



GRADUATION PROJECT

Degree in Dentistry

TYPES OF MYORELAXANT SPLINTS AND INDICATIONS

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RESUMEN

Introducción: Los trastornos temporomandibulares representan una causa común de dolor orofacial y deterioro funcional. Las férulas oclusales se utilizan ampliamente como tratamiento conservador para reducir la hiperactividad muscular y proteger la articulación temporomandibular; **Objetivos:** Analizar la eficacia de los diferentes tipos de férulas oclusales miorrelajantes utilizadas en el tratamiento de los trastornos temporomandibulares y comparar sus indicaciones clínicas, efectos terapéuticos y limitaciones; **Metodología:** Se realizó una revisión estructurada de la literatura científica utilizando la base de datos PubMed. Se incluyeron los estudios publicados entre 2015 y 2025 que evaluaban las férulas oclusales en pacientes con trastornos temporomandibulares según criterios de inclusión y exclusión predefinidos; **Resultados:** Los estudios seleccionados indican que las férulas de estabilización son los aparatos más utilizados y se asocian con reducciones a corto plazo del dolor y mejoras en la movilidad mandibular. Otros diseños de férulas, como férulas de desprogramación anterior, férulas blandas o hidrostáticas, aparatos NTI, las férulas de reposicionamiento, férulas pivotantes y férulas posteriores pueden aportar beneficios en situaciones clínicas específicas. Sin embargo, los datos disponibles actualmente no demuestran una superioridad clara de un diseño de férula sobre otros, especialmente si se comparan con otros enfoques conservadores; **Conclusiones:** Las férulas oclusales siguen siendo una importante opción de tratamiento conservador para el manejo de los trastornos temporomandibulares. Su eficacia depende de un diagnóstico adecuado, la selección correcta del aparato y su integración en un enfoque terapéutico multidisciplinario.

PALABRAS CLAVE

Odontología, Férula miorrelajante, férula oclusal, trastorno temporomandibular, tratamiento conservador

ABSTRACT

Introduction: Temporomandibular disorders represent a common cause of orofacial pain and functional impairment. Occlusal splints are widely used as a conservative treatment to reduce muscular hyperactivity and protect the temporomandibular joint; **Objectives:** To analyze the effectiveness of the different types of myorelaxant occlusal splints used in the management of temporomandibular disorders and to compare their clinical indications, therapeutic effects, and limitations; **Methods:** A structured review of the scientific literature was conducted using the PubMed database. Studies published between 2015 and 2025 evaluating occlusal splints in patients with temporomandibular disorders were included according to predefined inclusion and exclusion criteria; **Results:** The selected studies indicate that stabilization splints are the most commonly used appliances and are associated with short-term reductions in pain and improvements in mandibular mobility. Other splint designs, including anterior deprogramming splints, soft or hydrostatic splints, NTI appliances, repositioning splints, pivot appliances and posterior bite planes may provide benefits in specific clinical situations. However, current evidence does not demonstrate clear superiority of one splint design over others particularly when compared with other conservative approaches; **Conclusions:** Occlusal splints remain an important conservative treatment option for the management of temporomandibular disorders. Their effectiveness depends on appropriate diagnosis, correct appliance selection and integration into a multidisciplinary therapeutic approach.

KEYWORDS

Dentistry, Myorelaxant splint, Occlusal splint, temporomandibular disorder, conservative treatment

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1. INTRODUCTION

1.1. General

Temporomandibular disorders (TMDs) are a major cause of chronic orofacial pain. They represent a group of functional alterations of the masticatory system that are often associated with pain, muscle tightness and occlusal imbalance that can disrupt oral comfort and daily activities. (1-3)

Complex clinical signs such as limited mandibular movement, muscle tiredness during mastication, joint sounds and in some cases occlusal instability result from temporomandibular disorders affecting the temporomandibular joints (TMJ), the masticatory muscles and the associated supporting tissues. Parafunctional habits, especially tooth clenching or grinding, are frequently associated and may contribute to the onset or aggravation of these disorders. (4-6) All the symptoms can affect daily activities like mastication, stress, sleep that show that TMDs is the most common pain due to non-dental orofacial pain. (7,8)

Their etiology is multifactorial, involving interactions among muscular activity, psychological stress and occlusal factors which together make both diagnosis and management difficult. (9,10) Epidemiological studies report a prevalence ranging from 5% to 12% of the population although prevalence varies according to age and population characteristics. (4) Stress, anxiety, sleep-related bruxism may contribute to the worsening of symptoms. (11)

The main treatment options in conservative dentistry are the occlusal splint therapy. It offers a reversible and non-invasive way to restore neuromuscular balance, reducing excessive muscle activity and protecting both the teeth and temporomandibular joints.

However, the result depends on the splint design, fabrication material and clinical protocol that highlights the importance of adapting the device to each individual case. (12,13)

1.1.1. Definition

Temporomandibular disorders include a group of functional and structural alterations affecting the masticatory system particularly the TMJ, the masticatory muscles and their supporting tissues. (1) TMDs often manifest by pain located in the preauricular area, limitation in jaw movement and characteristic joint sounds such as clicking or crepitation reflecting alterations in the function of TMJ and associated muscles. (5)

Occlusal or myorelaxant splints are important among conservative treatment. The removable devices generally made of acrylic or thermoplastic materials, it will cover one dental arch to redistribute occlusal forces and promote neuromuscular relaxation. (14)

Their therapeutic effect of the splint is mainly related to the adjustment of altered proprioceptive input from the periodontal and masticatory systems, which helps decrease muscular overactivity and relieve pain. (9) And to prevent and limiting excessive loading the splints act as a mechanical protection for the teeth and joints. (2)

1.2. Etiology

The development of TMDs results from a combination of mechanical, muscular, psychological, and postural factors which all make their diagnosis and management difficult. The interrelation explains why treatment must not focus only on the symptoms but also on the underlying causes affecting muscle coordination and occlusal stability. (1)

1.2.1. Mechanical and occlusal factors

Mechanical factors involve irregular occlusal contacts and excessive functional or parafunctional loading of the temporomandibular joint (TMJ). Inadequate coordination between condylar movement and dental contact may generate repetitive microtrauma potentially leading to localized inflammation and joint pain. (1) Altered occlusal relationships can also interfere with mandibular guidance and modify the distribution of forces within the masticatory system. (3)

