

Review Article

OCCLUSAL APPLIANCES – A REVIEW

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ABSTRACT:

Over the years, functional disturbances of the masticatory system around TMJ have been identified by different terms. Temporomandibular joint disorders (TMDs) are the most frequent and latest term used to describe this group of symptoms around the TMJ. TMD refers to a cluster of conditions characterized by pain in the TMJ or its surrounding tissues, functional limitations of the mandible, or clicking in the TMJ during motion. Symptoms of TMD include joint pain, joint clicking, popping, jaw stiffness, radiating pain to neck or face, ringing of ears and limited movement of jaws.

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INTRODUCTION

Over the years, functional disturbances of the masticatory system around TMJ have been identified by different terms. Temporomandibular joint disorders (TMDs) are the most frequent and latest term used to describe this group of symptoms around the TMJ.¹

TMD refers to a cluster of conditions characterized by pain in the TMJ or its surrounding tissues, functional limitations of the mandible, or clicking in the TMJ during motion.² Symptoms of TMD include joint pain, joint clicking, popping, jaw stiffness, radiating pain to neck or face, ringing of ears and limited movement of jaws.

There are different treatment modalities available for treating TMD which can be categorised as conservative treatment in which comes are physical therapy:³

- 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., 2007)
- alternative therapies such as acupuncture (List et al., 1993)
- ultrasound, soft laser, diathermy, and infrared radiation (Mohl et al., 1990)
- Surgical management.(Seifeldin)

“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.”⁴

Occlusal splint therapy has been used for many years for the diagnosis and treatment of various disorders of the masticatory systems.⁵ It is defined as “the art and science of establishing neuromuscular harmony in the masticatory system by creating a mechanical disadvantage for parafunctional forces with the removable appliances”.⁶

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.⁷

OCCLUSAL SPLINT INDICATIONS

- Patients with masticatory myalgia or TMJ arthralgia⁸
- Patients with myospasms or myositis⁸
- Patients with a history of trauma or inflammatory joint conditions and existing causes of parafunctional activity, such as bruxism^{6,8,9}
- Patients with unstable occlusion (Yadav & Karani, 2011).
- Patients with stress-related pain symptoms, such as tension headaches and neck pain of muscular origin^{6,8,9}

CLASSIFICATION OF OCCLUSAL APPLIANCES

According to Okeson¹⁰

- Muscle relaxation appliance or stabilization appliance
- Anterior repositioning appliance or Orthopaedic repositioning appliance
- Anterior bite plane
- Posterior bite plane
- Pivoting appliance

According to Dawson¹¹

- Permissive splints or muscle deprogrammer
- Directive splint or non-permissive splint
- Pseudo permissive splints

Characteristics of Occlusal Splint

The characteristics of a successful splint should include stability, balance in centric relation, equal intensity stops on all teeth, immediate posterior disocclusion, smooth transitions in lateral, protrusive and extended lateral excursions, comfort during wear, reasonable esthetics and patient compliance.⁸

FLAT PLANE STABILIZING APPLIANCE

Other names for this appliance are superior repositioning splint, the Tanner appliance, the Michigan splint, the Fox appliance, or the centric relation appliance.¹² It is mostly prepared in the in the upper arch with acrylic or polycarbonate.

In optimal position- condyles are musculoskeletally stable and simultaneously teeth are contacting with canine disocclusion of posterior teeth during eccentric movement.¹²

It increases occlusal stability, muscle relaxation, mandibular posture deprogramming, and vertical dimension modification.¹³ This is the most commonly used type of intraoral appliance, and when properly fabricated it has the least potential for adverse effects to the oral structures.¹⁴



Figure: Flat plane stabilizing appliance

Indications for the Michigan splint include TMJ and muscle disorders and pain, severe bruxism, diagnosis and treatment of trauma from occlusion to any part of the masticatory system.¹⁴

Study was conducted by Pficer.J.K et al (2017) according to which Stabilizing splint can play 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 TMDs. As concluded by results wearing splint for 24 hours per day results in occlusal stabilization.¹⁵

ANTERIOR REPOSITIONING APPLIANCE OR ORTHOPAEDIC 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 these splints are intended in 1971 by Farrar.¹⁶ This splint affects the physiological topographical relationship of the disc condyle complex. It induces a therapeutic mandibular position which is forward to the maximum intercuspation position of the patient.¹

