

Different Types of Occlusal Splint Used In Management of Temporomandibular Joint Disorders- A Review

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Review Article

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Abstract:

American academy of orofacial pain stated that, TMD is referred as a combined term taking up a variety of clinical problems that involve the masticatory musculature, the TMJ and associated structures or both.

A variety of therapeutic modalities have been proposed for the management of TMD's, such as orthopaedic stabilization, intraoral appliances, behavioural therapy, physiotherapy, pharmacological modalities and jaw exercise and collective treatment^[1]. "Splint" can be several apparatus, appliance or device employed to provide stabilization or support of teeth or bones, or generally to resist motion or displacement of fractured or

injured structures (Glossary of orthodontic terms). [2] Classification of occlusal appliances. According to Okeson [3] is Stabilization appliance, Anterior repositioning appliances (ARA) and other types such as Anterior/Posterior bite plane, Pivoting appliance, Soft/ resilient appliance (silicone) . There are different methods for fabrication of appliances and it will depend on the type of appliance's mode of action. Different materials are available to make these appliances. Flexibility of appliance will depend on the material used (acrylic, transparent thermoplastic material). Different splints have different drawbacks which should be taken into consideration before delivering it.

A 1990 survey of a random sample of 10,000 members of the American Dental Association (with a 25 percent response rate) identified splint therapy as the most used treatment modality.

Purpose of this study is to review information regarding different studies carried out to see which type of splints used in treatment of TMD and to give clinician proper splint that can be deliver for specific problem. This article, review's the narrative in relation to Occlusal Splint in Management of Temporomandibular disorders (TMD).

Keywords: ‘Appliance of occlusal area’, TMD, splints, myofascial pain; craniomandibular disorders.

Introduction:

The lower jaw & base of skull is connected by a joint called the temporomandibular joint. Craniomandibular disorder (CMD) is a group of disorders with wide variety of signs and symptoms which involve joint pain or muscles of jaw or on mandibular movement, clicking, noise, and grating in the jaw joint, locking/luxation of joints or problems such as chewing or opening the jaw.

There are different treatment modalities available for treating TMD which can be categorised as conservative treatment in which comes are physical therapy, localized steam application, external muscle massage ([Reisine and Weber, 1989](#)), occlusal adjustment ([Lundh et al., 1988](#)), analgesia, psychotropic medication ([Greene, 1992](#)), splint therapy ([Kafas et al., 2007b](#)), alternative therapies such as acupuncture ([List et al., 1993](#)), as well as treatment modalities such as ultrasound, soft laser, diathermy, and infrared radiation ([Mohl et al., 1990](#)) and Surgical management.[1]

Purpose of this study is to reassess information regarding different type of splints in management of temporomandibular disorder. So the current article reassessed the narrative regarding Splints used occlusally in treatment of Temporomandibular disorders.

Occlusal splints and its types:

“Splint” can be several apparatus, appliance or device employed to provide stabilization or support of teeth or bones, or generally to resist motion or displacement of fractured or injured structures (Glossary of orthodontic terms) [2]

Classification of occlusal appliances

- **According to Okeson [3]**

- 1) Stabilization appliance
- 2) Anterior repositioning appliances (ARA)/ Mandibular orthopedic repositioning appliance (MORA)

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. Non-permissive splints/ Directive splints
3. Pseudo permissive splints (e.g. Soft splints, Hydrostatic splint)

There are different methods for fabrication of appliances and it will depend on the type of appliance's mode of action. Like if the appliance allows mandible to glide freely and allow closing it in maximum intercuspation or holding mandible in proper condylar position and physical aspect of appliance i.e. coverage of teeth in jaw whether it cover upper arch or lower arch teeth, type of retention used, material used for its fabrication, and its thickness. Stabilization and anterior positioning appliances are the two common appliances which have generally used in treatment of TMJ patients.