1.2.2. Muscular factors

The muscular system represents a major component of TMD, particularly in cases of myogenous origin. Sustained contraction of the masseter and temporalis muscles may lead to myofascial pain, fatigue, stiffness, and limitation of mandibular movement. (5,9) Increased muscle activity especially when prolonged contributes to functional overload and may maintain pain through altered neuromuscular patterns. (3)

1.2.3. Psychological factors

Psychological aspects such as stress and anxiety play an important role in the onset and persistence of TMD symptoms. These factors are frequently associated with parafunctional habits including tooth clenching and grinding which increase muscular activity and occlusal

loading. (2) Sleep bruxism contributes to repetitive muscular contraction and may accelerate dental wear while increasing stress on the temporomandibular joints. (6)

1.2.4. Postural and neuromuscular

Postural and neuromuscular factors play a complementary role. Inadequate head or mandibular alignment may disrupt muscle coordination and modify functional patterns within the stomatognathic system. Alterations in mandibular dynamics and neuromuscular control have been associated with functional disturbances in TMD patients. (7)

In summary, TMDs results from the combined influence of mechanical overload, altered neuromuscular regulation and psychological stress. These interrelated factors contribute to the persistence of pain and functional limitations and support the need for a comprehensive therapeutic approach. (1,15)

1.3. Therapeutic approaches and role.

The management of TMDs is mainly based on conservative and reversible treatments aimed at restoring functional balance and reducing pain without the need of surgical intervention. (1) It is important to consider both the mechanical and neuromuscular components of the disorder before considering invasive options. (3)

1.3.1. Non-invasive conservative therapies

Conservative treatment typically includes physiotherapy, jaw mobility exercises, relaxation techniques and the use of mild analgesics or anti-inflammatory drugs when necessary. This can be complemented by the use of occlusal splints. The main objective of these treatments is to reduce muscular tension, restore joint movement and help control parafunctional habits. Surgical options are only for cases in which conservative strategies fail. (16,17)

Multimodal approaches often provide better results than isolated interventions. For example, combining an occlusal splint with a structured physiotherapy program achieves better results in muscle pain and mandibular mobility than using the splint alone. (10)

Relaxation techniques and behavioral interventions aimed at reducing parafunctional habits can significantly decrease muscle hyperactivity particularly in patients with bruxism due to stress. (5,6)

The combination of dental treatment, physiotherapy and psychological support is one of the most effective approaches because it improves long-term symptom control and patient adherence to treatment. Also, patient education and counseling especially regarding stress management, sleep hygiene and parafunctional behaviors play a key role in limiting recurrence. (3) Overall, it confirms that the combination of conservative physical therapies and occlusal splints is the most effective first strategy for managing TMD symptoms, particularly in patients presenting muscular pain, bruxism, or functional instability. (17)

1.3.2. Principle and role of myorelaxant splints

Occlusal splints or myorelaxant appliances represent the most important element in conservative management of TMDs. These removable devices most often made of rigid acrylic or thermoplastic materials cover part or all the occlusal surfaces to help maintain functional relationship between the dentition, masticatory muscles and the TMJ. (1,14)

Their therapeutic effect results from several complementary mechanisms. By eliminating premature contacts and separating the dental arches, the splint allows a more balanced distribution of occlusal forces and reduces excessive muscular activity. They also lower the electrical activity of the masticatory muscles which helps to reduce spasms, tension, and fatigue. Electromyographic studies demonstrate that wearing a splint can decrease the hyperactivity of the masseter and temporalis muscles. (7) This reduction in electrical activity is associated with a decrease in muscle spasms, a decrease in fatigue during clenching and a general improvement in functional comfort. (9)

Splints used in bruxism have shown that this neuromuscular relaxation is often achieved during sleep when parafunctions are more intense. Also, splints act as a protective barrier that prevent tooth wear and reduce excessive mechanical load on the temporomandibular joints. (13) Hydrostatic splints which are less stable have also been reported to provide temporary relief in acute muscular episodes by redistributing occlusal pressure. Some splints design such as repositioning appliances have been shown to influence condylar seating more directly whereas stabilization splints tend to favor muscular balance and joint decompression. (16)

Meanwhile, digital splints produced via CAD/CAM (Computer Aided Design/ Computer Aided Manufacturing) technology ensure better precision, improved comfort, and enhanced patient adherence to treatment. (18) Overall, the therapeutic benefits of splints extend beyond simple

occlusal protection. Their ability to influence muscle activity, joint biomechanics, functional stability, and parafunctional behavior explains why they remain a central element in the conservative treatment of TMDs. (19)

1.3.3. Benefits and limitations

Occlusal splints are effective in producing rapid pain relief and improving jaw mobility during the initial phase of treatment. This short-term effectiveness has been observed across different types of splints, including stabilization, anterior deprogramming, and soft appliances, although the degree of improvement may vary according to the design. (9)

Their long-term benefits depend largely on the appropriateness of the chosen design, the precision of clinical adjustment and patient adherence to therapy. (13)

An important parameter that should not be overlooked is that poor adherence or inadequate follow up adjustments may limit therapeutic benefits or even lead to occlusal changes over time. (12) Digital splints, which offer higher precision and better adaptation through CAD/CAM fabrication have shown promising results in improving stability and patient comfort potentially enhancing long-term success. (18)

Their effectiveness increases significantly when integrated into a broader treatment strategy that includes physiotherapy, muscle stretching, stress management and habit modification techniques aimed at reducing clenching and grinding. (10) Patient education also plays a major role as identifying and modifying parafunctional habits can reduce recurrence and enhance treatment results. (3)

Despite their benefits, certain limitations must be acknowledged. Stabilization splints remain the most widely supported devices, but their efficacy still depends on individual muscular and joint characteristics. (9) Repositioning appliances can be useful for selected articular disorders but may induce occlusal changes when worn for extended periods which require careful monitoring. (16)

Soft splints may stimulate muscle contraction in some patients, reducing their effectiveness in managing myofascial pain. Hydrostatic splints can provide immediate relief but lack durability and are intended only for short-term use. (16)