It treats reciprocal clicking, stabilizes the condyle-disk relationship, and reduces retrodiscal tissue compression by moving the condyle away from the fully seated joint position.¹⁴ The beneficial effects of the anterior repositioning splint on the TMJ are pain and noise reduction and mandibular function improvement in patients with arthrogenous TMDs, which may be attributed to restoring normal disc-condyle relationship.¹⁷

The splint should lean for shorter time in order that it'll not cause any irreversible changes in lateral striated muscle.¹¹

ANTERIOR BITE PLANE

Traditional Anterior Bite Plane

Prepared from acrylic, this design provides contact with only the mandibular anterior teeth. It eliminates the influence of posterior teeth in the function or dysfunction of the masticatory system.¹ It disengages all teeth except the incisors, reducing the clenching force on muscles, parafunctional movement, and TMJ strain.¹⁴

However, undesirable changes could take place such as supraeruption of teeth in posterior region of jaw which is not acceptable, if used only at night time & with no support in posterior region, Temporomandibular joints are going to be overloaded.¹⁸

Mini splint Appliances

These splints engage only maxillary incisors.¹⁹ 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. This appliance covers only anterior teeth so chances of supraeruption 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.³

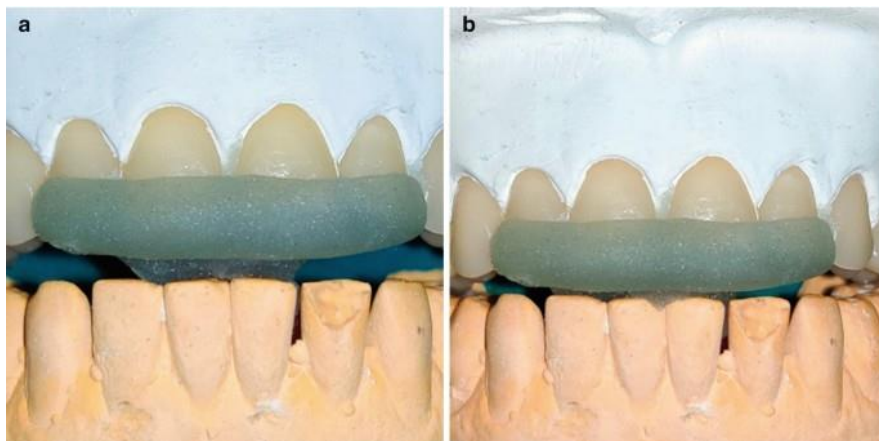


Figure: Anterior bite plane

They include the nociceptive trigeminal inhibition tension suppression system, the best bite, and the anterior midline point stop devices.³

POSTERIOR BITE PLANE

MORA (Mandibular Orthopedic Repositioning Appliances) is formed from hard acrylate resin. It's to be worn on lower arch. It's designed such that it'll disocclude anterior teeth. Hard acrylic tables are given on posterior teeth like molar and premolar each side are connected by lingual block. This appliance aims to achieve a horizontal maxillomandibular relationship, major vertical dimension changes, and mandibular repositioning.¹⁴



The lower mandibular acrylic splint is constructed as per the bite manipulated by the K7. At this bite, the mandible is in its most relaxed position and is worn as a daytime appliance only (in case the patient does not suffer from OSA) for 4 months.

Figure: Posterior Bite plane

It also has been claimed that this type of appliance has the ability to increase overall physical strength and enhance athletic performance. The major concern regarding this appliance design is that occlusion only occurs on posterior teeth, thereby allowing for over-eruption of the unopposed anterior teeth and/or intrusion of the opposing posterior teeth, resulting in an iatrogenically created posterior open bite.²⁰

PIVOT APPLIANCES

Also known as a distraction splint, the pivot splint was introduced by Krough-Poulsen.¹ This device is additionally manufactured from hard acrylic and forms one point contact in both the arches. Appliance is fabricated such that it'll cover complete upper and lower jawbone and one occlusal contact, placed on posterior most region of the arch in each quadrant.³

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.¹ 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 disc freedom to maneuver to its original place.¹⁸ However, studies proved that 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.²¹

PERMISSIVE SPLINTS OR MUSCLE DEPROGRAMMER

They have a smooth surface that can face either the upper or lower arch if the mandible can freely get positioned into centric relation. They are designed to unlock condyle to slide freely into centric relation. Hence occlusion is unlocked by removing deflecting tooth inclines.¹

It achieves balanced muscular function and eliminates abnormal occlusal contact (by reducing parafunctional activity). Consequently, muscular activity can also be controlled.²²