Different appliances are used for different purposes like anterior positioning splint is used in patient of disk displacement with reduction it will hold mandible in such a position so that disk and condyle should close in proper articulation and it will ensure minimal or no trauma to retrodiscal tissue and the loading force will be transmitted to intermediate zone of disk. Whereas in stabilization appliance it has a flat occluding surface with contemporary arch, which allows free movement of lower jaw from maximum intercuspation and can be given in patients with tooth attrition or TMD symptoms.[4]

Designs of Oral appliance and related concepts:

- 1) Flat plane stabilization appliance :

Stabilizing splint is one of the most commonly used splints. Also called "Michigan splint", 'muscle relaxation appliance'/ gnathologic splint and it's usually made for upper arch. Being made up of hard acrylic or polycarbonate material, when this appliance is given intraorally, it causes minimal change in relation of maxilla and mandible only the thickness of material can produce whatever change in maxillomandibular relation occur. This splint has least adverse effect and it is most commonly used splint. It can be fabricated in lower arch, according to a study conducted by Turb J C et al (2004) statistically significant reduction in severity of symptoms are achieved with mandibular stabilization appliance as compared to anteriorly

occluding maxillary splint (relaxing splint)[5]. For decreasing muscle tension [7] & promoting occlusal stability [6] Stabilizing splint has been designed.

Study was conducted by Pficer.J.K et al (2017) according to which Stabilizing splint can play a important part in managing TMDs in short span, whereas the outcome is poised with erstwhile therapeutic modalities for long term follow up. Outcome of stabilizing splint also depends on certain factors among which only continuous use of this splint can cause reduction in symptoms of TMD's .As concluded by results wearing splint for 24 hours per day results in occlusal stabilization [8].

2) Anterior Bite Plane: Mini Anterior Appliances

This splint engages only maxillary incisors [9].EMG study was done by Becker to record clenching force in numerous areas of jaw. Study shown that clenching force was 100% upon molar contacts, whereas it was 60% with cuspids & it was found minimum ie: 20-30% on incisor contact of maximum clenching force[10] This appliance is employed to scale back parafunctional movement. It disengages posterior teeth and causes elimination of clenching forces over that area. Bite plane therapy should be used when there's a muscle disorder caused because of excessive loading of musculature and hyper occlusion; these bite plates allow muscle to relax. It is suggested mostly in patients having muscle pain which could be acute/ chronic. Nociceptive trigeminal inhibition (NTI) splint, Lucia Jig come under Anterior midpoint contact permissive splints.

This appliance covers only anterior teeth so chances of overeruption of posterior teeth are more which can result in anterior open bite. Moreover, it can lead to intruded upper front teeth which held the appliance would exaggerate. This can be major concern of using miniature splint as possibility of adverse occlusal changes occurring with it because of continuous and long-term use is more. There are chances that the upper teeth holding this appliance can displace by occlusal forces or lower teeth because of single point contact may show unfavourable mobility of anterior teeth.

Besides, there's a chance of dangerous attributable for tiny mass of those appliances, within which it is also swallowed. [11]

3) Anterior Bite Plane: Traditional Anterior Bite Plane

These splints are made from hard acrylate resin. Their design is such a that they cover occlusal table of 6 or 8 posterior teeth with a horse shoe shape palatal-coverage advocated in maxillary arch. They're mainly wont to prevent clenching and also for treating TMDs. Also, an undesirable changes could take place within sort of supraeruption of teeth in posterior region of jaw which is not acceptable,if used only at nighttime & with no support in posterior region, Temporomandibular joints are going to be overloaded [12].

4) Anterior Repositioning Appliance (Orthopedic Repositioning Appliance):

Anterior disk displacement is functionally classified as displacement with or without reduction. Displacement with reduction is clinically characterized by reciprocal clicking. To treat such style of disorder this splints are intended in 1971 by Farrar. This splint alters maxillomandibular relationship in order that mandible is positioned anteriorly so as to take care of normal relation of condyle and disk [13]. It causes anteriorly displaced disk to come to its original place for stabilizing relationship between disk & condyle (recaptured). It can

even be utilized in cases like retrodiscal trauma with edema, directive splint is employed to carry the condyle forward. It'll prevent compression of the retrodiscal tissue.

The Splint should lean for shorter time in order that it'll not cause any irreversible changes in lateral striated muscle [14].