Overall myorelaxant splints offer a reliable and reversible option supported by current scientific evidence for managing TMD and bruxism although the overall certainty of evidence remains limited. (20) When prescribed after accurate diagnosis, selected according to the patient's

functional profile, and regularly adjusted, they constitute an essential component of modern conservative dentistry. (1)

1.4. Types of myorelaxant splints

1.4.1. Stabilization or permissive splints

1.4.1.1. Full coverage stabilization appliances

- Stabilization splint (*Michigan*) (**Figure 1**)



Figure 1. Stabilization splint. A. Michigan splint. B. Frontal view of Michigan splint. C. Lateral view of the Michigan splint. From Albagieh et al. (1), CC BY-NC-ND 4.0

Stabilization splints or permissive or Michigan splints are the most frequently used type of occlusal appliance. They are designed to provide even tooth contact and allow the mandible to move freely in all directions. (9,21) By providing a stable and uniform surface, these splints prevent the mandible from being guided into a restricted position and support a more natural pattern of muscle activity. (1)

Their primary goal is to reduce excessive muscle activity by eliminating occlusal interferences and distributing forces evenly across the dental arches. Electromyographic studies have shown

that stabilization splints can significantly decrease the hyperactivity of the masseter and temporalis muscles which means a reduction in muscle pain, fewer episodes of fatigue and improved comfort during mastication. (7)

In patients with myogenous TMD, these appliances are often associated with a rapid decrease in pain intensity and an improvement in mandibular mobility especially when combined with physiotherapy or exercise therapy. (10)

They contribute to joint protection by buffering excessive functional and parafunctional loads. They help to minimize tooth wear, limit microfractures and reduce the transmission of excessive forces to the temporomandibular joints which is particularly relevant in patients with sleep bruxism. (2) These splints promote a more stable and symmetric condylar position within the articular fossae, thereby improving joint kinematics and decreasing intra-articular pressure. (12) The effectiveness of stabilization splints can be further enhanced through precise fabrication techniques. Digital splints made from CAD/CAM manufacturing allow for more accurate adaptation, better occlusal adjustment and improved patient comfort which may increase compliance and long-term success. (18)

In addition, when stabilization splints are integrated into a broader multimodal program, including counseling, stress management and physiotherapy, they appear to provide more durable symptom control and greater functional recovery than if they were used alone. (15) For this reason, stabilization splint remain the reference of myorelaxant appliances for muscular TMD and bruxism due to their capacity to reduce muscle hyperactivity, protect the dentition and joints and support joint stability when they are correctly indicated, fabricated, and monitored. (1,22)

1.4.1.2. Partial coverage permissive appliances

- Anterior splints (**Figure 2**)



Figure 2. Anterior splint. A/B. Anterior Bite Plane. C. Frontal view of the Anterior Bite Plane. D. Lateral view of the Anterior Bite Plane. From Albagieh et al. (1), CC BY-NC-ND 4.0

Anterior or deprogramming splints or anterior bite planes are designed so that only the anterior teeth contact the device while the posterior teeth remain completely out of contact. This selective contact configuration aims to interrupt habitual occlusal patterns, reduce hyperactivity of the lateral pterygoid muscles, and facilitate neuromuscular reprogramming through temporary alteration of mandibular guidance. (1,14)

By eliminating posterior contacts, these appliances disrupt the conditioned chewing patterns that often maintain muscular tension. These splints can significantly reduce the activity of the temporalis and masseter muscles during clenching. (3) This decrease in muscular recruitment is often associated with rapid relief of myofascial symptoms and improved jaw mobility, particularly in patients presenting strong parafunctional habits or acute muscular spasms. (4)

However, anterior splints also modify the distribution of occlusal forces which can lead to biomechanical changes within the temporomandibular joint. During clenching anterior

appliances can lead to a slight decrease in joint space as the condyle shifts position, implying a temporary modification of how forces are transmitted within the TMJ. (7)

Because anterior bite planes rely on contact with a small number of teeth and intentionally remove posterior support prolonged use may lead to dental intrusion, extrusion, or occlusal changes. For this reason, it is recommended to use them only for short-term therapeutic objectives such as acute muscular relaxation, diagnostic deprogramming, or preparation for a definitive stabilization splint. (12,16)

When combined with physiotherapy and behavioral strategies, anterior splints may provide improved clinical outcomes while reducing the risk of unwanted dental movement. (10) Overall, when carefully monitored and used for an appropriate duration, anterior splints represent an effective appliance for interrupting maladaptive neuromuscular patterns and managing acute myogenous components of temporomandibular disorders.

- NTI appliances

The NTI (Nociceptive Trigeminal Inhibition) appliance is a prefabricated or custom anterior device designed to establish contact only at the incisal level while the posterior teeth remain completely disengaged. With only anterior contact the device aims to interrupt habitual clenching patterns and induce reflex inhibition of the elevator muscles through trigeminal neuromodulation. This mechanism is based on the principle that anterior tooth contact can reduce activity of the masseter and temporalis muscles during maximal clenching thereby limiting occlusal loading and parafunctional intensity. (2,13)

Unlike full arch stabilization splints which distributes occlusal forces evenly across the dental arch, the NTI appliance makes selective contact and functional disocclusion. Classification of occlusal appliances generally categorize NTI appliances as partial coverage anterior splints differentiating them from permissive stabilization splints that aims to harmonize global occlusal relationship. (16) This fundamental biomechanical difference implies that NTI appliances don't mainly stabilize the mandibular position but instead acts by temporarily reducing excessive muscular activity.

