(e) ISSN Online: 2321-9599
(p) ISSN Print: 2348-6805

ORIGINAL ARTICLE

TEMPOROMANDIBULAR JOINT DISORDER: ROLE OF BILATERAL BALANCED AND CANINE GUIDANCE OCCLUSAL SPLINTS: A CLINICAL STUDY

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ABSTRACT:
Background: Temporomandibular Disorders (TMD) are changes in the temporomandibular joints, masticatory muscles, or both. **Materials and methods:** This study was conducted 40 patients who were suffering from subjective and objective signs of Temporomanbdibular Disorders (TMD). The patients were randomly divided into two groups of 20 each according to the fabrication of the occlusal design of the stabilization splint. Helkimo Dysfunction Index (HDI) and Pantographic examination through Pantographic Reproducibility Index (PRI) was used to assess the degree of TMD before and after splint therapy. **Results:** The results showed a significant improvement in the TMD symptoms as monitored by HDI scores and PRI scores in both groups after 4 months of using the different occlusal design stabilizing splint with Bilateral balanced and canine guidance stabilization splints. **Conclusion:** Author concluded that the canine guidance stabilization splint produces significant reduction in the TMD symptoms than bilateral balanced stabilization splint.
Key words: Temporomandibular Disorders, Helkimo Dysfunction Index, Pantographic Reproducibility Index

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This article may be cited as: Bakshi Y, Ahuja N. Temporomandibular Joint Disorder: Role of Bilateral Balanced and Canine Guidance Occlusal Splints: A Clinical Study. J Adv Med Dent Scie Res 2016;4(3):79-83.

INTRODUCTION

Temporomandibular Disorders (TMD) are changes in the temporomandibular joints, masticatory muscles, or both. Characteristics are frequent musculoskeletal pain expressed in the region of the face, head, neck and ears, articular sounds when opening and/or closing mouth, changes in patterns of jaw movements, such as limitations of these movements or deviations and deflections[1].

Poor posture, malocclusion and bruxism (clenching/grinding of one's teeth) can affect the masticatory muscles, temporomandibular joint and associated structures, giving rise to TMD[2]. Moreover, TMD may be caused by occlusal macro-traumas and micro-traumas.

According to Okeson[3], "Occlusion is defined as the relationship between the upper and lower teeth in functional contact during activity of the mandible".

TMD is more prevalent among adults and may be related to high degrees of stress during activities of daily living as well as the prolonged maintenance of occlusal problems and parafunctional habits[3].

Some authors stated that a pantograph can be used to determine the coordination of mandibular movements. Pantographic tracings, quantitated by a pantographic reproducibility index (PRI), can be used to diagnose the presence and degree of TMD[4]. In addition, Helkimo Dysfunction Index (HDI) which was effective aid in detecting the severity of TMD on clinical basis is used[5].

Non-uniform distribution of tooth contacts and the presence of occlusal interferences tend to disturb the muscle symmetry in the masticatory system. As the stabilization splint, when properly adjusted, eliminates occlusal interferences and restores uniform tooth contacts, the splint is expected to improve muscle symmetry[6]. The present study was conducted with following aims and objectives-

AIMS AND OBJECTIVES

1. To evaluate the efficacy of stabilization splint in TMD's Disorders.
2. To evaluate the use of pantographic tracing through PRI as an objective method to monitor the success of occlusal splint therapy in management of TMD.
3. To evaluate the use of Helkimo Dysfunction Index (HDI) in TMD's.

MATERIALS & METHODS

This study was conducted in department of prosthodontics, from JAN 2016 to APRIL 2016. The study consisted of 40 patients age ranged from 30-50 years.

Inclusion criteria-

The presence of two or more TMD signs/symptoms such as pain on movement of the mandible, muscle pain or pain in palpation of Tempromandibular Joint (TMJ).

Only those patients who met the above criteria were included in the study.

Radio graphical examination of TMJ in the positions of the maximum closure and maximum opening were done at the first visit and to evaluate the position of both condyles and joint spaces.

Maxillary and mandibular primary impressions were made using alginate impression material in modified stock trays. Study casts were made upon which special trays were fabricated in auto-polymerizing acrylic resin and final impressions were recorded using Polyvinyl Silicosane impression material.

