Archives of Dental Research 2022;12(2):60–68

Content available at: https://www.ipinnovative.com/open-access-journals

Archives of Dental Research

Journal homepage: https://www.adr.org.in/

Review Article

Guardians of the temporomandibular joint: The occlusal splints- an overview

Swetha MU[1], Suneetha Rao[1], Ashok K[1], Shruti Mishra Sarkar[1], Prerana Eshwar[1]*, Jyothi S[1]

[1] *Dept. of Prosthodontics, Vydehi Dental College and Hospital, Bengaluru, Karnataka, India*

ARTICLE INFO

Article history:
Received 23-05-2022
Accepted 25-07-2022
Available online 20-02-2023

Keywords:
Temporomandibular Mandibular joint
Disorders (TMD)
Occlusal splints
Bite plane
Michigan splint
Tanner splint
Repositioning splints
Stabilisation splints
Soft splints
Hard splints

ABSTRACT

Management of temporomandibular joint disorders requires a multifaceted approach. Splint therapy is one among the preferred treatment modalities. There are various schools of thought pertaining to splint therapy which is often challenging to both dentists and patients. Hence a thorough knowledge regarding splints and its application proves to be of great importance in proper treatment planning. Occlusal splint therapy is a non- invasive, reversible and conservative type of treatment recommended for parafunctional habit, unstable occlusion, stress related pain symptoms, occlusal interferences, in extensive restorative treatment and also other masticatory muscle disorders. Its function has been proved to reduce appropriate symptoms by altering the occlusal equilibrium, distributing forces associated with parafunctional activities and normalizing periodontal ligament proprioception. This article enumerates various aspects of splint therapy such as types of splints, their uses, functions, design, fabrication and its modification with a clear insight on the physiologic and therapeutic effects of various splints. This knowledge gives way to the selection, designing and application of a specific occlusal splint which would help in achieving appropriate and successful treatment planning for the patient.

1. Introduction

The Temporomandibular joint (TMJ) is the joint between the skull base and mandible. TMJ disorders (TMD) or Craniomandibular disorder (CMD) refers to conditions producing abnormal, incomplete or impaired function of the temporomandibular joint(s) and the muscles of mastication.[1] The common signs and symptoms of TMD are joint sounds, pain, limited or asymmetrical jaw movement which may affect the quality of life. Anderson et al.[2] reported that approximately 75% of the population are having at least one sign of joint dysfunction (viz. tenderness on palpation, joint noises, deviation during movements etc.). Prosthodontics is a multidimensional speciality which offers numerous treatment options for the betterment of patients with TMDs. It essentially requires complete examination of the patient in relation to the masticatory apparatus with differential diagnosis for the TMD.[3] Several definitive and supportive treatment modalities have been well documented which includes occlusal splints, counselling, physiotherapy, pharmacotherapy, surgical treatment and a combination of the above,[4] amongst which the most commonly used treatment option is the occlusal splint therapy.

An Occlusal splint is defined as a removable artificial occlusal surface used for diagnosis or therapy affecting the relationship of the mandible to the maxilla.[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." These appliances can be indicated for occlusal

* *Corresponding author*.
E-mail address: prerana.e@gmail.com (P. Eshwar).

https://doi.org/10.18231/j.adr.2022.012

stabilization/malocclusion, prevention of the wear of dentition /parafunctional habits, fatigued masticatory muscles, headaches, sore teeth, noisy and uncomfortable temporomandibular joints and /or for treatment of TMJ disorders.[3] According to Dawson, one of the primary principle of these appliances is, to alter an occlusion which may have been the reason for preventing complete seating of the condyles into the centric relation.[5]

Although, there are different types of occlusal appliances which are documented to treat temporomandibular disorders, there is considerable debate about its application, design, fabrication, its effectiveness and follow up of occlusal appliances. Hence a thorough knowledge of the each type of occlusal appliances becomes mandatory.

This paper is an overview of various types of occlusal appliances, its design, appropriate application in the diagnosis and management of temporomandibular disorders (TMD).