Clinical reports on bruxism and muscular TMDs suggest that anterior appliances may produce rapid reductions in muscle tenderness and parafunctional activity particularly in acute phases characterized by intense clenching. (13) The immediate decrease in maximal bite force observed with anterior contact may contribute to short-term pain relief especially in patients presenting

with pronounced myogenous components. However, the magnitude and durability of these effects appear variable across studies and long-term superiority over conventional stabilization splints has not been clearly demonstrated. (23)

When posterior teeth are not in contact, occlusal forces are no longer distributed normally and the loading of the mandible may change. Although this temporary anterior contact can reduce muscle activity and provide short-term relief, prolonged absence of posterior contacts may lead to occlusal instability. Continuous use without monitoring may result in intrusion of anterior teeth or extrusion of posterior teeth. (1,16)

Because the NTI relies on a limited contact area, patient compliance and careful follow-up are essential. Inadequate monitoring may increase the risk of occlusal changes or discomfort. For this reason, it is recommended prescribing NTI appliances for short-term therapeutic objectives such as acute muscular deprogramming or temporary control of bruxism rather than as a long-term solution. (16)

When integrated into a multimodal treatment approach including behavioral counseling and physiotherapy, NTI appliances may contribute to improved symptom control. (10)

However, current evidence does not support their routine preference over stabilization splints particularly in chronic or structurally complex temporomandibular disorders. (23)

1.4.1.3. Material-based permissive appliances

- Soft and hydrostatic splints (**Figure 3**)



Figure 3. Soft and hydrostatic splint. A. Soft Rubber Splint. B. Frontal view of the Soft Rubber Splint. C. Lateral view of the Soft Rubber Splint. From Albagieh et al. (1), CC BY-NC-ND 4.0

Soft splints usually fabricated from elastic thermoplastic materials are appreciated for their comfort and ease of adaptation. They are often recommended during acute pain episodes or used as an initial, transitional phase before providing a rigid stabilization appliance. Their flexibility allows them to absorb and cushion occlusal forces which may help reduce discomfort in patients experiencing increased muscle sensitivity. (2,13). However, the elastic resilience of soft splints may occasionally stimulate increased muscular activity due to reflex contraction particularly in bruxism patients, thereby limiting their therapeutic value to short-term use. (5)

Hydrostatic devices such as the Aqualizer function differently by incorporating liquid filled chambers that dynamically redistribute occlusal pressure across the dental arches. This system allows forces to balance automatically according to mandibular position, promoting almost immediate muscular relaxation and reducing strain on both teeth and temporomandibular joints. These devices can rapidly decrease muscular hyperactivity and provide effective relief in

acute myofascial episodes. (4,16)

Despite these advantages, there are notable limitations. Their structural fragility due to the thin plastic membranes containing the liquid, reduces their lifespan and reliability during long-term use. They are therefore prescribed primarily as temporary aids, often to interrupt acute parafunctional activity or to help determine whether a more stable appliance such as stabilization splints would be beneficial. (7) Hydrostatic splints may also be useful as diagnostic tools, helping clinicians assess mandibular balance and identify whether muscular or occlusal factors predominate in the patient's symptoms. (10)

Overall, both soft and hydrostatic splints can provide rapid, short-term symptom relief particularly in the early stages of treatment or during acute muscular flare-ups. However, current evidence indicates that their therapeutic impact remains limited compared with rigid stabilization splints and their use must be carefully monitored to avoid unwanted neuromuscular responses or functional instability.

1.4.1.4. Neuromuscular permissive appliances

- **Neurophysiological (MAPA)**

The most recent developments in occlusal splints introduce a neurophysiological approach rather than relying solely on mechanical disengagement or force redistribution.

The Maxillary Anterior Passive Appliance (MAPA) described by Crout (14) represents a distinct category of splints designed to influence muscle function through controlled sensory input rather than extensive occlusal coverage. Unlike conventional stabilization appliances, the MAPA contacts the dentition mainly during clenching, maintaining minimal interference during rest or functional movements.

Its mechanism of action is based on proprioceptive modulation. By directing occlusal contact primarily onto the canines because there are teeth characterized by rich periodontal mechanoreception, the device leverages the strong sensory feedback of these receptors to regulate neuromuscular activity. This selective stimulation helps interrupt dysfunctional muscle patterns, reduce the recruitment of elevator muscles, and limit the vertical and horizontal forces transmitted to posterior teeth. As a result, the MAPA may reduce muscular hyperactivity and limit overload on the temporomandibular joint. (3,14)

Neurophysiological appliances may be particularly useful for patients with persistent myofascial symptoms or those who exhibit increased muscular activity despite conventional splint therapy. (3,4) By adopting a proprioceptive focused design, these devices allow neuromuscular adjustments without significantly altering the condyle disc relationship, making them a safe option for cases where joint mechanism must be preserved. (8,16)

Additionally, the limited posterior contact involved in MAPA therapy may help reduce parafunctional intensity in nocturnal bruxism. When anterior contact occurs during clenching, elevator muscle output may decrease, contributing to muscle relaxation. (5,6) Because of its passive and minimalist design, the MAPA can also offer high patient comfort and may encourage better compliance compared with bulkier full arch appliances. Early work on CAD/CAM fabrication suggests that digitally produced MAPA type appliances may further improve precision and overall tolerance. (11,18)

Although neurophysiological splints remain less extensively studied than stabilization or repositioning devices, emerging evidence indicates that they may play a valuable role in targeted muscle regulation and conservative management of specific TMD patterns. When properly indicated and monitored, MAPA type appliances can complement conventional splint therapy and expand the clinician's ability to modulate neuromuscular behavior in a minimally invasive manner.

