



Journal Homepage: -www.journalijar.com
**INTERNATIONAL JOURNAL OF
 ADVANCED RESEARCH (IJAR)**

Article DOI:10.21474/IJAR01/5890
 DOI URL: <http://dx.doi.org/10.21474/IJAR01/5890>



RESEARCH ARTICLE

THE BASICS OF OCCLUSAL SPLINTS- A REVIEW.

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Manuscript Info

Manuscript History

Received: 16 September 2017
 Final Accepted: 18 October 2017
 Published: November 2017

Key words:-

Occlusal Splint Therapy, Splints,
 Temporomandibular Joint, Masticatory
 Muscles, Occlusal Interferences.

Abstract

Occlusal splint therapy is used routinely for diagnosis and treatment of various masticatory system disorders. Splints have proven for alleviating the pain of many types of temporomandibular disorders and bruxism, though questions still remain regarding how splints work. Treatment with these appliances is non-invasive, reversible, and provides proper treatment. The purpose of this paper was to review information regarding the basic splint types and how it works and when to use these effectively.

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Introduction:-

Treatment of occlusal-related disorders is often a challenge for both the dentist and the patient. These disorders are often difficult to diagnose, as the presenting symptoms can be variable. Occlusal splint design and function can be considered an example of the art and science of dentistry. Once the cause of occlusal-related disorders is identified, this reversible, non-invasive therapy provides both diagnostic information and relief without the problems that often accompany other approaches to care, ie, surgery and extended drug therapy.¹ 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.²

Goals:-

A common goal of occlusal splint treatment is to protect the TMJ discs from dysfunctional forces that may lead to perforations or permanent displacements. Other goals of treatment are to improve jaw-muscle function and to relieve associated pain by creating a stable balanced occlusion.² It is the most widely accepted form of therapy for nocturnal bruxism and ensuing signs and symptoms of craniomandibular disorders (CMD).³

Classification:-

Okeson classified splints as: 1) Muscle relaxation appliance/ stabilization appliance used to reduce muscle activity. 2) Anterior repositioning appliances/ orthopedic repositioning appliance.⁴

Other types: a) Anterior/Posterior bite plane b) Pivoting appliance c) Soft/ resilient appliance (silicone)

Dawson classified splints as: 1. Permissive splints/ muscle deprogrammer. 2. Directive splints/ non-permissive splints. 3. Pseudo permissive splints (e.g. Soft splints, Hydrostatic splint).⁵

Permissive Splints:-

A permissive splint allows the teeth to move on the splint unimpeded, which in turn allows the condylar head and disk to function anatomically⁶. These include bite planes (anterior deprogrammer, Lucia jig, anterior jig) and stabilization splints (Tanner, centric relation, flat plane, and superior repositioning).²

The two classic designs of permissive splints are anterior midpoint contact splints and full contact splints.

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Concepts behind splint designs:-

1. Anterior midpoint contact permissive splints- It removes occlusal interferences to complete joint seating on closure. Simultaneously, it allows freedom for full seating of the mandibular condyles when the elevator muscles contract on closure. It encourages release of the lateral pterygoid and anterior neck positioning muscles on closure.⁶ It has been shown through electromyography that molar contact allows 100% clenching force; cuspid contact permits approximately 60% maximum clenching force; and incisor contact minimizes elevator muscle clenching force to 20% to 30% of maximum clenching force.⁷ Therefore, muscle clenching forces are reduced significantly when contact is isolated exclusively on the incisors.⁸
2. Full contact permissive splints- Uniform contacts are established on all teeth when the joints are fully seated by the elevator muscles or manually by the clinician. Dawson's bimanual manipulation technique is used to seat the joints when adjusting the splint occlusion in centric relation.⁶

Directive Splints/Non-Permissive Splints:-

Should be used only when a specifically directed position of the condyles is required.⁹ It has a ramp or "indentations" that position the mandible inferiorly and anteriorly and secure it there.² Examples include an anterior repositioning appliance (ARA) and a mandibular orthotic repositioning appliance (MORA).^{2,10}

Concept behind splint design:-

The only purpose of a directive splint is to position or align the condyle-disc assemblies. They guide the mandibular condyles away from the fully seated joint position when a painful joint problem is present.⁶

Pseudo Permissive Splints:-

Do not provide the characteristics necessary for successful splint therapy. These splints can exacerbate bruxism, possibly due to premature posterior contacts related to the fact that these splints cannot be balanced.⁷

