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*Original Article*

# Occlusal Splints Used in Prosthetic Management of TMJ Disorders

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**Abstract**

An occlusal appliance (often called a splint) is a removable device, usually made of hard acrylic that fits over the occlusal and incisal surfaces of teeth in one arch, creating precise occlusal contact with the teeth of opposing arch. It is commonly referred to as a bite guard, night guard; inter occlusal appliances, intra-oral arthotic, or even orthopaedic device.

**Keywords:** Splints; Pain; TMJ; Muscle Deprogrammers; Device.

## Introduction

These are extensively used in management of TMJ disorders. They showed considerable control in myofacial pain, however no clear hypothesis about the mechanism of action has been proved. It has more of diagnostic value, for example, if a patient responds favorable to an occlusal device then the response to the same restorative permanent treatment should be positive. So it serves as an important diagnostic value before going to a fixed prosthodontic therapy [1,2].

## Literature Review

An extensive research was done in pubmed and science direct data bases on occlusal splint therapy using following meshwords like splints, pain, TMJ, muscle deprogrammers & device from the year 1983 till 2009 and 55 articles were found, out of which 13 articles were reviewed as per relevance for the present research paper.

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### *Definitions*

*Temporomandibular Joint:* The articulation between the temporal bone and the mandible. It is a diarthroidal, bilateral ginglymus arthroidal joint [3]. The articulation of the condylar process of the mandible and the interarticular disk with the mandibular fossa of the squmous portion of temporal bone; movement in upper joint compartment is mostly translational, whereas in the lower joint compartment is mostly rotational [4]. The joint connects the mandibular condyle to the articular fossa of the temporal bone with the temporomandibular disc interposed.

*Temporomandibular Disorders*

"Abnormal, incomplete, or impaired function of TMJ" [5].

*Occlusal Splint/Occlusal Device/Orthotics*

"Any removable artificial occlusal surface used for diagnosis or therapy affecting the relationship of the mandible to the maxillae. It may be used for occlusal stabilization, for treatment of TMJ disorders, or to prevent wear of the dentition."

*Occlusal Pivot*

"An elevation placed on the occlusal surface, usually in the molar region, designed to act as a fulcrum, thus limiting mandibular closure and

inducing mandibular rotation".

*Occlusal Prematurity*

"Any contact of opposing teeth that occurs before the planned articulation".

*Bruxism/Tooth Grinding/Occlusal Neurosis*

"The parafunctional grinding of teeth". "An oral habit consisting of involuntary rhythmic or spasmodic non-functional gnashing, grinding or clenching of teeth, in other than chewing movements of mandible, which may lead to occlusal trauma".

*Purpose*

The purpose of occlusal treatment is to make the teeth conform to a correct skeleton-related position of the condylar axis. The purpose of occlusal splints is to provide an indirect method for altering the occlusion until the correctness of the condylar axis position can be determined and confirmed.

*What Occlusal Splints Can Do*

An occlusal splint can effectively stabilize weak or hypermobile teeth by the adaptation of the splint material around the axial surfaces & distribution of occlusal forces along with reduction of wear & stabilization of the unopposed teeth [6,7].

*What Occlusal Splints Cannot Do*

Occlusal splints cannot cause effects that are in violation of mechanical laws. Thus an occlusal splint does not unload the condyles. The popular claim that a posterior occlusal splint serves as a pivot for distraction of the condyles is in violation of facts of anatomy, laws of physics, and clinical data.

TYPES: *According to Okeson [8];*

1. Muscle relaxation appliance/ stabilization appliance used to reduce muscle activity
2. Anterior repositioning appliances/ orthopedic repositioning appliance

*Other Types*

a. Anterior bite plane
b. Pivoting appliance
c. Soft/ resilient appliance

*According to Dawson*

1. Permissive splints/ muscle deprogrammer
2. Directive splints/ non-permissive splints
3. Pseudo permissive splints (e.g Soft splints, Hydrostatic splint)

MORA – mandibular orthopedic repositioning appliance

*Types of Occlusal Splints [9,10]:*

1. A permissive splint
2. A directive splint

*Permissive Splints*

Are designed to unlock the occlusion to remove deviating tooth inclines from contact. The condyles are then allowed to return to their correct seated position in centric relation if the condition of the articular components permits. Permissive splints are often referred to as muscle deprogrammers. A properly made centric relation occlusal splint is a permissive splint. If a centric relation splint is made with deep fossae and inclines that are too steep, it can be turned into a directive splint that limit condylar access to centric relation only.