1.4.2. Repositioning or directive splints (non-permissive)

1.4.2.1. Repositioning splint (**Figure 4**)

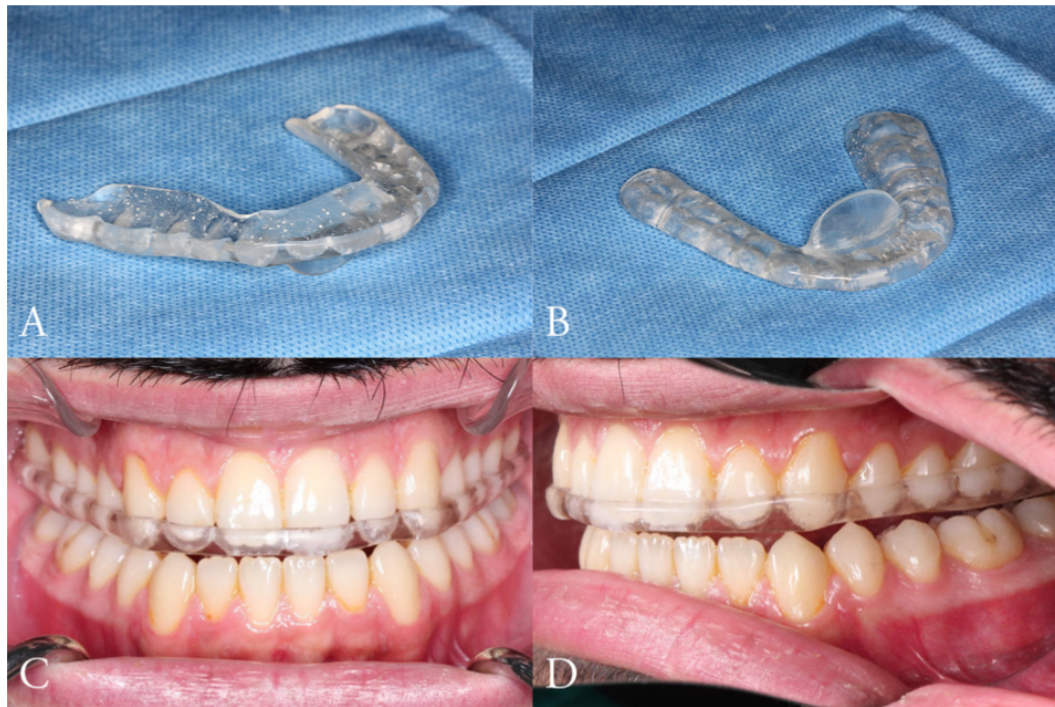


Figure 4. Repositioning splint. A/B. Anterior repositioning Splint. C. Frontal view of anterior Repositioning splint. D. Lateral view of anterior repositioning splint. From Albagieh et al. (1), CC BY-NC-ND 4.0

Repositioning splints or directive appliances are designed to modify mandibular posture by encouraging the condyles to adopt a specific therapeutic position most often a slightly anterior position that facilitates a more favorable relationship between the condyle and the articular disc. Their purpose is to re-establish functional alignment in situations where joint coordination is disrupted particularly when the disc is displaced or when mandibular stability is compromised. (24,25)

These appliances are most frequently recommended for patients presenting disc displacement with reduction, significant clicking, intermittent locking sensations or signs of condylar instability. By altering the mandibular trajectory, the splints aim to reduce mechanical strain on the retro discal tissues, decrease intra-articular friction and promote smoother joint translation during mandibular movements. (25,26)

Directive splints can temporarily reduce joint sounds and improve functional parameters in patients whose symptoms originate from articular derangements rather than muscular overactivity. (7,9) This effect is often due to the decompression of the retro discal area, where inflammation and mechanical irritation are commonly observed in disc related disorders. Additionally, repositioning the mandible into an anterior position has been shown to increase joint space and enhance disc condyle coordination during opening and closing movements. (7,19,25)

However, these benefits must be weighed against certain limitations. Prolonged or inappropriate use can lead to occlusal changes. (12,16) For this reason, repositioning appliances are generally prescribed for short-term use and require close clinical monitoring with regular adjustments, imaging control when necessary and eventual transition to a stabilization splint once symptoms improve. (8,18)

Combining directive splints with physiotherapy or muscle relaxation protocols may enhance clinical outcomes, especially in patients who present both joint derangement and muscular compensation patterns. (10,20) When used correctly and within a clearly defined treatment plan, repositioning splints can provide meaningful relief for articular TMD patients and contribute to restoring functional joint mechanics. (24)

1.4.2.2. Pivot splint (**Figure 5**)



Figure 5. Pivot splint. A. Distraction Splint. B. Frontal view of the Distraction Splint. C. Lateral view of the Distraction Splint. From Albagieh et al. (1), CC BY-NC-ND 4.0

Pivot splints are characterized by a localized posterior contact usually positioned in the molar region which functions as a mechanical fulcrum during mandibular closure. Unlike full coverage stabilization splints that aim to distribute occlusal forces evenly across the arch. Pivot appliances rely on selective posterior contact to intentionally alter mandibular biomechanics. Their theoretical rationale is based on the hypothesis that a posterior pivot point may induce a slight condylar distraction potentially reducing intra-articular pressure within the temporomandibular joint. (16,23)

In classification of occlusal appliances, pivot splints are frequently grouped among directive or repositioning type appliances because of their intended influence on condylar dynamics rather than neuromuscular stabilization alone. (1,16) This distinguishes them conceptually from permissive stabilization splints which aim to provide a balanced occlusal platform and muscular relaxation without actively modifying condylar position.

The fulcrum effect generated by posterior contact may modify load transmission across the temporomandibular joint during clenching. Moreover, improvements in symptoms observed with pivot splints are often similar to those reported with stabilization appliances making it

difficult to attribute clinical benefits specifically to the fulcrum mechanism. (1,23)

Another important consideration concerns occlusal stability. Because pivot rely on a concentrated posterior contact, prolonged or uncontrolled use may theoretically induce occlusal changes or asymmetrical loading patterns. This potential risk combined with the absence of strong evidence demonstrating clear clinical superiority over full arch stabilization splints has contributed to their limited adoption in routine practice. (23)

However, clinical investigations have produced heterogeneous and sometimes contradictory results and evidence demonstrating predictable modification of condylar position remains limited. For this reason, pivot splints are rarely recommended as a first line treatment and are generally considered more controversial compared with stabilization appliances. (1,23) Their indication remains selective and may be considered in specific biomechanical contexts under strict supervision.

1.4.2.3. Posterior bite plane (**Figure 6**)



Figure 6. Posterior bite plane. A. Posterior Bite Plane. B. Frontal view of the Posterior Bite Plane. C. Lateral view of the Posterior Bite Plane. From Albagieh et al. (1), CC BY-NC-ND 4.0

Posterior bite planes are occlusal appliances characterized by contact limited to the posterior teeth generally in the molar or premolar region while anterior teeth remain out of occlusion. Unlike full coverage stabilization splints, these devices do not aim to establish global

occlusal balance but rather to selectively modify posterior contacts. (1,16)

Their design is based on the concept that altering posterior occlusal support may influence mandibular position, muscular activity, and temporomandibular joint loading conditions. (23)

Posterior bite planes modify the vertical dimension locally and can temporarily change mandibular guidance during closure. By concentrating contact in the posterior region, they may reduce anterior guidance influence and modify elevator muscle recruitment patterns. (3)

Some classifications of occlusal appliances describe posterior bite planes as directive or repositioning devices due to their potential effect on condylar position and intra-articular loading. These appliances have been proposed in specific situations such as acute muscular hyperactivity, occlusal instability, or certain joint related conditions. (16)

However, their therapeutic rationale differs from that of stabilization splints which distribute occlusal forces across the entire arch. Because posterior bite planes provide partial coverage, their indication is generally considered limited in duration and requires careful monitoring. (23)

There is no clear superiority of posterior bite planes over full arch stabilization splints in the management of temporomandibular disorders.