The final impressions were poured in dental stone and mounted on a semi-adjustable Hanau articulator by using an ear piece face-bow and centric relation record, made by two-sheets of thick wax rim bite wafer was adapted to the mandibular arch and guided to close. This wax record was reinforced with polyvinylesiloxane (Addition Type) bite registration material. A full arch mandibular plane occlusal splint (Stabilization type) in heat cured acrylic (Acrostone, heat cure transparent, England, UK) was made for each subject over the occlusal and incisal surface of the teeth. The patients were instructed to wear the stabilization splint (SS) three hours daily and continuously at night for three months, and instructed to come after 48 hours for further adjustments.

The patients were randomly divided into two equal groups, twenty patients in each according to the type of opposing arch occlusion with the Stabilization splint.

Group 1: Twenty subjects were treated with acrylic full-covered stabilization splint with canine guidance on the mandibular arch.

Group 2: Eight subjects were treated with acrylic full-covered stabilization splint with bilateral balanced occlusion on mandibular arch.

The parameters were made for each patient before stabilization splint therapy, 4 weeks and 4months after splint therapy.

CLINICAL EXAMINATION

The clinical examination of masticatory system was performed with the help of index known as **HELKIMO DYSFUNCTION INDEX** given by Helkimo[5].

Helkimo was a pioneer in developing indexes to measure the severity of TMJ disorders, as well as pain in this system. In an epidemiological study, he developed an index that was further broken down into anamnesis, clinical and occlusal dysfunction. Through this index, he tried to assess, individually and in the general population, the very prevalence and severity of TMJ disorders in mandibular pain and occlusal instability.

The following symptoms were seen

1. Pain on palpation of TMJ.
2. Muscle pain.
3. Impaired range of movement of the mandible.
4. Pain on movement of the mandible.
5. Impaired function of TMJ.

The following symptoms of Helkimo clinical dysfunction index was seen to assess the degree of TMD. It was scored before using splints, four weeks and four month after using splints.

Immediately following the clinical and radio graphical examination, mandibular movements were recorded graphically for each patient using Denar-Pantograph (Denar Corporation, Anaheim, California, USA) to assess the degree of TMD through **Pantographic Reproducibility Index (PRI)[6].**

This scoring method was termed "**pantographic reproducibility index"** (PRI) for Temporomandibular Joint (TMJ) Dysfunction.

The PRI scores were divided into ranges representing the severity of dysfunction:

No dysfunction =Scores ranging from (0 to 15)
Slight dysfunction= Scores ranging from (16 to 30)
Moderate dysfunction= Scores ranging from (31 to 60)
Severe dysfunction= Scores ranging from (61 to 144)
For recording the mandibular movements the patient's head was firmly seated on a headrest and was asked to protrude and retrude the mandible to the most retruded position for recording this position similarly, the lateral excursive movements were recorded.
The graphic recording of mandibular movements using HDI and PRIscores were evaluated prior to fabrication of the splint, four weeks and four months after using the stabilization splint therapy to assess the degree of TMD.

RESULTS

TABLE 1: Helkimo Dysfunction Index (HDI) and Pantographic Reproducibility Index Scores (PRI) in group 1

Type of test	Type of group		Baseline before splint using	4 weeks after splint using	4 month after splint using	P value
HDI	Group 1	Canine guidance stabilization splint				<0.001
		Min- Max	7-26	2-7	0.2±1.8	
		Mean±S.D	14±39	4.2±3.32	0.48±0.54	
PRI		Canine guidance stabilization splint				<0.001
		Min- Max	55-119	21-57	4-15	
		Mean±S.D	55.12±17.75	32±12.98	7.72±4.40	

TABLE 2: Helkimo Dysfunction Index (HDI) and Pantographic Reproducibility Index Scores (PRI) In Group 2

Type of test	Type of group		Baseline before splint using	4 weeks after splint using	4 month after splint using	P value
HDI	Group 2	Bilateral balanced stabilization splint				<0.001
		Min- Max	8-29	3-17	0.±3.0	
		Mean±S.D	14±8.10	7.2±3.12	1.48±1.54	
PRI		Bilateral balanced stabilization splint				<0.001
		Min- Max	55-119	29-82	29-82	
		Mean±S.D	57.12±18.15	44±21.08	44±21.08	