2. Purpose of an Occlusal Appliance[3–6]

1. To provide diagnostic information
2. To protect teeth and associated structures from parafunction if any
3. To allow the condyle to seat in CR
4. To reduce muscle contraction and/or associated forces on the TMJ

2.1. Classification of Occlusal Splints

2.1.1. According to Okeson[7]

1. Stabilization appliance: Anterior repositioning appliances (ARA) / Mandibular orthopedic repositioning appliance (MORA)
2. Other types: Anterior bite plane, Posterior bite plane, Pivoting appliance, Soft/resilient appliance (silicone)

2.1.2. According to dawson[7]

1. Permissive splints/muscle deprogrammers[8]
   These splints allow unrestricted movement of the mandible, by guiding the teeth unimpeded over the opposing biting surface. Majority of the splints fall under this group. eg: bite planes, anterior jig, Lucia jig, stabilisation appliance like- Tanner splint, flat plane splint, superior repositioning splints.
2. Non-permissive splints /Directive splints[8]
   These splints have ramps or indentations that limit the movement of the mandible. Eg: anterior repositioning appliance (ARA) and Mandibular orthopaedic repositioning appliance (MORA).
3. Pseudo permissive splints.[9]
   These splints do not provide the characteristics of either of the above two which are necessary for successful splint therapy.eg. Soft splints, Hydrostatic splint.

2.1.3. According to Stavicek (JCO 1989 feb)

1. Myopathic
2. Decompression
3. Compression
4. Verticalization
5. Anterior repositioning

3. Materials Used for Splint Appliances (Table 1)

3.1. Types of splints used for TMDs

3.1.1. Permissive splints

These are designed to eliminate noxious harmful occlusal contacts and promote orthopaedic stability and harmonious masticatory muscle function. They primarily function to alter the occlusion so that teeth do not interfere with complete seating of the condyles and to alter muscle forces like the usual flat-plane appliances.[10]

The two classic designs of permissive splints are.

1. *Anterior midpoint contact splints. Egs:* B splints**,** Bite planes, Lucia jig, NTI, Leaf gauge, kois deprogrammer.
2. *Full contact splints (stabilizing splints) Egs:* Michigan splint (flat plane), shore, repositioning appliances, tanner / centric relation splints.

4. Anterior Midpoint Contact Splints: (Figure 1)

These occlusal splints allow the contact of the incisors only resulting in reduction of the clenching forces to 20-30% of maximum clenching force as per EMG studies. It removes occlusal interferences allowing complete joint seating on closure.[11] It encourages release of the lateral pterygoid and anterior ligaments on closure. It is given when muscle disorders are suspected like acute or chronic muscle pain.[8] it is advised to be used during night time and not for more than 10-12 hrs/day, if worn for longer than 24-48 hrs continuously, they may cause supra eruption of posterior teeth due to lack of contact.[2]

4.1. 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 and no posterior teeth in occlusion. It is usually flat & parallel to the occlusal plane. Anterior jig, Lucia jig, Hawley bite plane, anterior deprogrammer and Sved plate[12] are the types of anterior bite planes. These must be used only for short periods under close monitoring.

4.2. Mechanism of action

It is primarily intended to disengage the posterior teeth about 2-3 mm to establish a neuro-muscular reconditioning and thus eliminate their influence on the function or

dysfunction of the masticatory system. Thereby aiding the relaxation of the muscles (the lateral pterygoid) and encourage the readaptation of condyle to the rest position.[13]

4.3. Indications[14]

1. Treatment of muscle disorders related to orthopaedic instability or an acute change in the occlusal condition.
2. Parafunctional activity associated with unfavourable posterior tooth contacts can also be treated but only for short periods.

4.4. Limitations

If the appliance is worn continuously for more than 3-4 weeks, the unopposed mandibular teeth might supraerupt, resulting in an anterior open bite[15] and may add to a TMJ overload without the posterior contacts.

4.5. Lucia jig

Lucia jig is a neuromuscular deprogramming device. It is a type of modification of anterior bite plane placed between the maxillary and mandibular incisors.