Overall, posterior bite planes remain less commonly used than stabilization splints and their use should be based on precise diagnosis and clearly defined therapeutic objectives. (16,23)

2. OBJECTIVES

P (population): Patients diagnosed with TMDs

I (intervention): different types of myorelaxant occlusal splints

C (comparison): comparison between splint types or conservative approaches

O (outcome): clinical indications, therapeutic effects, limitations

Primary objective: Analyze the effectiveness of the different types of myorelaxant splints used in the management of temporomandibular disorders.

Secondary objective: Compare the specific clinical indications, therapeutic effects, and limitations of the main types of myorelaxant splints.

3. MATERIAL AND METHODS

This work is based on a structured review of the scientific literature on the use of myorelaxant occlusal splints in the management of temporomandibular disorders. This literature search was conducted in the PubMed database using the following keywords: “Myorelaxant splint”, “Type”, “Occlusal splint”, “Temporomandibular disorders”.

The search strategy was refined to focus on studies specifically addressing different occlusal splints designs, to improve the specificity of the review question.

The review aimed to answer the following PICO-based question: In patients with temporomandibular disorders, what are the clinical effects, indications, and limitations of myorelaxant occlusal splints compared with other splint designs or conservative approaches?

Studies involving adult patients diagnosed with muscular, articular, or mixed forms of TMD were considered for inclusion, as well as those presenting symptoms commonly associated with splint therapy such as muscle pain, joint clicking or parafunctional habits.

Articles evaluating different types of splints, including stabilization splint, anterior splint, hydrostatic splint, repositioning splint, NTI appliances, pivot splints and neurophysiological splints were considered in order to compare their clinical indications and reported outcomes.

Table 1. Eligibility criteria

INCLUSION CRITERIA	EXCLUSION CRITERIA
- Primary evidence links with TMD. - Evaluated at least one type of occlusal or myorelaxant splint with another splint or other treatment. - Presented clinical outcomes such as pain levels, muscle activity, mandibular movement, or joint noises. - Article published between 2015 and 2025. - Full text articles available. - Text in English.	- Systematic reviews, meta-analyses, narrative reviews, study protocols. - Case reports and case series due to their limited methodological strength and low generalizability. - Articles focused on orthodontics or surgical appliances. - Studies involving patients with systemic disorders directly affecting TMJ or recent maxillofacial trauma. - Article that did not provide enough information about the splint. - Article without accessible full text.

The following initial search was carried out on PubMed:

((type) AND (occlusal splint) OR (myorelaxant splint)) AND (temporomandibular disorder)

((("type"[All Fields] AND "occlusal splints"[MeSH Terms]) OR (("myorelaxant"[All Fields] OR "myorelaxants"[All Fields] OR "myorelaxation"[All Fields] OR "myorelaxing"[All Fields]) AND "splints"[MeSH Terms])) AND ("temporomandibular joint disorders"[MeSH Terms] OR ("temporomandibular"[All Fields] AND "joint"[All Fields] AND "disorder"[All Fields]) OR "temporomandibular joint disorders"[All Fields] OR ("temporomandibular"[All Fields] AND "disorders"[All Fields]) OR "temporomandibular disorders"[All Fields]))

The initial search identified 75 articles.

After the search, records were screened by title and abstract according to the predefined eligibility criteria. Studies that appeared relevant were then assessed in full text. Only primary studies meeting the inclusion criteria were retained for the final analysis. The study selection process was summarized in a PRISMA flow diagram.

For each included study, the following information was extracted: year of publication, study design, sample size, splint type, indication, comparison group, reported results and main limitations.

4. RESULTS

After applying the predefined inclusion and exclusion criteria, 6 primary clinical studies were retained for the final analysis, as shown in the PRISMA flow diagram. (27)