Table 1 shows helkimo dysfunction index (HDI) and to pantographic reproducibility index scores (pri) in group 1 using canine guidance stablisation splint at baseline, 4 weeks after splint, 4 months after splint.
The mean of these scores for HDI was 14±39, 4.2±3.32 and 0.48±0.54 respectively.
On comparing the PRI scores in group 1, the mean was 55.12±17.75, 32±12.98 and 7.72±4.40 at baseline, 4 weeks after splint and 4 months after splints, respectively.
Table 2 shows helkimo dysfunction index (HDI) and to pantographic reproducibility index scores (pri) in group 1 using Bilateral balanced stabilization splint at baseline, 4 weeks after splint, 4 months after splint.
The mean of these scores for HDI was 14±8.10, 7.2±3.12and 1.48±1.54respectively.
On comparing the PRI scores in group 2, the mean was 57.12±18.15, 44±21.08and 44±21.08at baseline, 4 weeks after splint and 4 months after splints, respectively.
When comparing the mean difference of HDI and PRI scores of the patients with TMD before using the canine guidance stabilization splint (baseline) and pantographic reproducibility index scores with 4 weeks and 4 months after using the splint, the result showed that there was a significant difference of reduction of PRI scores and HDI scores were found in both groups.

DISCUSSION

The TMJ syndrome was first described by Costen in 1934[7]. The American Dental Association President's Conference on Temporomandibular Disorders (American Dental Association, 1983) defined TMD as – a group of orofacial disorders characterized by pain in the pre-auricular area, TMJ, or muscles of mastication, limitations and deviations in mandibular range of motion, TMJ sounds during jaw function.[8,9]
Dental occlusal splinting and permanent occlusal adjustment have been the mainstays of TMJ disorder treatment. It is generally agreed that they have important role in the treatment of temporomandibular disorders (TMD), particularly where myofacial pain is a prominent symptom.[10] They are also useful in the treatment of nocturnal bruxism, clenching, and the associated occlusal-incisal attrition seen in adults and children[10,11,12].
Occlusal splint therapy may be defined as "the art and science of establishing neuromuscular harmony in the masticatory system by creating a mechanical disadvantage for parafunctional forces with removable appliances." Occlusal splint is a diagnostic, relaxing, repositioning, and reversible device. "Occlusal splint is defined as any removable artificial occlusal surface used for diagnosis or therapy affecting the relationship of the mandible to the maxilla. It may be used for occlusal stabilization, for treatment of temporomandibular disorders, or to prevent wear of the dentition.[13,14]" Two main types of splinting are available: Occluding and non-occluding. Occluding splints, also called stabilization splints, are specially fabricated to improve the alignment of the upper and lower teeth. Non-occluding splints, also called simple splints, primarily open the jaw, release muscle tension, and prevent teeth clenching. Non-occluding splints are typically made of a soft-vinyl and are easier and cheaper to fabricate.[15-17]
Following are few concepts, which explain how occlusal splints can help:
1. Preventing the patient to close in maximal intercuspal position.
2. Distribution of forces.
3. normalizing periodontal ligamanet proprioception.
4. relaxing the muscles.

The result of this study revealed that, individuals wearing stabilization splints in both groups reported a significant improvement in the TMD symptoms. The within group analysis demonstrated a significant decrease in the clinical symptoms monitored by HDI scores and PRI scores after 4 weeks of wearing the stabilization splint in comparison with the baseline and the same occurred after 4 months in comparison with 4 weeks.
There is significant reduction in the muscle activity using these splints and more effectively protected against excessive forces which cause unphysiologic muscle tension in eccentric position where the subject can trace reproducible mandibular border movement as recorded by the pantograph through PRI. This means that the canine guidance stabilization splint causes more significant reduction in the PRI score so provides more improvement of TMD symptoms.
Our result is in agreement with some authors who reported that the role of the canine guidance in splints to decrease muscle activity and pain has to be considered.[18,19]
Ledermann and Clayton[20] concluded that the PRI indicated the presence of Temporomandibular Joint (TMJ) dysfunction in 70% of patients with no subjective complaints, indicating that patients do not always know that they have Temporomandibular joint

dysfunction, so the pantographic reproducibility index was more reliable than clinical and subjective signs or symptoms in detecting TMJ dysfunction specially in the slight dysfunction category.

CONCLUSION

Author concluded that the canine guidance stabilization splint produces significant reduction in the TMD symptoms than bilateral balanced stabilization splint. Moreover, the pantographic reproducibility index is considered an important diagnostic objective method to monitor the success of occlusal splint therapy through the tracing of the functional capability of mandibular movements.

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Source of support: Nil **Conflict of interest:** None declared