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REVIEW ARTICLE

ESSENTIALS OF OCCLUSAL SPLINT IN THE MANAGEMENT OF TEMPOROMANDIBULAR DISORDERS: A LITERATURE REVIEW

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ABSTRACT

Acrylic resin interocclusal appliances have been used in dentistry for the management and treatment of temporomandibular disorders (TMDs). Appliances have been used with the goals of altering occlusal relationships, redistributing occlusal forces, preventing wear and mobility of teeth, reducing bruxism and other parafunctional habits, repositioning the condyle, and treating masticatory muscle pain. Articles from 1974 to 2013 were randomly selected using online search engine. Articles that could be procured have been compiled in this literature review

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INTRODUCTION

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” (Dylina et al., 2001). Occlusal splint is a diagnostic, relaxing, repositioning and reversible device. According to Glossary of Prosthodontic Terms-8, 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.” A bite splint can be a valuable diagnostic and treatment aid in carefully selected cases if properly made, adjusted and maintained. A properly constructed splint supports a harmonious relation among the muscles of mastication, disk assemblies, joints, ligaments, bones, teeth, and tendons. It provides a relatively easy, inexpensive and non-harmful way to make reversible changes in the occlusion (SangeetaYadav et al., 2011).

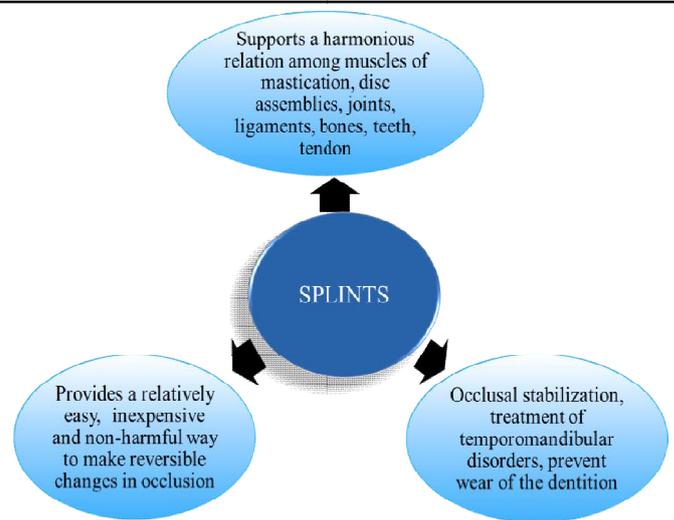


Fig. 1. Schematic diagram depicting what splints can do (Kreiner et al., 2001; Ash, 1986; Nelso, 1995; Attanasio, 1997, Boero, 1989)

Permissive Splints (Muscle Deprogrammers)

They are designed to unlock the occlusion to remove deviating tooth inclines from contact, thus eliminating the cause and effect of muscle in co-ordination. The condyles are then allowed to return to their correct seated position in centric relation (SangeetaYadav et al., 2011). The two classic designs

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of permissive splints are anterior midpoint contact splints (nociceptive trigeminal inhibition (NTI) splint, Lucia jig and the B splint) and full contact splints (centric relation splint).

### Directive Splints

They 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-disc assemblies<sup>2</sup>. The jaw to jaw relationship that results from maximum intercuspation with the splint determines the position of the condyles at the intercuspal position. Anterior repositioning splint is a type of directive splint.

### Stabilization Splint (Superior Repositioning Splint, The Tanner Appliance, The Michigan Splint, The Fox Appliance Or The Centric Relation Appliance)

It is a hard acrylic splint that provides a temporary and removable ideal occlusion, thereby reduces abnormal muscle activity and produces neuromuscular balance (Gray *et al.*, 2001). It is suggested that patients should wear the splint only at night. The splint should be adjusted over several visits as the masticatory muscles relax until a consistent jaw relationship is reached (between 2 to 3 months). A stabilization splint provides centric relation occlusion, eliminates posterior interference, provides anterior guidance and gives stable occlusal relationships with uniform tooth contacts throughout the dental arch. They are used in the following situations; masticatory myalgia, (Kurita *et al.*, 1997). TMJ arthralgia, oral habit management, parafunctional activity, (Solberg *et al.*, 1975; Okeson *et al.*, 1998) myospasms or myositis, trauma/inflammatory joint disorder.