4.6. Mechanism of action

It acts by de-programing the proprioceptive patterns of habitual contact between teeth (engram) changing the mandibular closure pattern and allowing the condyles to seat in the most superior position.[16]

4.7. Indications

1. In full mouth rehabilitation cases to establish centric relation by eliminating any type of occlusal contacts.
2. In cases where muscle relaxation is required to make jaw manipulation easier.[10]
3. In cases of muscular hyperactivity[17,18]

4.8. Limitations

1. Owing to the small size, possibility of aspiration or ingestion,
2. Mobility of anterior teeth and
3. Occlusal changes if used unmonitored for a long time

4.9. Fabrication[19]

It can be either fabricated from acrylic resin on a dental cast or can use a prefabricated jig which can be relined with impression compound or PVS type rigid bite registration material. It should extend from the labial aspect to the palatine aspect of the tooth to be included. Both sides should converge to a wedge-shaped vertex on the labial aspect. Prefabricated jigs are selected according to the patient's dentition. Then the patient is instructed to slowly occlude the mandibular central incisors on the vertex of the resin until the posterior teeth were approximately 1 mm apart. The Lucia jig is adjusted with a pear-shaped tungsten drill so that it has only one contact point in the palatine wedge vertex against the mandibular central incisors, in the midline and when the mouth is closed, providing a 1 mm maximum disocclusion between the posterior teeth.

5. NTI-Nociceptive Trigeminal Inhibition Tension Suppression System

The NTI-tss device is a modified anterior bite plane which is narrower than the regular bite plane. It covers only two maxillary (or mandibular) central incisors. This is also known as "miniature anterior bite appliance".[20] Duration to be worn is about 6 to 8 weeks.

5.1. Mechanism of action

NTI splint has a "disoccluding element" which contacts the two mandibular central incisors upon closure.[21] The NTI-tts splints primarily function to relax the muscles involved in bruxing by reducing nociceptive stimulation.

5.2. Indications

It is indicated for the prevention and treatment of sleep bruxism, temporomandibular disorders (TMDs), tension-type headaches, and migraine which is triggered by hyperactivity of the trigeminal nerve causing migraine like events.[22] Hence it is used always while sleeping.

5.3. Limitations

Aspiration, ingestion, mobility of anterior teeth and occlusal changes after prolonged unmonitored use.

5.4. Fabrication

It is fabricated by selecting a standard acrylic matrix form that fits passively over the maxillary incisors and filled with acrylic, which is then left to polymerize intraorally. This increases the vertical dimension between the maxillary and mandibular jaw. Adjustments along the outer surface of the bite stop are made by the dentist to ensure that at jaw closure and during excursive movements tooth contacts are present only between the intraoral device and the incisal embrasures of the antagonistic teeth.[23]

6. Stabilization Splints (Or Muscle Relaxation Splints (Mrs: (Figure 2))

These stabilization splints are commonly used to treat masticatory dysfunctions (muscle hyperactivity) by decreasing related parafunctional activity which is usually accompanied with signs and symptoms like muscular pain, TMJ pain, clicking, crepitus, limitation and in-coordination

Table 1: Materials used for splint appliances

Material	Hard acrylic resins (methyl methacrylate)	Soft plastic pressure molded polyvinyl	Dual laminated
Advantages	Adjustments are easy and quick	Can engage into available undercuts for better retention	Can be used in severe grinding
	Easily repaired		Long lasting
	Accurate fit Reliable method of fabrication	An be layered with hard acrylic to contact/occlude opposing dentition for stable occlusion.	More comfortable than traditional hard splints: [24]
	Longevity	More comfortable for the patient	
		Can be fabricated chairside	
	Colour stability	Easy to construct	
	Polymerization shrinkage may result in less accurate fit	Requires special equipment for fabrication	Bulk is more
Disadvantages	Ball clasps may be required as the rigid undercuts would be eliminated which may apply pressure on the interdental papillae	Expensive	Takes time for patient to adapt
		Difficult to adjust	Not recommended for heavy clenchers.
		Less wear resistance	
		Dimensionally less stable [10]	

