



Comprehensive Appraisal of Applications and Usages of Intra-Oral Appliances for the Clinical Management of Temporomandibular Disorders: A Review of Literature

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ABSTRACT:

Numerous anomalies of the masticatory system have been identified and treated with OAT (occlusal appliance therapy). These non-invasive, reversible medical devices are effective at treating patients. The recommended course of treatment for temporomandibular disorders is discussed in the literature, along with the use of intra-oral splints. Choosing the ideal design for the patient's disorder will be simpler if you have a better understanding of the physiologic and therapeutic impacts of splints. Basic inter-occlusal splint designs are offered to readers in this review article, along with guidelines on when and how to use them.

Introduction

The somatognathic system supports mastication, including speaking, swallowing, chewing, and aesthetics. The system is composed of the TMJ,

muscles of mastication, and dentition, coordinated by the central nervous system.¹ Costen coined "temporomandibular disorder" in 1934 to refer to a group of symptoms that are frequently observed in various combinations and are brought on by altered



anatomic relationships and TMJ derangement linked to loss of vertical dimension of occlusion, loss of support of the back teeth, and associated malocclusions.² According to Anderson et al., over 75% of people exhibit at least one symptom of joint dysfunction, such as discomfort with touch, clicking sounds of the jaw, or deviation during movement of the jaw.³ Intra-oral occlusal device: a removable acrylic intra-oral device constructed to keep opposing teeth in equal occlusal contact in both centric and anterior contact when the mandible is in a lateral and protrusive position. These are employed to treat abnormalities of the muscles of mastication and TMJ disorders, including musculature spasm and contracture, unstable occlusion and displacement of the disc, myofascial pain, and arthromyalgia.⁴ With the use of an occlusal splint, the patient displayed a marked reduction in both subjective and objective discomfort. Appliance therapy is advantageous in several ways, making it useful for treating many abnormalities related to the TMJ. The symptoms are also changed when an occlusal device is made to change the etiology of TMDS. The efficiency ranges from 70% to 90%, according to an early comprehensive critical analysis of the literature.^{5,6,7} An adjustment to a new resting postural position is achieved with the insertion of a splint.⁸ The success of the therapy is determined by the appliance's design, construction, and adequacy, as well as by the patient's participation.⁹ The optimal type of splint therapy must be selected based on a clear diagnosis of the TMJ anomalies and a thorough understanding of the anatomy of the condyle and the articular disc.⁹ It prevents the TMJ discs from being damaged or permanently displaced by dysfunctional forces by establishing a stable, balanced occlusion.⁵ The treatment enhances jaw-muscle function and reduces related pain.⁵

Indications and Contraindications²

1) Tipping movement of teeth during mixed dentition as an adjunct to fixed orthodontic appliances 2) Prevention of the emergence of aberrant orofacial habits 3) TMJ disturbances include anterior disc displacement and friction of the joint 4) It can't be used in cases of severe vertical discrepancies or severe crowding.

Mechanism of Action

Principle: Occlusal splints alter an occlusion without interfering with condylar articulation in the glenoid fossa.¹ How does an occlusal splint operate? An occlusal splint forces the patient to place the lower jaw differently, which results in new muscle and articular balance. Functions of the occlusal splint⁵: Distribution of forces across the masticatory system, Maintenance of the proprioception of periodontal fibers, Relaxation of elevator muscles through anterior and condylar guidance, Preservation of the vertical height to allow neuromuscular relaxation, Making the patient aware of mandibular posture and habits, Prevention of CNS-induced bruxism. The limitations of the occlusal splints are; the condyles are not released when using an occlusal splint. They are not allowed to have effects that defy mechanical laws. A posterior occlusal splint's alleged pivotal role is a common perception for the distraction of condyles against the physical rules and realities of anatomy.² Splints are unable to release the joint's load or stop the night time grinding of teeth, which are the fundamentals of therapy.⁹