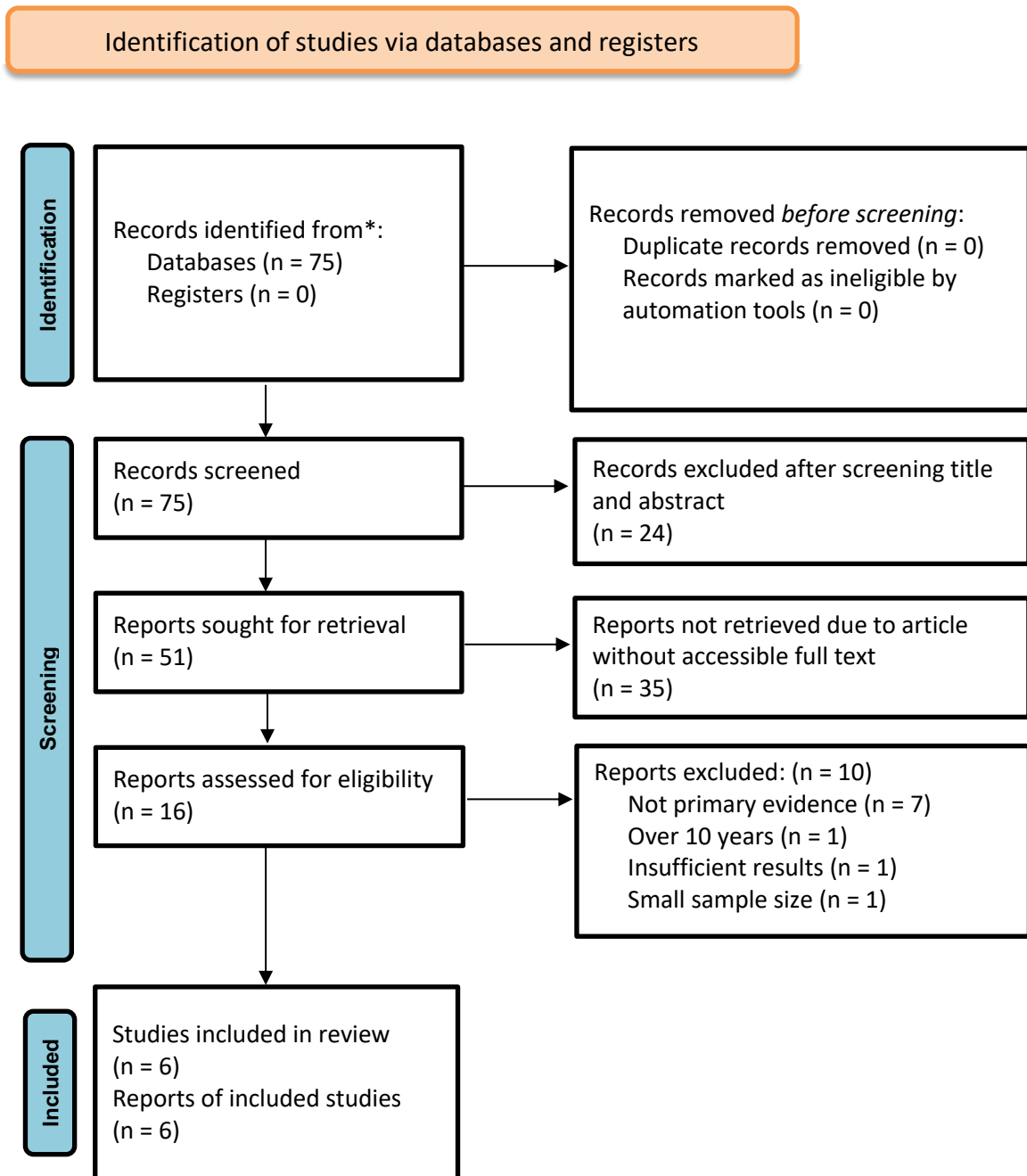


Figure 7. PRISMA flow diagram of study selection process on PubMed. From Page (27)

Table 2. Characteristics of the included articles according to splint type and clinical indications.

Authors	Sample size	Splint Category	Study Design	Indications	Reported results	Main Limitations
Salloum et al. (28)	N = 80	Stabilization splint	Randomized controlled trial (RCT)	Myofascial pain (muscular TMD)	- Pain intensity decreased -stabilization splint group showed short term pain reduction -long-term results were similar	- four-arm design reduced the number of participants per group
Saha et al. (29)	N = 60	Stabilization splint	RCT	TMD associated with migraine or tension-type headache	-no significant difference in headache intensity -within the splint group headache intensity decreased and physical quality of life improved	-small sample -low power -imbalance between groups due to dropout rates
Huth et al. (30)	N = 40	Aqualizer guided splint	RCT	Pain related TMD	-both groups showed reduction in TMD symptoms and pain -Aqualizer showed better improvement in TMJ pain on maximum opening and quality of life	-no untreated control groups - heterogeneous TMD presentations
Alajbeg et al. (31)	N = 34	Stabilization splint	RCT	Chronic TMD pain (myalgia / arthralgia)	-improvement in pain-related disability, pain-free mouth opening	-small sample -all participants were female

					and depressive symptoms -decrease in oxidative/antioxidant ratio at follow up	-no untreated control
Van Grootel et al. (32)	N = 72	Stabilization splint	RCT	Myogenous TMD	-similar long term success rate and effectiveness were observed in both groups -treatment duration differed between groups	-Only myogenous TMD was included -study design allowed therapy specific duration
Derwich et al. (33)	N = 40 TMD + 15 controls	Occlusal splint + physiotherapy	Prospective case-control study	TMD with craniovertebral / craniomandibular alterations	-significant post treatment changes in mandibular position, cervical parameters and craniovertebral relationship	-no RCT design -combined intervention did not isolate the effect of splint therapy

Following the PRISMA diagram with the application of the predefined inclusion and exclusion criteria, a total of 6 primary clinical studies were included in the final analysis. (27) Among them, 5 were randomized controlled trials and 1 was a prospective case-control study. No systematic reviews, meta-analyses, narrative reviews, study protocols were included in this section.

The selected studies were published between 2017 and 2024. Most of them compared occlusal splint therapy with another conservative intervention such as physiotherapy, exercises, usual care, or different clinical procedures related to splint fabrication. (28-32) Sample sizes varied across studies. The randomized trials ranged from 34 to 80 participants while prospective case-control study included 40 patients with TMD and 15 controls. (28-33)

The populations assessed were mainly adults diagnosed with myogenous TMD particularly myofascial pain. (28,32) One RCT included patients with TMD associated with migraine or tension type headache. (29) Another focused on chronic TMD pain with myalgia and arthralgia and explored both clinical and biochemical parameters. (31) The prospective study included patients with TMD presenting craniovertebral and craniomandibular alterations. (33)

5 out of 6 articles shown appliance was the stabilization splint. (28-32) Across the RCTs, these splints were generally associated with reductions in pain intensity and improvements in mandibular mobility particularly in patients with muscular forms of TMD. (28,31,32)

However similar clinical improvements were also observed in comparison groups receiving physiotherapy, exercise-based interventions, ultrasound therapy or usual care. (28,29,32) In patient with headache associated to TMD, no significant between group difference was observed for some patient-reported outcomes. (29)

One RCT reported changes in oxidative stress markers and depressive symptoms together with clinical improvement after stabilization splint therapy. (31) Another study showed that the method used to record the maxillomandibular relationship before splint fabrication influenced treatment outcomes with symptom reduction reported in both registration groups. (30)

In the prospective case-control study, the combination of physiotherapy and occlusal splint therapy was associated with measurable changes in craniovertebral and craniomandibular parameters after treatment. (33)

Overall, the included primary studies showed short-term improvement after occlusal splint therapy although the degree of improvement varied according to the comparator, patient group and outcomes measure assessed.