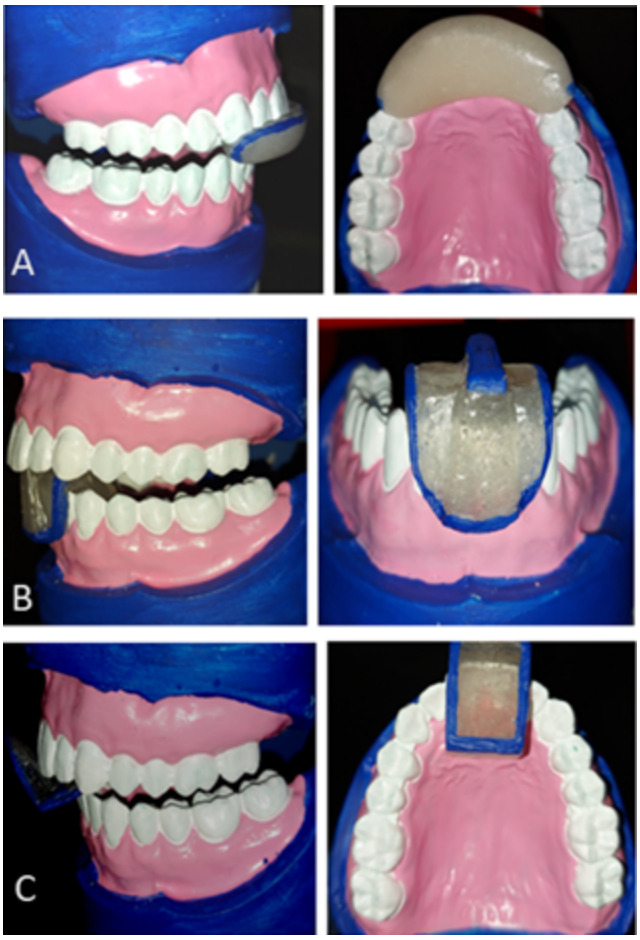

Figure 1: Anterior midpoint contact splints (A: anterior bite plane; B: NiTi; C: Lucia jig)

Figure 2: Stabilization splints (or) Muscle relaxation splints (A: Michigan; B: Tanner's)

of mandibular movement periods of stress. [25]

6.1. Mechanism of action

Provides separation of the posterior teeth during the mandibular movements. It initiates simultaneous contact to occur occlusally as well as musculoskeletally. An adjustment of the splint is needed periodically so that the masticatory muscles relax until a consistent jaw relationship is achieved.

Table 2: Summary of the splints

Splints	Indications	Duration of use	Arch of use
Anterior bite plane	Treatment of muscle disorders related to orthopaedic instability or an acute change in the occlusal condition.[45]	1-2 Weeks (short duration)	Maxilla
	Parafunctional activity associated		
Lucia Jig	To establish centric relation by eliminating any type of occlusal contacts	15mins	maxilla
	Where muscle relaxation is required to make jaw manipulation easier[11]	2 weeks	
	Muscular hyperactivity.		
NTI	Sleep bruxism	2 weeks (only during night)	Mandible
	Temporomandibular disorders (TMDs)		
	Tension-type headaches, and migraine		
Stabilization	TMJ and/or muscle disorders and pain	24hrs/day	Maxilla or mandible
	Severe bruxism		
Appliance (Michigan and Tanner's appliance)	Diagnosis and treatment of trauma from occlusion to any		
	Stabilization of mobile maxillary teeth and to		
	Prevent supraeruption of mandibular teeth		
	Tension headaches		
Anterior repositioning appliance	Disc derangement disorders.	24 hrs/ day for 3 months	maxilla
	Patients with joint sounds (eg: a single or reciprocal click).		
	Intermittent or chronic locking of the joint (e.g., retrodiscitis).		
Posterior bite plane appliance or mandibular orthopedic repositioning appliance(MORA)	TMD'S	Case dependant	Mandible
Soft or resilient appliance	Protective athletic splints	4-6 months	Maxilla / mandible
	Clenching and bruxism,		
	To reduce symptoms of joint dysfunction or myalgia.		
Pivoting appliance	Osteoarthritis of the TMJs,	24hrs/day	Mandible
	Acute unilateral disc dislocation without reduction.		

The aim to provide the patient with a stable occlusion in which the maximum number of simultaneous occlusal contacts are made with equal force between the opposing teeth.[12] This also allows an adaptation of the temporomandibular joint apparatus by increasing the vertical dimension, occlusal stability and aids in self repositioning of the condyle in the glenoid fossa.