DIRECTIVE SPLINT OR NON-PERMISSIVE SPLINT

They are designed to direct condyle to a predetermined position. The main purpose of this appliance is to position or align condyle-disc assemblies. Hence, they should be used in intracapsular TMDs.¹

PSEUDO PERMISSIVE SPLINTS

Two splints given below i.e Soft splints and hydrostatic splints are considered as pseudo permissive splints. They are usually fabricated from resilient materials designed to separate maxillary teeth. The function of these splints differs greatly from permissive splints; therefore, they may exacerbate bruxism, possibly by causing premature posterior contacts due to their imbalance.¹¹

Hydrostatic splint

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.²³

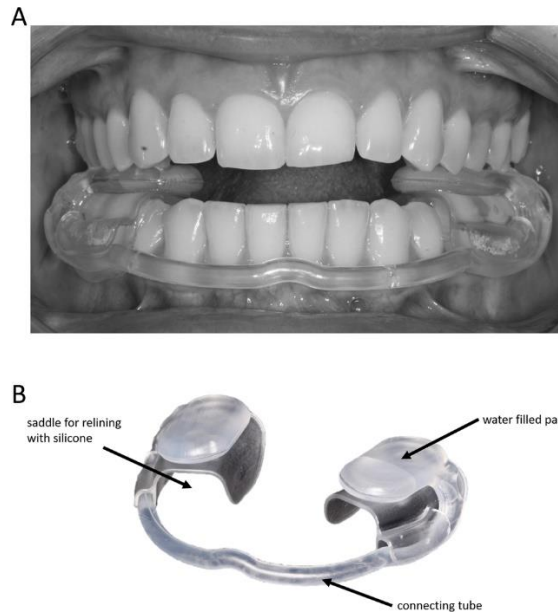


Figure: Aqualizer

They are designed to balance the biting pressure by employing water. A sequence of reorganization spreads through the stomatognathic system when the hydrostatic cell is inserted between the arches. By the distribution of fluid within the cell, all occlusal disharmonies are compensated automatically.¹

Soft splints

A resilient appliance achieves even and simultaneous contact with opposing teeth to relieve pain, discomfort, myalgia, bruxism, and clenching.¹⁴



Figure: Soft splint

They are usually adapted to the upper arch. They are designed to achieve even and simultaneous contact with opposing teeth.¹ This splint is accustomed to reduce any pain and discomfort or myalgia of joint also for prevention of bruxism, clenching and might be employed by athletes.²⁴ As it is quick to fabricate hence it can be used as an emergency treatment for acute TMD patients.¹

But it can even aggravate bruxism thanks to imbalanced occlusion contacts.²⁴

UTILIZATION

According to Yadav et al., the duration of treatment varies according to the type of therapy and rate of recovery to prevent involuntary parafunctional motor activities such as bruxism and clenching. It is recommended that patients wear splints only at night. Those unable to manage their habits when awake may have to keep their splint during the day. Wearing them constantly for twenty-four hours a day might cause irreversible changes in occlusion. Individuals with intracapsular pathology who wear anterior bite splints for longer than two weeks have a higher risk of compression.⁸

If splint therapy is successful, the patient can retain the splint to use on an as-needed basis. If the symptoms get reduced it will provide additional diagnostic information.¹

The Short- and Long-Term effects of occlusal splints and other treatment Techniques:

The long-term efficacy of occlusal therapies in treating TMDs is debatable (Pfcier et al., 2017), and researchers should consider both the short- and long-term therapeutic effects in their investigations. According to the

American Association for Dental Research (AADR), policy the treatment should be evidence-based and offer the greatest possibility for long-term relief.¹⁵

A study compared two groups using occlusal splints and other treatment modalities to determine the short- and long-term efficacy of TMDs. The occlusal splint provided patients with TMDs with short-term benefits, but its long-term effect was comparable to other therapeutic modalities.¹⁵ Another study was conducted to determine the effectiveness of oral splints in reducing pain intensity in patients with TMDs during both short- and long-term treatment and, the short-term trials, demonstrated pain reduction superior to that of the control group; however, in long-term studies, it becomes inconsequential.²⁵

CONCLUSION

As explained in the literature, occlusal splints are appliances that can be used to create separation between teeth, relax the oral musculature and position the condyle-disk assembly in a comfortable position helps in healing and fibrosis of inflamed retrodiscal tissue. Each appliance is built with a specific purpose targeting to relieve symptoms of TMD.

Familiarity with application of splint therapy for patients with occlusal-related disorders can be one approach to treatment of affected individuals. Proper diagnosis and fabrication of the appropriate device can often result in relief of symptoms.²⁰

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