5) Posterior Bite Plane Appliance (Mandibular Orthopedic Repositioning Appliances):

MORA is formed from hard acrylate resin. It's to be worn on lower arch. It's designed such it'll disocclude anterior teeth. Hard acrylic tables are given of posterior teeth like molar and premolar each side are connected by lingual block. [15,16]. Such appliance is meant to supply horizontal maxillomandibular relationship and vertical dimension changes. Functional maxillomandibular relationship should be checked properly [17] as appliance is meant to supply ideal maxillomandibular relationship, followed by occlusal procedure to take care of ideal relation permanently. In contrast to miniature splint, this appliance makes contact on teeth in posterior region which could lead to intrusion of opposing teeth in posterior region or overeruption by anterior teeth ends up in posterior open bite. [18]

6) Pivot Appliances:

This device is additionally manufactured from hard acrylic and forms one point contact in both the arches. Appliance is fabricated such a that it'll cover complete upper and lower jawbone and one occlusal contact, placed posterior on most region of the arch in each quadrant.

The appliance is given in patients having internal disc derangements or intracapsular inflammation. It can act by reducing intra-capsular pressure by condylar distraction. On clenching there is downward pulling of condyle upon pivot during this case mandible fulcrums round the pivot leading to unloading of articular surface of joint of the joint giving disk freedom to maneuver to its original place. [12]

However studies proved that there's no distractive effects are seen by occlusal pivot. If a unilateral pivot is placed on the posterior aspect it can unload contralateral side joint and slightly distract ipsilateral joint. However, the device which was modified could cause changes in occlusal areas like in pivot region opening of posterior bite. [19]

Pseudo Permissive Splints:

Two splints given below i.e Soft splints and hydrostatic splints are considered as pseudo-permissive splints. These splints can exacerbate bruxism, possibly thanks to premature posterior contacts associated with the very fact that these splints can not be balanced [20].

1) Hydrostatic Appliance:

This appliance is originally given by Lerman over 30 years ago. Its commercial name is Aqualizer. It's called as hydrostatic appliance because it has bilateral water filled chamber on posterior teeth occluding thereon. These chambers are attached to acrylic palatal plate. It is available as Aquasplint mini, Aquasplint classic and Aquasplint ultra. It is inserted either in upper and lower jawbone. [21]

Concept of mode of action is that the correct placement of mandible is identified by mandible itself and device won't direct the jaw to rest position. However, there is no proof on such thing till date.

2) Soft rubber splint:

For fabrication of sippy tissue splint a vaccum pressure molding device is required during which 2 mm thick resilient rubber sheet is employed (polyvinyl sheet). This splint is accustomed reduce any pain and discomfort or myalgia of joint also for prevention of bruxism , clenching and might be employed by athletes. But it can even aggravate bruxism thanks to imbalanced occlusion contacts [22]. Importance of recognizing complications and action to be taken after recognizing is of utmost importance.[23]

Summary of different splints used for treatment of TMD'S in orthodontics:

Splints	Uses of splint
Flat plane stabilizing appliance	1)Promotes occlusal stability 2)Muscle relaxation 3) Mandibular position deprogramming. 4) Vertical dimension alteration.
Anterior bite plane- mini anterior appliance	1) Reduces clenching force on muscles. 2) Reduces parafunctional movement. 3) To unload TMJ.
Anterior bite plane- traditional anterior bite plane.	1) Reduces clenching forces on masticatory muscle.
Anterior repositioning appliance	1) To treat reciprocal clicking 2) Stabilization of condyle-disk relation. 3)To prevent compression of retrodiscal tissue
Posterior bite appliance	1) To produce horizontal maxillomandibular relationship and vertical dimension changes.
Pivot appliance (distraction splint)	1) To treat internal disc derangements or intracapsular inflammation by condylar distraction.
Hydrostatic splint (Aqualizer)	1) Mandibular repositioning.
Soft rubber splint	1) Reduce pain or discomfort, myalgia. 2) Prevent bruxism and clenching. 3) Used by athletes as protective appliance.

Conclusion:

This article is review of different types of splint that can be given to TMD patient for different problems and for selecting proper splint clinician should have through understanding of dynamics of mastication and carry out a complete assessment of Temporomandibular joint and its associated make-up. Perfect appliance with fewer complications should be delivered.

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