Whatever changes are seen in the maxillomandibular relation occur only due to variation in the thickness of the material. According to a study conducted by Pficer. J.K et al. (2017), only continuous use of this splint can cause reduction in symptoms of TMD's. And concluded that by wearing splint for 24 hours per day results in occlusal stabilization.[26]

6.2. Indications[27]

1. TMJ and/or muscle disorders and pain
2. Severe bruxism
3. Diagnosis and treatment of trauma from occlusion to any part of the masticatory system
4. Stabilization of mobile maxillary teeth and to prevent eruption of mandibular teeth
5. Differential diagnosis for patients with signs and symptoms imitating TMJ or muscle disorders, but without origin in the masticatory system.
6. Treatment of patients with tension headaches

6.3. Limitations

As these splints do not prevent tooth clenching due to the contact of lower teeth, may aggravate the condition in few patients.

Figure 3: Non permissive splints- respositioning appliance (A: anterior repositioning splint; B: MORA)

Figure 4: Others (A: soft splint; B: pivot splint; C: Hydrostatic splint)

6.4. *Fabrication*

It is fabricated to the construction bite position, which is provided with the working models. The anterior portion has a slight incline that is balanced so as to allow lateral and protrusive movements with incisal guidance. The posterior acrylic has slight indexing of the maxillary posteriors to help maintain the pre-determined mandibular position as provided by the Construction Bite.

Commonly used stabilization splints are:

1. Michigan splint / Gnathologic splint / flat plane splint
2. Tanner's splint

6.5. *Michigan splint*

It is a flat plane stabilization appliance usually made for maxillary arch in hard acrylic or polycarbonate material. This is most commonly used for stabilization and has least adverse effect.

The main features which separate the Michigan splint[26] (Geering & Lang, 1978) from other stabilization splints are: (i) Always adjusted to centric relation. (ii) Freedom in centric zone: 0-5-1-0 mm on a flat surface. (iii) Cuspid rise starts about 1 mm from freedom in centric. (iv) No incisal guidance from centric occlusion. (v) Allows the condyles to seek optimal position. (vi) Can be used for indefinite time without change in occlusal relations of the teeth.

6.6. *Tanner's splint*[28,29]

The Tanner /CR Splint is a repositioning splint that is fabricated on the mandibular arch and is used to advance the mandible. It is a full-coverage splint with acrylic which contacts the maxillary anterior and posterior teeth.

7. Non permissive Splints- Respositioning Appliance (Figure 3)

Repositioning splints are used to recapture the displaced disc or to establish a better jaw position by moving the mandible either forward or backward into a protruded position. The construction and insertion of this splint has been described by Clark.[30]

7.1. *Limitations*

Prolonged usage for more than six weeks might change the bite permanently, lead to damage of the joint on a longer run.

Types of repositioning splints:

1. Anterior repositioning splint or orthopedic repositioning appliance
2. Posterior bite plane appliance or mandibular orthopedic repositioning appliance(MORA)

7.2. *Anterior repositioning appliance*

The anterior repositioning appliance is an interocclusal device that encourages the mandible to assume more anterior position than the intercuspal position. It aims to provide a better condyle-disc relationship in the fossae so that normal function will be reestablished. The goal of treatment is not to alter the mandibular position permanently but only to change the position temporarily so as to enhance adaptation of the retrodiscal tissues.[31] It is a full-arch hard acrylic device used in either arch. However, the maxillary arch is preferred because a guiding ramp can be more easily fabricated to direct the mandible into the desired forward position.

7.3. *Mechanism of action*

By maintaining the mandible in a temporary therapeutic position where the click is eliminated and thereby allowing the disc to reposition. To achieve a maximum success rate these splints should be worn on a 24-hour-a-day basis for 3 months, followed by a careful, controlled, gradual weaning off period. At follow-up visits, acrylic is ground by 1 mm every 4–6 weeks from the posterior areas to clear the

occlusal aspect of the mandibular molars and premolars, thereby encouraging vertical eruption of these teeth, settling occlusion and re-establishing the position.[32]

7.4. Indications

1. In cases of disc derangement disorders
2. Patients with joint sounds (eg: a single or reciprocal click).
3. Intermittent or chronic locking of the joint (e g, retrodiscitis).

7.5. Limitations

There could be permanent and irreversible occlusal changes on long term use.

7.6. Fabrication[33,34]

The initial step in fabricating a maxillary anterior repositioning appliance is identical to that in fabricating a muscle relaxation appliance. The records needed are a maxillary and mandibular alginate impression and a protrusive mandibular bite record in a "post-clicking" position.

