJ Scale are:

1. Pain Report (PR).
2. PalPation (PP).
3. Perceived Malocclusion (MO).
4. Joint Dysfunction (JD).
5. Range of Motion Limitation (RL).
6. Non-TM Disorders (NT).
7. Psychological Factors (PF).
8. Stress (ST).
9. Chronicity (CN).
10. Global Scale (GS).

The first five scales assess physical symptom areas commonly associated with TMD. The perceived malocclusion scale is scored with the splint not in place in the treated patients. The Non-TM disorders scale is a non specific measure of symptoms involving other head and neck disorders. Such as sinusitis, otitis, migraine and vascular headaches. The psychological factors, stress and chronicity scales are psychosocial constructs.

They measure general psychological distress, stress and the predisposition to develop or have a chronic disorder. Global scale is an over all measure of the presence and severity of TMD.

Statistical analysis

Means and standard deviation for each subscale pre and post treatment scores was calculated for both groups. The t-test statistics were used to determine whether the difference between means for the treated and un-treated groups was statistically significant.

Results

For every subscale, the treatment group reported more improvement than the control group (table 2). The differences were statistically significant at the 0.05 level for six of the 10 subscales, including the Global scale, and approach significant for RL and not significant for JD, PF and CN.

Within the control group 8% of subjects improved on Global scale level, despite the variation in there symptoms. In the treated group, 75% were improved on the level of the same scale.

Table (2): Means with Standard Deviations of Control and Treatment Groups.

Groups	***First TMJ Scale***		***Second TMJ Scale***	
Controls	***Mean***	***STDEV***	***Mean***	***STDEV***
n=26				
PR	*1.15*	*0.97*	*1.27*	*0.96*
PP	*1*	*0.85*	*0.88*	*0.65*
MO	*0.96*	*0.91*	*1.3*	*0.92*
JD	*1.77*	*1.34*	*1.77*	*1.21*
RL	*0.96*	*0.72*	*0.92*	*0.69*
NT	*0.96*	*0.77*	*0.77*	*0.59*
PF	*0.73*	*0.45*	*0.85*	*0.37*
ST	*0.85*	*0.73*	*0.81*	*0.57*
CN	*1.38*	*1.24*	*1.35*	*1.29*
GS	*1.77*	*0.95*	*1.69*	*0.88*
Treated group n=28				
PR	*1.25*	*1.11*	*0.79*	*0.69*
PP	*1.32*	*1.21*	*0.57*	*0.5*
MO	*0.71*	*0.53*	*0.57*	*0.5*
JD	*1.75*	*1.4*	*1.46*	*1.45*
RL	*1*	*0.9*	*0.68*	*0.61*
NT	*0.75*	*0.64*	*0.54*	*0.51*
PF	*0.89*	*0.31*	*0.82*	*0.55*
ST	*0.89*	*0.83*	*0.54*	*0.5*
CN	*1.39*	*1.23*	*1.25*	*1.17*
GS	*1.61*	*0.96*	*0.96*	*0.79*

STDEV = Standard Deviation

Discussion

This study advocates the result of Levitte and McKinney, [25] that TMJ Scale is a more reliable, comprehensive and consistent measure for the assessment of treatment outcome. In addition, it supports the finding of Steed and Wexler, [26, 27] that TMJ Scale measures an important component of TMD, which is a psychosocial factor that has often been over-looked. In this study, it is important to note that treated patients showed a significant improvement on the stress scale even though no treatment has rendered in this area. This suggests that splint was well acting in breaking the stress relieving habit, and it is in agreement with Boero, [28] demonstrated an improvement in 82% of 170 TMJ patients were wearing this appliance. At the same time, non-significant improvement in other two psychosocial constructs (PF and CN) of TMJ Scale of treated group suggests that the reduction in pain and dysfunction plays an important role in improving the patient's psychological functioning, equilibrating the depression, anointment and behavioral changes developed by wearing a new oral appliance.

The improvement of 8% subjects in the control group tends to corroborate the general remodeling ability of the joint hard [29] and soft [30] tissues and enhances the idea that TMJ is one of the most accommodating joint in the body, with the aid of splinting muscle action. A significant improvement in PR, PP, and MO, which assess physical symptoms, associated with TMD by using this splint design, mostly relates to the free mandibular movement gets by the splint, as well as immediate posterior disocclusion in all mandibular movement. The action of splint design seems to be effective in the treatment of TMD, and possible mechanisms by which the splint works include:

1. Reduction in parafunctional activity.
2. Provide an occlusion relationship considered optimal for the patient. When the splint is in place it creates neuromuscular balance by eliminating occlusal interference and producing a degree of tactile afferent impulses from the periodontal proprioceptive fibers, and keeping the condyle in their most musculoskeletal stable position at the time that the teeth are contacting evenly and simultaneously.

It is obvious from this study, the nice results in masticatory apparatus conflict with splint effect on JD, so no significant improvement of TMJ clicking along the course of the treatment. This gives the construction of the original sample a big role in determination of this result, as the percentage of the patients having myogenic facial pain with internal derangement was far more than those without. This accentuates the limited if no repositioning effect of this design, and agrees with El-Tounsy and El-Madany, [31] explanation to the action of lateral pterygoid muscle role, as with prolonged displacement of the mandibular disk anteriorly, the structure and function of superior belly of lateral pterygoid muscle could be altered. This alteration in structure and function could serve to maintain and displace the TMJ disk anteriorly during protrusion of the mandible and at the same time contraction of the lateral pterygoid muscle facilitates the passage of the mandibular condyle over the thick posterior margin of the mandibular disk.

The last physical symptom in TMJ Scale is RL that near the significant level for the treatment group, which may explain the sharing effect of muscular system and articular system on RL, inasmuch as this design has positive effect on muscular problem and negligible effect on articular function, this result was expected. This agrees with Gray and Davies, [5] described a variety of splint designs and ensured that each splint design has a proven success rate for the specific diagnosis.

The NT scale represents a non-specific measure of symptoms involving the head and neck. It was significant in treated group, that may be related either to the full mouth rehabilitation for receiving splint therapy, or to the effect of splint on referred pain which confirmed by Quayle et.al., [32] when reported that splint resulted in marked improvement or complete relief in significant number of patients experienced migraine or tension vascular headache symptoms, in contrast to those who suffering from tension headache failed to benefit from splint therapy.

In conclusion, the present study shows that conservative splint therapy should be the first approach in the treatment of TMD. The splint design of hard acrylic, full coverage and maxillary occlusal splint seems to be effective and offer superior improvement in physical symptoms particularly with pain and tenderness reduction of masticatory muscles. On the other hand, the use of a standardized, psychometrically developed outcome measure with high sensitivity, specificity and predictive values, such as the TMJ Scale, allows a consistent, validated and quantitative method of comparing patient's symptom changes or fluctuations. Such a technique also allows a comparison of treatment effectiveness at different sites and with different modalities.

This study suggests conducting similar study of treatment outcomes comparison between absolute splint therapy and combined therapeutic approach in Iraqi patients.