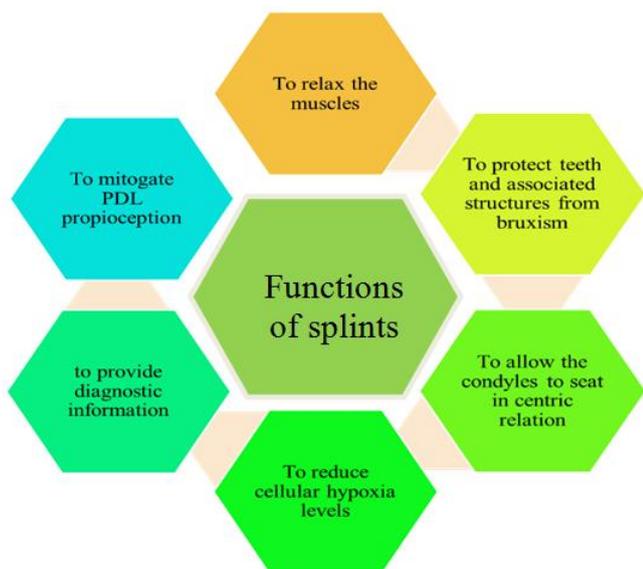


Fig. 2. Schematic diagram depicting functions of splints (Ramford and Ash, 1983; Manns *et al.*, 1993)

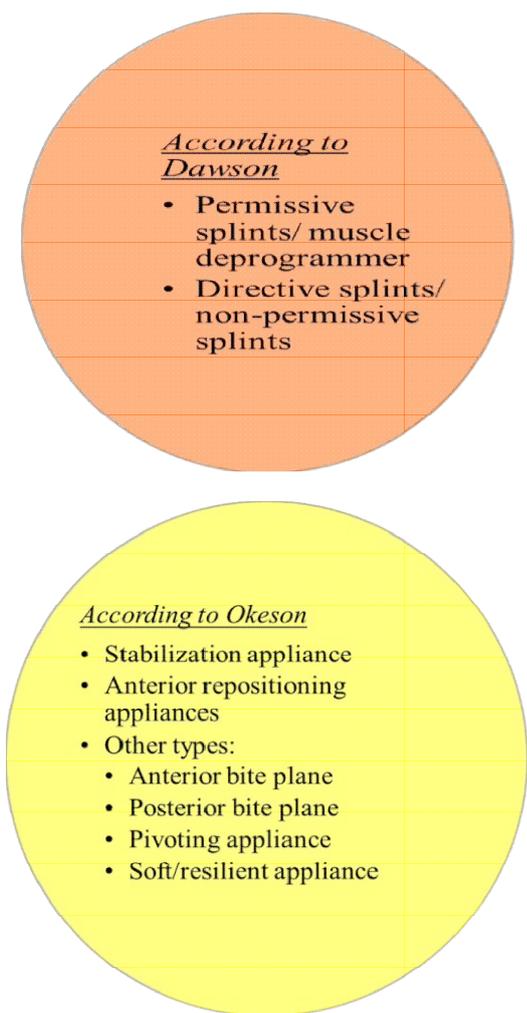


Fig. 3. Schematic diagram depicting types of occlusal splints (Dawson, 1989; Okeson, 1998)

Fig. 4. Stabilization splint (source: internet)

## Anterior Repositioning Splint

This splint induces a therapeutic mandibular position, forward to the maximum intercuspation position of the patient and position provides a more favorable condyle-disc relationship in the fossa, (Maloney and Howard *et al.*, 1986; Davies and Gray *et al.*, 1997). It is typically placed on the maxillary arch with an anterior ramp that first engages mandibular teeth on initial closure and shifts the jaw forward into final closure, when all mandibular teeth contact the splint. They are recommended only for short-term use because they can cause occlusal changes if worn continuously or chronically. The anterior repositioning splint is used in the treatment of disk-interference disorders, intermittent or chronic locking of the joint and inflammatory disorders, single or reciprocal click.



Fig. 5. Anterior repositioning splint (source: internet)

### Anterior Bite Plane

The anterior bite plane is a hard acrylic appliance which provides contact with only the mandibular anterior teeth. It is worn over the maxillary teeth and used to disengage the posterior teeth, thus eliminating their influence in the function or dysfunction of the masticatory system. Examples of anterior bite plane include Anterior jig, Lucia jig, Hawley with bite plane, anterior deprogrammer and Sved plate, (Farha *et al.*, 1991). Anterior bite plane therapy must be used only for a short period of time as continuous application for several

weeks to months can result in supraeruption of the unopposed mandibular teeth, thus later resulting in an open bite when the appliance is removed. It is indicated in the treatment of muscle disorders related to orthopedic instability or an acute change in the occlusal condition, and parafunctional activity associated with unfavorable posterior tooth contacts.



Fig. 6. Anterior bite plane (source: internet)

### Posterior bite Plane

Made of hard acrylic, it covers the posterior teeth and is connected by a cast metal lingual bar, used mainly on the mandibular teeth. The GELB-MORA (mandibular orthopaedic repositioning appliance) Gelb *et al.* (1991) is an example of a posterior bite plane. It is indicated when there is severe loss of vertical dimension of occlusion and when a major change in the anterior positioning of the mandible is desired. Constant and long term use is contraindicated as it can cause supraeruption of the unopposed teeth and the intrusion of the occluded teeth.

### Pivoting Splint (Distraction Splint)

It is a hard acrylic splint introduced by Krough-Poulsen that covers one arch and usually a single posterior contact in each quadrant. This contact is usually established as far posteriorly as possible. The proposed effect is that the condyles are pulled downward upon clenching on the pivot, thereby relieving traumatic load and giving the disc freedom to reassume a normal position. It is used to unload the articular surface of the joint caused by decrease in inter-articular pressure, to treat joint sounds and to treat symptoms related to degenerative joint diseases.