The anterior stop is constructed and the appliance is fitted to the maxillary teeth. The anterior stop must not be covered by the acrylic. When the anterior teeth are felt to contact in the groove on the anterior stop, the position is verified by opening and closing a few times. With the teeth resting together, the patient should gently place his tongue on the setting resin lingual to the anterior teeth and press. This will adapt the resin to the lingual surfaces of the mandibular anteriors and provide the needed ramp for guiding the mandible into the forward position.

8. Posterior Bite Plane Appliance or Mandibular Orthopedic Repositioning Appliance (MORA)

The MORA appliance was first described by Dr. Gelb.[35] It is designed to reposition the mandible to achieve a neuromuscular balance and an optimal condylar-fossae relationship. It is more aesthetic than other splints and usually does not present any great problems while speaking or eating. Worn only on the mandibular arch.

8.1. Mechanism of action

The change in jaw position was said to relieve muscle tension in the head and neck, improving the individual's neuromuscular efficiency and dynamic balance.[36]

8.2. Indications

Treating temporomandibular joint dysfunction.

8.3. Limitations[37]

1. It is difficult to construct a guide ramp to direct the mandible into a protrusive position.
2. During sleep or while reclining, the mandible can retrude even with the appliance in place.
3. With prolonged wearing and/or heavy clenching, there may be intrusion of posterior teeth
4. Eruption of mandibular incisors may occur if contact between the maxillary and mandibular incisors is not achieved during function.

8.4. Fabrication

The MORA is a partial coverage appliance and consists of two pads of acrylic, which sit on the mandibular bicuspids and molars and are connected by a metal lingual bar.

8.5. Others: (Figure 4)

8.5.1. Soft or resilient appliance[5]

Since 1942, Mathews[38] recommended the use of soft occlusal splints. The soft appliance is a device fabricated from resilient material that is usually adapted to the maxillary teeth. Goals on achieving even and simultaneous contact with the opposing teeth. These appliances are usually worn only at night, will produce some symptomatic relief within 6 weeks. It is advised to be replaced after 4-6 months as they lose their resilience with the passage of time.

1. *Indications:* Protective athletic splints decrease the likelihood of damage to the oral structures when trauma is received, Clenching and bruxism, to reduce symptoms of joint dysfunction or myalgia.
2. *Limitations:* might encourage muscle hyperactivity[39]
3. *Fabrication:* The appliance is generally made out of 2 mm polyvinyl in a vacuum former. In case selectively thicker appliance is required layers can be added in certain areas and if thinner appliance is required then the sheet can be overheated in the former to ensure an even occlusal contact.

8.6. Hydrostatic splint[40]

To equalize the occlusal forces, water is used in this kind of splint. Hydrostatic cell is inserted between the upper and lower arch. The occlusal load is reorganized and evenly distributed throughout the stomatognathic system.

8.7. Pivoting appliance

It is a hard acrylic device that covers one arch and usually provides a single posterior contact in each quadrant. When superior force is applied under the chin, the tendency is to push the anterior teeth close together and pivot the condyles downward around the posterior pivoting point.[41]

8.8. Mechanism of action

The proposed principle is that the condyles are pulled downwards upon clenching on the pivot, which causes a mandibular torque with an upward direction, also this torque is smaller than one that would be caused by a more anterior pivot, thereby relieving traumatic load and giving the disk freedom to reassume a normal position. The contact in these splints is usually on most posterior tooth.[42]

8.9. Indications

To decrease intraarticular pressure and thus unload the articular surfaces of the joint. In treatment of symptoms related to osteoarthritis of the TMJs, acute unilateral disc dislocation without reduction.

9. Limitations

May cause occlusal changes as a posterior open bite in pivot area.[43]

Summary of the splints(Table 2)

10. Conclusion

Occlusal splint therapy has been used for diagnosis and treatment of various disorders of the masticatory system. Many designs are described in the literature. Despite the research since many years on the effect of occlusal splint design in general and its therapeutic benefit in particular remains controversial. Different conditions are treated by a different splint. A proper examination and differential diagnosis is the key in making a decision regarding the appropriate role of splint therapy for each problem. This article gives an insight to the clinicians to successfully implement splint therapy into their armamentarium of treatment options in managing masticatory system disorders. Perfect appliance with fewer complications should be delivered.

11. Source of Funding

None.