Measures for evaluating treatment outcomes

There are various measures for evaluating the effectiveness of occlusal splints in TMD patients that are also applicable to recurrent or persistent states of prolonged agony. The TMJ scale is one of the most useful outcome measures that depends on physical signs and symptoms (abnormalities of the TMJ joint, restricted movement of the lower jaw, stress).¹⁰



Selection of a Proper Occlusal Splint¹¹

Condition	Appliance
Night grinding and headaches	Complete coverage splint at night
Muscular disorders	Bite and stabilization devices
Disc and muscular diseases	Stabilizing bite appliances
Acute traumatic cases	ARS therapy for 1 week

Various Occlusal Splint Types

For the treatment of TMDS, a variety of occlusal devices have been proposed (Based on the choice of material).¹²

Hard Splints: A 3 mm-thick flat acrylic is used in between the back tooth regions of the upper and lower jaws. All of the occluding posterior teeth have uniform occlusal contact with the central cusps against the splint.¹³ These splints are modified to provide adherence to occlusion models.¹⁴ The connection between the discs and condyles may be strengthened with a strong splint. A firm occlusal splint provides clinically satisfactory results for patients with pain and restricted mouth openings.¹⁵ The firm appliance helps dental proprioception, which prolongs the effects of muscle retraining.¹⁴

Soft Splints: Types of pseudo-permissive splints. These are made of a 3 mm-thick flexible polyvinyl sheet that neutralizes occlusal interactions.¹³ These splints are made for the upper arches, are simple to fabricate, and are usually used during early assessment.⁸ It feels heavy and causes clenching, yet it improves mouth opening.¹⁴

Liquid Splints: An already-made flexible liquid occlusal splint straightens the bite to maximize the other structures, equalizes all biting forces, keeps the jaw in a pleasant position, and instantaneously establishes a muscle-dominant functionally produced occlusion.⁶ According to Okeson (1987), a firm splint reduces muscular hyperactivity more than a soft splint.¹⁶ Stabilization appliances and anterior repositioning appliances (ARS) are the two most often used appliances. Anterior bite appliances, posterior bite appliances, MORA, and distraction appliances are some further types of appliances.¹² These are removed while eating.¹⁴

Three types of occlusal splints, classified by Dawson:

Muscle De-programmer Device/Permissive Appliance

These splints allow the mandible to move freely because they easily guide the teeth over the contralateral biting surface. Example: Stabilization Appliance, Anterior De-programmer Appliance, Posterior De-programmer Appliance, Superior Repositioning Occlusal Splints, etc.³

Non-Permissive Appliance: The mandible's range of motion is restricted by these splints, ramps, or indentations. Example: Anterior Repositioning Splint and Mandibular Orthopaedic Repositioning Occlusal Appliance of the Lower Jaw.³

Pseudo-Permissive Appliance: It enhances mouth opening and enables equilateral contact with the contralateral teeth at the same time. Example: Soft Splint, Hard Splint

The two most commonly used appliances, classified by Okeson.

Stabilization Appliance: These are named the centric splint, modified mandibular appliance, and Tanner splint. These can be fabricated in either the maxillary or mandibular arch, but the maxillary arch is preferred. The condyles articulate in the steadiest position, i.e., the most musculoskeletally stable position, while the appliance is in place. It enables the canine to occlude the back teeth during eccentric movement. The main purpose of treatment is to resolve any orthopaedic instability.¹² Mandibular stabilization appliances are sometimes preferred because they may be more aesthetically pleasing and have less impact on speech.^{1,14} It retains more efficacy if used for a short duration (during sleep).¹⁴ Dentists should rely on a bilateral manual manipulation approach during the construction of a mandibular stabilization appliance to find a stable joint position.¹² It should not be chewed while being worn at night.¹⁷



Indications³: Stabilization of mobile maxillary teeth, TMJ and muscle disorders with severe pain, Retrodiscitis secondary to trauma, Local muscle soreness or chronic, centrally mediated myalgia, Severe bruxism injuries, Fabrications.³ It is constructed according to the working models, given the constructed bite position. With incisal guiding, the anterior part's moderate incline allows lateral and protrusive motions. The construction bite's predetermined lower jaw position is maintained by the posterior acrylic's minor indexing of the maxillary posteriors.