Fig. 7. Posterior bite plane (source: internet)

### Soft or Resilient Splint

This appliance is generally made of a resilient material (2-4mm of polyvinyl sheet) and is adapted to the maxillary arch. This splint should be worn only at night and generally produces symptomatic relief within 6 weeks. As they lose their resiliency over time, this appliance should be replaced every 4-6months. The soft splint is less likely to cause significant occlusal changes that are occasionally noted with hard occlusal splints. They are used to reduce symptoms of joint dysfunction or myalgia, to prevent bruxism and clenching and as a protective device in athletes.

### Bite Splint According to Shore

This splint has a similar design to the stabilization splint, except that it does not extend onto the facial or buccal surfaces of the teeth and it covers the entire palatal area. It is indicated in patients with parafunctional tongue activities.



Fig. 8. Soft or resilient splint (source: internet)



Fig. 9. Bite splint according to Shore (source:internet)

### Cap Splint

A cap splint can be referred to as an intermediary between a splint and a bridge. It is useful for temporary reconstruction before final decision about design, vertical dimension, etc., can be made. It is often made with metal with the occlusal surface in hard acrylic.

### Hydrostatic Pressure Appliance (Commercial name: Aqualizer)

It employs water to balance the biting pressure, to treat malocclusion and to relieve TMJ pain and symptoms associated with TMDs (Lerman *et al.*, 1974; Lerman *et al.*, 1974). When the hydrostatic cell is inserted between the

arches, a sequence of reorganization spreads throughout the stomatognathic system. Occlusal forces to every tooth become systematically equalized and axially oriented. The volume of fluid within the cells is adjusted to obtain the desired degree of increase in the vertical dimension of occlusion. It is worn for 24 hours and removed only while eating, for several weeks to years. The cells retain their fluid for about two weeks and a new cell is installed when the enclosed fluid escapes.



Fig. 10. Hydrostatic pressure appliance (Aqualizer, source: internet)

### NTI (Nociceptive Trigeminal Inhibition) Tension Suppression System

This appliance was introduced by Dr. James Boyd. The direct stimulation of the PDL of the incisors activates a feedback loop, limiting the contraction intensity of the closing muscles. The appliance takes advantage of NTI reflex via an acrylic guard worn on either the mandibular or maxillary incisors.

### Combination Splint

- An invisible retainer can act as a soft acrylic splint.
- A Shore splint can function as a temporary partial denture by adding artificial teeth.

- A removable bionator appliance acts as an orthodontic appliance and a repositioning splint (Abbott *et al.*, 1991)



Figure 11. NTI splint (source: internet)

### Location of Splint: Maxillary or Mandibular?

If teeth are missing, the splint is usually made in the jaw where most teeth are lost to increase the stabilizing effect by creation of additional occlusal points. In case of missing molars and premolars in both jaws, it is advisable to fabricate both upper and lower splint. In case of significantly increased incisor overjet, as in case of severe Angle Class II, an occlusal splint on the maxillary arch is preferred because it is difficult to achieve proper anterior contacts and guidance with a mandibular splint. In case of a deep curve of Spee, mandibular splint is preferred. Mandibular occlusal splint also offers the advantage of encouraging a better rest place for tongue (which is anterior palate).

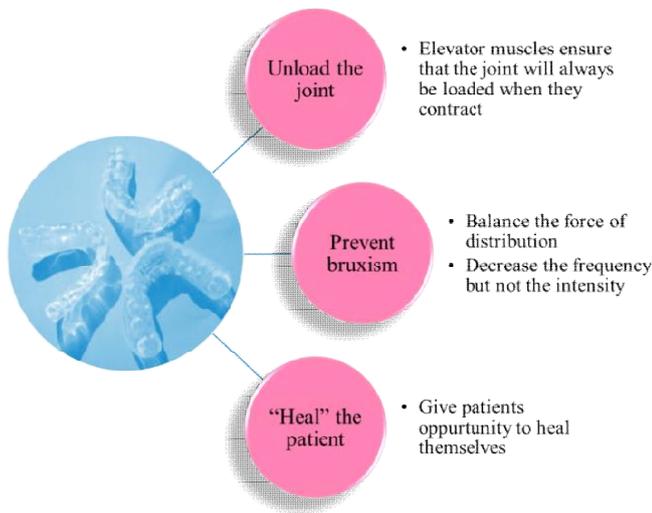


Fig. 12. Schematic diagram depicting what splints cannot do (Manns et al., 1979; Holmgren et al., 1993)

## Conclusion

Occlusal splint therapy has been used for many years for the diagnosis and treatment of various disorders of the masticatory system. Many designs are described in the literature. The different types of splint are used to treat different conditions. A proper examination and differential diagnosis are the prerequisites for making a decision regarding the appropriate splint therapy best suited for different situations.

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