12. Conflict of Interest

None.

References

1. Ferro KJ. The Glossary of Prosthodontic Terms. 9th ed. and others, editor; 1956. p. 1–34.
2. Anderson GC, Schiffman EL, Schellhas KP, Fricton JR. Clinical vs. arthrographic diagnosis of TMJ internal derangement. *J Dent Res*. 1989;68(5):826–9.
3. Anderson GC, Schiffman EL, Schellhas KP, Fricton J. Clinical vs. arthrographic diagnosis of TMJ internal derangement. *J Arthritis*. 2020;68(5):826–9.
4. Dawson PE. Evaluation, diagnosis, and treatment of occlusal problems. vol. 32. 2nd ed. and others, editor; 2007. p. 632.
5. Dylina TJ. A common sense approach tosplint therapy. *J Prosth Dent*. 2001;86(5):539–45.
6. Okeson JP. Management of temporomandibular disorders and occlusion. St. Louis: Mosby; 1998. p. 512.
7. Dawson PE. Evaluation, diagnosis and treatment of occlusal problems. 2nd ed. St. Louis;Mosby; 1989. p. 186.
8. Dylina TJ. The basics of occlusal splint therapy. *Dent Today*. 2002;21(7):82–7.
9. Bharadwaj K. The Basics of Occlusal Splints- A Review. *Int J of Adv Res*. 2017;5:1239–42.
10. Dalal S. Occlusal splints. *J Dent Med Sci*. 2018;17(4):51–6.
11. Mckee JR. Comparing condylar positions achieved through bimanual manipulation to condylar positions achieved through masticatory muscle contraction against an anterior deprogrammer: A pilot study. *J Prosthet Dent*. 2005;94(4):389–93.
12. Gray RJ, Davies SJ. Occlusal splints and temporomandibular disorders: why, when, how? *Dent Update*. 2001;28(4):194–9.
13. Ré JP, Perez. The occlusal splint therapy. *Int J Stomatol Occlusion Med*. 2009;2:82–6. doi:10.1007/s12548-009-0015-y..
14. An Original dental appliance for esthetic occlusal vertical dimension rehabilitation. *Esthetic*. 2019;34:29–40.
15. Prabhu B, Hedge M, Sandhu A, Desai A, Pradeep, Ragher M. Essentials of occlusal splint in the management of Temporomandibular disorders: Aliterature Review". *Int J Curr Res* . 2015;7:11599–603.
16. Nassar MSI, Palinkas M, Regalo SC, Sousa LG, Siéssere S, Semprini M. The effect of a Lucia jig for 30 min on neuromuscular re-programming, in normal subjects. *Brazilian Oral Res*. 2012;26(6):530–5.
17. Wilson PH, Banerjee A. Recording the retruded contact position: A review of clinical techniques. *Br Dent J*. 2004;196(7):395–402.
18. Land MF, Peregrina A. Anterior deprogramming device fabrication using a thermoplastic material. *J Prosthet Dent*. 2003;90(6):608–18.
19. Ferrario VF, Serrao G, Dellavia C, Caruso E, Sforza C. Relationship between the number of occlusal contacts and masticatory muscle activity in health young adults. *Cranio*. 2002;20(2):91–9.
20. Wilson PHR, Banerjee A. Recording the retruded contact position: a review of clinical techniques. *J Prosthod Dent Occlusal Splints*. 2020;196(7):395–402.
21. Land M, Peregrina A. Anterior deprogramming device fabrication using a thermoplastic material. *J Prosthet Dent*. 2003;90(6):608–10.
22. Laskin, Daniel M, Greene C. Temporomandibular Disorders: An Evidence-Based Approach to Diagnosis and Treatment; 2006. p. 377–90.
23. Stapelmann H, Türp JC. The NTI-tss device for the therapy of bruxism, temporomandibular disorders, and headache - where do we stand? A qualitative systematic review of the literature. *BMC Oral Health*. 2008;8:22. doi:10.1186/1472-6831-8-22.
24. Available from: www.sportingsmiles.com/blog/teeth-grinding-guard-types-soft-hard-or-dual-laminate/.
25. Pereira CP, Palinkas M, De Vasconcelos P, Rancan S. Lucia Jig - temporomandibular dysfunction promotes muscle relaxation? *Acta Scientiarum Health Sci*. 2016;38(2):199. doi:10.4025/actascihealthsci.v38i2.31825.
26. de Paula Gomes CAF, Hage YE, Amaral AP, Politti F, Gonzalez DAB. Effects of massage therapy and occlusal splint therapy on electromyographic activity and the intensity of signs and symptoms in individuals with temporomandibular disorder and sleep bruxism: a randomized clinical trial. *Chiropr Man Therap*. 2014;22(1):43. doi:10.1186/s12998-014-0043-6.
27. Pficer JK, Dodic S, Lazic V, Trajkovic G, Milic N, Milicic B. Occlusal stabilization splint for patients with temporomandibular disorders: Meta-analysis of short and long term effects. *PLoS One*. 2017;12(2):e0171296. doi:10.1371/journal.pone.0171296.
28. Ramfjord SP, Ash MM. Reflections on the Michigan occlusal splint. *J Oral Rehabil*. 1994;21(5):491–500.
29. Tanner HM. The Tanner Mandibular Appliance. *J Colo Dent Assoc*. 1996;75(2):14–8.