*Directive Splints*

Are designed to position the mandible in a specific relationship to the maxilla. The sole purpose of a directive splint is to position or align the condyle-disk assemblies. Thus directive splints should be used only when a specifically directed position of the condyles is required.

*General Considerations*

Appliance therapy has several favorable qualities that render it extremely helpful for the treatment of many TM disorders. An appliance can affect a patient's symptoms in several ways. It is extremely important that when it reduces symptoms the precise cause-and-effect relationship be identified before irreversible therapy is begun. Occlusal appliances are equally helpful in ruling out certain etiologic factors. When a malocclusion is suspected of contributing to a TM disorder, occlusal appliance therapy can quickly and reversibly introduce a more desirable occlusal condition. They are a reversible non-invasive modality that can help manage the symptoms of many TM disorders. The success or failure of occlusal appliance therapy depends on the selection, fabrication, and

adjustment of the appliance and on patient cooperation.

*Description and Treatment Goals*

The muscle relaxation appliance is generally fabricated for the maxillary arch. When it is in place, the condyles are in their most musculoskeletally stable position at the time that the teeth are contacting evenly and simultaneously. Canine disocclusion of the posterior teeth during eccentric movement is also provided. Treatment goal eliminate any orthopedic instability between the occlusal position and the joint position.

*Indications*

1. Treat muscle hyperactivity
2. Decrease the parafunctional activity
3. Bruxism
4. Local muscle soreness or myositis
5. Retrodiscitis secondary to trauma.

*Simplified Fabrication Technique*

An alginate impression is made of the maxillary arch. It is poured immediately with a suitable gypsum product. With a pressure or vacuum adapter, 2-mm-thick hard, clear resin sheet of material is adapted to the cast. The outline of the appliance is then cut off the cast with a separating disk. The cut is made at the level of the interdental papilla on the buccal and labial surfaces of the teeth. The lingual border of the appliance extends 10 to 12 mm from the gingival border of the teeth throughout the lingual portion of the arch. The labial border of the appliance terminates between the incisal and middle thirds of the anterior teeth [11].

A small amount of clear self-curing acrylic resin is mixed in a dappen dish. It is added to the occlusal surface of the anterior portion of the appliance. This acrylic will act as the anterior stop. It is approximately 4 mm wide and should extend to the region where a mandibular anterior central incisor will contact.

*Developing the Occlusion*

When the CR position has been located, the patient should become familiar with it by wearing the appliance for a few minutes. Instructions are given to tap on the anterior stop. The appliance is removed from the mouth and self-curing acrylic is added to the remaining anterior and posterior regions of the occlusal surface. The appliance is then returned to the mouth, and the patient either closes or is guided into CR. The mandibular teeth should sink into the soft acrylic until the incisors contact the anterior stop.

*Adjusting the CR Contacts*

The occlusal surface of the appliance is best adjusted by first marking the deepest area of each mandibular buccal cusp tip and incisal edge with a pencil. The acrylic surrounding the pencil marks is removed so the relatively flat occlusal surface will allow eccentric freedom. All contacts, both anterior and posterior, should be carefully refined so they will occur on flat surfaces with equal occlusal force.

*Adjusting the Eccentric Guidance*

The acrylic prominences labial to the mandibular canines are smoothed. They should exhibit about a 30- to 45-degree angulation to the occlusal plane and allow the canines to pass over in a smooth and continuous manner during protrusive and laterotrusive excursions. It is important that the mandibular canines move freely and smoothly over the occlusal surface of the appliance. If the angulation of the prominences is too steep, the canines will restrict mandibular movement and may aggravate an existing muscle disorder.

Eccentric contacts of the mandibular central and lateral incisors also must be eliminated so the predominant marks are those of the mandibular canines. During a protrusive movement, guidance by the maxillary canines, not the mandibular central and lateral incisors, is the goal.

*Final Criteria for the Muscle Relaxation Appliance*

The following eight criteria must be achieved before the patient is given the muscle relaxation appliance:

It must accurately fit the maxillary teeth, with total stability and retention when contacting the mandibular teeth and when checked by digital palpation.