ARS (Anterior Repositioning Appliance)

Types of directive or non-permissive splints: an effective conservative approach for treating TMD caused by disc dislocation is ARS.¹⁸ In order to temporarily alleviate symptoms, the condyles are moved anteriorly relative to their musculoskeletally stable position.¹² It is constructed to fit both arches, although a maxillary appliance works better to keep the mandible positioned forward.¹⁴ It should be worn at night.¹² ARS is useful to replace the displaced disc associated with reduction and without reduction.¹⁷

Indications: These appliances are used to treat disc dislocation, clicking noises in joints, and retrodiscitis cases.¹²

Contraindications: Bilateral open bite in the back teeth region due to prolonged use.¹⁴ An orthopaedic repositioning appliance named MORA has the ability to change the lower jaw position related to the cranium. It enables the remodelling of the joint and corrects internal disc derangement issues.¹⁸

Construction:¹² Locating the correct anterior stop, Fabrication is done on the anterior part of the appliance when patients have protruding mandibles, Finding a stable position that relieves pain and joint noises.

Other Splints:

Relaxation Splint: Relaxation splints are only worn for a shorter duration (one month) to ensure that teeth are in proper alignment. Over the maxillary incisors, they are constructed. Mandibular anteriors are released by adding a platform.⁴ Older individuals with myofascial pain

can greatly benefit from using pre-made relaxation splints.¹⁹

Pivot Appliance/Distractor Appliance: Type of hard acrylic splint in which the most posterior teeth in a mandibular splint come into occlusal contact.²⁰

Principle: According to the proposed theory, clenching on the pivot causes the condyles to be pulled downward, which creates an upward-directed mandibular torque and allows the disc to resume its original position.²⁰

Functions: It alleviates the internal disc derangement symptoms. It does not release the load on the joint when the condyles are in the antero-superior position. It expands the discal space to prevent clicking noises in the joint.¹²

Anterior De-Programmer Appliance: A type of permissive splint with hard acrylic partial coverage is used to disocclude the posteriors. It is useful for treating para-functional activities of shorter duration. It does not cover the back teeth, so an anterior open bite occurs.¹²

Posterior De-Programmer Appliance: Hard appliance, covering the posterior teeth of the lower jaw.¹² Types of permissive splints used to correct lower jaw posture. It is mostly useful for the correction of anomalies in dislocated internal discs. Always complete coverage is needed to avoid the extrusion of exposed teeth.¹²

Conclusion

The interocclusal orthopaedic appliance (orthotic), which is used to treat myalgia and TMJ disorders, is simple, cost-effective, has minimal adverse effects, and improves patient compliance. The key to determining the optimal function of splint therapy for each issue is a thorough evaluation and differential diagnosis.⁵ After knowing the patient's acceptance and awareness of the treatment protocol, dentists should start to manage TMDS through the use of intraoral orthotics. Conservative splint therapy is the first treatment of choice for TMPDS.¹⁰ Both the hard and soft splints enhance



the TMJ disturbances, but firm acrylic with complete coverage and upper jaw splints are more efficient for improving physical symptoms.¹⁰ It may be necessary to carefully and continuously examine the condyle and disc after applying firm splints.²¹ Stabilizing an oral appliance with full coverage, which does not reposition the mandible, has fewer adverse effects than an appliance with partial coverage, where mandibular reposition occurs.¹⁴ Some short-term research indicates that stabilization appliances reduce the symptoms of muscle-related TMJ problems. Dental professionals have a duty to recognize the illness, treat it, and keep track of it. When treating patients with TMDS, clinicians should think about using occlusal splints or orthotics as a part of their treatment plan.¹³

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