30. Zonnenberg AJ, Mulder J. The efficacy of a specific stabilization splint. *Cranio*. 2014;32(1):68–74.
31. Clark GT. A critical evaluation of orthopedic interocclusal appliance therapy: design, theory, and overall effectiveness. *J Am Dent Assoc*. 1984;108(3):359–64.
32. Moloney F, Howard JA. Internal derangements of the temporomandibular joint. III. Anterior repositioning splint therapy. *Aust Dent J*. 1986;31(1):30–9.
33. Ma Z, Xie Q, Yang C, Zhang S, Shen Y, Abdelrehem A. Can anterior repositioning splint effectively treat temporomandibular joint disc displacement? *Sci Rep*. 2019;9(1):534. doi:10.1038/s41598-018-36988-8.
34. Hulland SA, Lucas JO, Wake MA, Hesketh KD. Eruption of the primary dentition in human infants: a prospective descriptive study. Pediatr Dent. *Pediatr Dent*. 2000;22(5):415–36.
35. Gelb ML, Gelb H. Gelb appliance: mandibular orthopedic repositioning therapy. *Cranio Clin Int*. 1991;1(2):81–98.
36. Moore TJ, Maria DL, Hatfield BD, Ryder MN, Weiner LB. The Mandibular Orthopedic Repositioning Appliance and its Effect on Power Production in Conditioned Athletes. *Phys Sportsmed*. 1986;14(12):137–45.
37. Pertes RA. Updating the mandibular orthopedic repositioning appliance (MORA). *Cranio*. 1987;5(4):351–6.
38. Dupont JS, Brown CE. Occlusal splints from the beginning to the present. *Cranio*. 2006;24(2):141–6.
39. Okesson JP. The effects of hard and soft occlusal splint on nocturnal bruxism. *J Am Dent Assoc*. 1987;114(6):788–91.
40. Lerman MD. The hydrostatic appliance: a new approach to treatment of the TMJ pain dysfunction syndrome. *J Am Dent Assoc*. 1974;89(6):1351–8.
41. Ito T, Gibbs CH, Marguelles-Bonnet R, Lupkiewicz SM, Young HM, Lundeen HC. Loading on the temporomandibular joints with five occlusal conditions. *J Prosthet Dent*. 1986;56(4):478–84.
42. Kilpatrick SR. Use of the pivot appliance in the treatment of temporomandibular disorders. *Cranio Clin Int*. 1991;1(2):107–21.
43. Lakshmi MS, Sufiyan MK, Mehta R, Bhangdia M, Rathore K, Lalwani V. Occlusal splint therapy in temperomandibular joint disorders. An update review. *J Int Oral Health*. 2016;8(5):639–84.

Author biography

Swetha MU, Reader

Suneetha Rao, HOD

Ashok K, Reader

Shruti Mishra Sarkar, Senior Lecturer

Prerana Eshwar, Post Graduate Student

Jyothi S, Post Graduate Student

Cite this article: Swetha MU, Rao S, Ashok K, Sarkar SM, Eshwar P, Jyothi S. Guardians of the temporomandibular joint: The occlusal splints- an overview. *Arch Dent Res* 2022;12(2):60-68.