In CR all posterior mandibular buccal cusps must contact on flat surfaces with even force. During protrusive movement the mandibular canines must contact the appliance with even force. The mandibular incisors may also contact it but not with more force than the canines. In any lateral movement only the mandibular canine should exhibit laterotrusive contact on the appliance. The mandibular posterior teeth must contact the appliance only in the CR closure. In the alert feeding position the posterior teeth must contact the appliance more prominently than the anterior teeth. The occlusal surface of the

appliance should be as flat as possible with no imprints for mandibular cusps. The occlusal appliance is polished so it will to irritate any adjacent soft tissues.

*Instructions and Adjustments*

The patient is instructed in proper insertion and removal of the appliance. Finger pressure is used to align and seat it initially. Removal is most easily accomplished by catching it near the first molar area with the fingernails of the index fingers and pulling the distal ends downward. When bruxism is the problem nighttime use is essential while day use may not be as important. When the disorder is retrodiscitis, the appliance may need to be worn most of the time. It has been demonstrated that myogenous pain disorders respond best to part-time use (especially nighttime use) while intracapsular disorders are better managed with continuous use. If wearing causes increased pain, the patient should discontinue wearing and report the problem immediately for evaluation and correction. On certain occasions fabrication of a mandibular muscle relaxation appliance may be desirable. Evidence suggests that maxillary and mandibular appliances reduce symptoms equally. The primary advantages of the mandibular type are that it affects speech less and aesthetics may be better.

*Fabrication Technique*

Like the muscle relaxation appliance, the anterior repositioning appliance is a full-arch hard acrylic device that can be used in either arch. However, the maxillary arch is preferred because a guiding ramp can be more easily fabricated to direct the mandible into the desired forward position.

*Fabricating and Fitting the Appliance*

The initial step in fabricating a maxillary anterior repositioning appliance is identical to that in fabricating a muscle relaxation appliance. The anterior stop is constructed and the appliance is fitted to the maxillary teeth. Acrylic extending over the labial surfaces of the maxillary teeth is not needed for occlusal purposes.

*Soft or Resilient Appliance [12]:*

*Description and Treatment Goals*

The soft appliance is a device fabricated from resilient material that is usually adapted to the maxillary teeth. Treatment goals are to achieve even and simultaneous contact with the opposing teeth.

*Indications*

It is in indicated in persons likely to receive trauma to their dental arches or as a protective athletic splint to decrease the likelihood of damage to the oral structures when trauma is received. It is also indicated in bruxers. Okeson demonstrated that nocturnal masseter EMG activity was increased in 05 out of 10 subjects with a soft appliance; in the same study 08 of the 10 subjects had significant reduction of nocturnal EMG activity with a hard muscle relaxation appliance.

*Common Treatment Considerations of Appliance Therapy*

However, much controversy exists over the exact mechanism by which occlusal appliances reduce symptoms. Most conclusions are that they decrease muscle activity (particularly parafunctional activity). Before any definitive therapy beguns, one needs to be aware that there are six general features common to all devices that may be responsible for decreasing muscle activity and symptoms.

1. Alteration of the occlusal condition
2. Alteration of the condylar position
3. Increase in the vertical dimension
4. Cognitive awareness
5. Placebo effect: 40% of the patients suffering from certain TM disorders respond favorably to such treatment.
6. Increased peripheral input to the CNS: Any change at the peripheral input level seems to have an inhibitory effect on this CNS activity.

**Conclusion**

Despite the unanswered questions on the physiologic mechanisms that explain the effectiveness of intra-oral appliances on reducing symptoms of TMD, there is still a plethora of documentation that intra-oral appliance when used in the management plan accurately, can contribute to the relief of TMD symptoms. The clinician is encouraged to evaluate fully each particular patient case in an effort to develop a differential diagnosis that leads to effective management plan. Before commencing any appliance therapy for a TMD, the clinician should be confident that the patient will benefit from the therapeutic approach. If the symptoms reduced that will provide additional diagnostic information. The clinician also needs to consider that 40% of patients suffering from TMD demonstrate favorable response to therapy from a

placebo effect. As with any treatment, a good patient-dentist relationship and concomitant with patent education, can alloy patient feelings and anxieties. It can contribute to a positive and favorable response to intra-oral occlusal splint therapy.

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