Different Types Of Splints:-**Stabilization Splint:-**

The stabilization splint is a hard acrylic splint that provides a temporary and removable ideal occlusion. Providing an ideal occlusion by the use of splint therapy reduces abnormal muscle activity and produces neuromuscular balance.¹¹ The teeth are contacting simultaneously and musculoskeletally; the condyles will be in their most stable position.¹² Also known as the superior repositioning splint, the Tanner appliance, the Michigan splint, the Fox appliance or the centric relation appliance.¹¹ The splint needs to be adjusted (rebalancing of the splint to the new position of the jaw by grinding some of its surface points, since the lower jaw will adopt a new position as a result of wearing the splint) over several visits as the masticatory muscles relax until a consistent jaw relationship is reached.⁹ Indications: Muscle hyperactivity, myospasms or myositis and parafunctional activity

Anterior Repositioning Splints:-

It encourages the mandible to assume a more anterior position to the centric occlusion to provide more favorable condyle relationship in the fossa. The anterior repositioning splint places a patient's mandible and TMJ into an anterior position so as to reduce a TMJ click that occurs on opening and closing of the jaw. The anterior repositioning splint 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. This position provides a more favorable condyle-disc relationship in the fossa so that normal function can be established.⁹

Indications- 1. For intermittent jaw locking with limited range of motion
2. To treat disc derangement disorders. Patients with joint sounds (e.g., a single or reciprocal click).¹²

Anterior Bite Plane:-

The anterior bite plane is a hard acrylic appliance worn over the maxillary teeth that provides contact with only the mandibular anterior teeth. It is primarily intended to disengage the posterior teeth. By disengaging, it eliminates the influence on the function of the masticatory system.^{9,12}

Examples- Anterior jig, Lucia jig, Hawley with bite plane, anterior deprogrammer and Sved plate

Indications-

1. Muscle disorders related to orthopedic instability or an acute change in the occlusal condition.
2. Parafunctional activity associated with unfavorable posterior tooth contacts.

Posterior Bite Plane:-

It is fabricated for the mandibular teeth. It consists of areas of hard acrylic located over the posterior teeth which is connected by a cast metal lingual bar. The treatment goal is to achieve major alterations in vertical dimension and repositioning of mandible.¹² If the appliance is worn continuously for several weeks or months, it is likely that the unopposed mandibular teeth will supraerupt.⁹ Example- Gelb (Gelb-MORA [mandibular orthopedic repositioning appliance]) splint

Indications-

1. Severe loss of vertical dimension
2. When major changes in anterior positioning of the mandible are needed

Soft or Resilient Appliance:-

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. These appliances are generally worn only at night and if they are successful, will produce symptomatic relief within 6 weeks. Generally made out of 2 - 4 mm polyvinyl sheet.¹²

Indications-

1. In reducing symptoms of temporomandibular disorders
2. Protective device for persons likely to receive trauma to their dental arches (athletic splint)
3. To prevent bruxism and clenching

Hydrostatic Appliance (Aqualizer) :-

It employs water to balance the biting pressure, to treat malocclusion and to relieve TMJ pain and symptoms associated with TMDs.^{13,14} When the hydrostatic cell is inserted between the arches, a sequence of reorganization spreads throughout the stomatognathic system, and all occlusal disharmonies are compensated automatically by distribution of fluid within the cell. Occlusal forces to every tooth contacting the cell thereby become systematically equalized and axially oriented.⁹ Occlusal forces that normally arise individually as the result of many maxillary and mandibular tooth contacts now are created as a whole within the hydrostatic cell, and distributed to each tooth that contacts the cell. The hydrostatic appliance should be worn 24 hours and removed only while eating, for a period ranging from several weeks to years.⁹ The appliance depends on the concept that mandible finds its ideal position automatically as the appliance will not direct where the jaw should be.

Conclusion:-

Clinicians should have a thorough knowledge and understanding of the functioning of masticatory system. A proper examination and differential diagnosis of the TMJ and its related structures is necessary to lead to a decision regarding the appropriate role of splint required for any particular condition.¹² A variety of splints and various designs are available, but a proper understanding of the topic is required regarding the use of specific splint design for the specific purpose. This article enlightens a few designs of splints available and its role in resolving or managing masticatory system disorders.

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