5. DISCUSSION

This literature review examined the effectiveness of myorelaxant occlusal splints in temporomandibular disorders, mainly in patients with myogenous TMD. Overall, the included primary studies suggest that stabilization splints may reduce pain and improve mandibular function especially in the short term. However, the results do not show a clear superiority of splint therapy over other conservative approaches such as physiotherapy, exercise-based therapy, or usual care. (28-33)

A first point emerging from the included studies is that stabilization splints appear to be useful, but their benefit is not exclusive. In the RCTs by Van Grootel et al. (32) and Salloum et al. (28), symptom improvement was observed not only in splint treated patients but also in patients receiving physiotherapy, ultrasound therapy or exercise-based management. This is important because it suggests that the improvement observed in TMD may depend on more than one therapeutic pathway. It is possible that muscular unloading, reduction of parafunctional habits and adaptation over time all contribute to clinical recovery. This makes a link with other reviews showing that splint therapy is often effective but not every time more effective than other conservative interventions. (9,12,20)

The absence of clear superiority over other treatments has also been reported in other reviews. The certainty of evidence for occlusal interventions is low and current data do not allow firm conclusions about superiority over other non-invasive options. (20) Similar conclusions were reported in systematic reviews focused on muscular TMD and on occlusal splints more generally where positive outcomes were described but with substantial variability between studies in terms of diagnosis, appliance design, follow-up, and measured outcomes. (9,12,21) This shows that the present review is consistent with the existing literature rather than contradictory to it.

The RCT by Saha et al. (29) adds another dimension because it included patients with TMD associated with migraine or tension-type headache. In this group, splint therapy did not demonstrate a clear advantage over usual care for headache intensity, even though some TMD-related and quality of life measures improved. This may indicate that splints are more effective for local musculoskeletal problems than for broader pain syndromes in which headache mechanisms, psychological factors and central sensitization may play a more prominent role. This does not reduce the value of splints but it suggests that their clinical indication should remain closely linked to the dominant symptom pattern.

Alajbeg et al. (31) explored oxidative stress markers and psychological parameters in addition to pain and function. This is particularly interesting because it opens the possibility that splint therapy may affect more than pain perception alone. These findings should be interpreted with caution. The study sample was small, included only women, and focused on a specific subgroup of chronic TMD patients. For this reason, the relationship between splint therapy, biochemical changes and symptom improvement cannot yet be considered established. At present, the clinical evidence for pain reduction is more convincing than the evidence for a specific biological mechanism.

Huth et al. (30) also deserves attention because it suggests that treatment outcome may depend not only on the type of splint used but also on how the splint is fabricated and how the mandibular relationship is recorded. This is clinically relevant. It supports the idea that precision of adaptation, comfort and functional balance may influence treatment response. This view is also supported by more recent literature on digital splint fabrication which emphasizes better fit and potentially improved patient comfort although the long-term clinical advantage still needs clarification. (11,18)

The inclusion of the prospective case-control study by Derwich et al. (33) suggests that splints may have a role within a broader multimodal program rather than as an isolated intervention. In that study, splint therapy combined with physiotherapy was associated with postural and craniovertebral changes. Because the splint was not tested alone, its individual contribution cannot be measured precisely. The findings support the idea that combining conservative strategies may provide broader functional benefits than any single treatment in isolation. This is consistent with reviews comparing splints with manual therapy or exercise-based approaches where multimodal management often appears more clinically realistic and potentially more effective over time. (18,20)

Some limitations of the present review should be acknowledged.

First, the term of “myorelaxant splint” used in the title and keywords is difficult because it is not standardized in English literature, and it may have reduced the sensitivity of the search.

Second, the search string was constructed to reflect the research question of the present review, which focuses on the different types of myorelaxant splints and their respective indications. This deliberate choice oriented the search toward studies comparing different splint designs against one another rather than studies evaluating a single appliance in isolation. While

methodologically justified, it restricted the number of eligible records and contributed to the limited number of studies ultimately retained for analysis, reflecting an intentional trade-off between search specificity and comprehensiveness.

Third, the studies were heterogeneous regarding sample size, patient characteristics, comparator groups, follow-up duration and outcome measures.

Fourth, most of the evidence concerned stabilization splints in myogenous TMD, which means that the conclusions cannot be generalized equally to all splint designs or all TMD subtypes. These factors reduce the strength of the conclusions and make direct comparison difficult.

Despite these limitations, the present findings provide clinically relevant information. They support the use of stabilization splints as a reversible conservative option particularly in muscular TMD. However, they also suggest that splints should not be seen as a universally superior solution. Their use appears more appropriate as part of a broader treatment strategy that may include physiotherapy, patient education, habit control and follow-up adjustment according to symptom evolution.

Future research should focus on larger randomized trials with more standardized diagnostic criteria clearly defined appliance protocols and longer follow-up periods. It would also be useful to identify which patient subgroups benefit most from splint therapy and whether certain fabrication or adjustment protocols improve long-term outcomes. Ultimately, such evidence would allow clinicians to make more informed and individualized treatment decisions.

6. CONCLUSION

Myorelaxant splints represent a valid conservative option in temporomandibular disorder management. Stabilization splints are the most widely supported appliances and are associated with short-term pain reduction and improvement in mandibular function, especially in myogenous TMD. However, current evidence does not show clear superiority over conservative approaches.

Among the main splint types, stabilization splints have the broadest clinical support whereas other designs may be useful in more specific situations. Their indications and therapeutic effects vary according to the clinical condition and duration of use. At present, no single splint design can be considered universally superior.

7. SUSTAINABILITY

The management of temporomandibular disorders through conservative and reversible treatments contributes to more sustainable healthcare practices. Occlusal splint therapy represents a non-invasive approach that may reduce the need for more complex and costly interventions such as surgical procedures or long-term pharmacological treatments. By focusing on prevention, early diagnosis and conservative management of temporomandibular disorders, this approach may help limit disease progression and reduce the burden on healthcare systems. From an economic and social perspective, occlusal splints may improve patient quality of life by reducing pain and functional limitation while preserving access to safe and affordable treatment. Patient education, behavioral modification and follow-up may also improve long term adherence and reduce recurrence which supports more efficient use of healthcare resources.

This approach is also linked to a lesser extent to environmental sustainability. Digital fabrication techniques such as CAD/CAM may improve precision, reduce remakes, and help limit material waste. In this context, the management of TMD with conservative splint therapy is particularly related to Sustainable Development Goal 3: Good Health and Well-Being, as it promotes effective, safe, and patient-centered care with lower biological and economic cost.

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