INDONESIAN JOURNAL OF PROSTHODONTICS

CASE REPORT

Management of disc displacement with reduction and local myalgia using the wax record technique with aluminum wax on stabilization splints and infrared therapy: A case report

Nabilah Fajri Damanik,[1]* Ismet Danial Nasution,[2] Ricca Chairunnisa[2]

Keywords: Aluminum wax, Arthralgia, Disc displacement with reduction, Infra-red therapy, Myalgia

ABSTRACT

Disc Displacement with Reduction (DDWR) is one of the most common temporomandibular disorders (TMD), characterized by anterior displacement of the articular disc during mouth opening, typically accompanied by clicking sounds and masticatory muscle pain. DDWR is frequently associated with local myalgia, often worsened by stress and parafunctional habits. Stabilization splints and infrared therapy have demonstrated effectiveness in reducing symptoms. The use of aluminum wax in bite registration helps achieve a stable centric relation, enhancing splint fabrication accuracy. This case report aims to describe the management of DDWR with local myalgia and arthralgia through bite registration using aluminum wax to support centric relation during stabilization splint fabrication, complemented by infrared therapy. A 40-year-old male reported pain in the left cheek and ear, along with clicking during jaw movement for six months. DC/TMD Axis I assessment confirmed DDWR with local myalgia and arthralgia, Axis II revealed psychological stress. Treatment consisted of behavioral counseling, infrared therapy applied to the left masseter, and splint fabrication with bite registration using aluminum wax. Registration was performed using baseplate wax combined with aluminum wax on the occlusal surface to achieve centric relation during articulator mounting. After two weeks, the patient experienced increased mouth opening from 45 mm to 46 mm, reduced muscle tenderness, and improved muscle relaxation. The combination of behavioral counseling, aluminum wax-assisted bite registration for splint fabrication, and infrared therapy proved effective in reducing symptoms and improving mandibular function in a patient with DDWR and local myalgia. (IJP 2025;7(1):71-76)

Introduction

Temporomandibular disorders (TMD) are a group of conditions involving the temporomandibular joint, masticatory muscles, and associated structures, resulting in pain and functional impairment of the jaw.[1] The prevalence of TMD in the adult population is reported to range from 10% to 15%, predominantly affecting individuals in their productive age.[2] One of the most commonly encountered forms of TMD is disc displacement with reduction (DDWR), which is characterized by anterior displacement of the articular disc that returns to its normal position during mouth opening, often producing a clicking sound. Clinically, DDWR is typically associated with joint clicking during mandibular movement and may be accompanied by jaw deviation or joint discomfort.[1,3]

DDWR is frequently associated with local myalgia, defined as muscle pain resulting from hyperactivity of the masticatory muscles, particularly the masseter and temporalis.[4] This muscle tension is often exacerbated by psychoemotional factors such as stress, as well as parafunctional habits like unilateral chewing. Excessive muscle activity may lead to local ischemia and accumulation of inflammatory mediators, such as prostaglandins and substance P, which contribute to pain. In addition, behavioral factors, including unilateral chewing habits and poor posture, also play a role in the development of TMD.[5]

A comprehensive diagnosis of TMD is established using the DC/TMD protocol, which includes both Axis I (clinical assessment) and Axis II (psychosocial evaluation) components.[6] Axis I examination facilitates the identification of structural abnormalities of the joint and muscles, while Axis II evaluates emotional factors and psychological burden influencing symptom presentation. Previous studies have demonstrated that patients with high levels of stress and anxiety are more susceptible to persistent muscle pain.[7,8] Therefore, treatment planning should adopt a multifactorial approach to achieve optimal outcomes, often requiring a combination of occlusal and physical therapies.[9]

The fabrication of a stabilization splint is one of the primary treatment modalities for TMD and requires accurate bite registration to achieve a stable centric relation.[9] he use of aluminum wax as an adjunct to baseplate wax can help maintain jaw position due to its rapid setting and dimensional stability. Consequently, aluminum wax improves the accuracy of model mounting and the success of splint design, allowing for more even occlusal load distribution and enhanced mandibular stability during treatment.[10]

1Specialist Program in Prosthodontics, Faculty of Dentistry, Universitas Sumatera Utara, Medan, Indonesia
2Department of Prosthodontics, Faculty of Dentistry, Universitas Sumatera Utara, Medan, Indonesia

*Corresponding author: ismetdanial@yahoo.com

DOI 10.46934/ijp.v7i1.338

Table 1. Results of the objective examination.

Examination	Region	
	Right	Left
Temporalis	Ant : 0 Med : 0 Post : 0	Ant : 0 Med : 0 Post : 0
Tendon temporalis	0	1
Lateral pterygoid	0	1
Masseter	Superior : 0 Middle : 0 Inferior : 0	Superior : 1 Middle : 1 Inferior : 1
Regio submandibula	0	1
Sternocleidomastoideus	Posterior : 0 Anterior : 0 Klavikula : 0	Posterior : 0 Anterior : 0 Klavikula : 0
Splenius Capitis	1	-
Trapezius	1	0
Maximum mouth opening without pain (mm)	145 mm	
Maximum mouth opening with pain (mm)	47.5 mm	
Maximum assisted opening (mm)	56.2 mm	
Lateral Movement	6 mm	5mm
TMJ Pain	0	1
TMJ Noises	Open : - Close : -	Open : Cliking Close: Cliking
Headache	-	-
Tinitus	-	-
Static Occlusion	Right : Klas I Angle (molar relationship) Left : Klas I Angle (molar relationship)	
Dinamic Occlusion	Group function Overbite : 3 mm Overjet : 2 mm	
Midline deviation during maximum mouth opening	Deviation to the left during maximum mouth opening.	

Table 2. Treatment outcome evaluation.

Parameter	Initial Condition	2 Weeks Follow Up	6 Weeks Follow Up
Maximum mouth opening without pain (mm)	45 mm	46 mm	48 mm
Lateral Movement	Right: 6 mm Left: 5 mm	Right: 6 mm Left: 5 mm	Right: 6 mm Left: 6 mm
Muscle Examination			
Tendon temporalis	Left: 1	Left: 1	Left: 0
Lateral Pterygoid	Left: 1	Left: 1	Left: 0
Masseter	Left Superior: 1 Middle: 1 Inferior: 1	Left Superior: 1 Middle: 1 Inferior: 1	Left Superior: 0 Middle: 0 Inferior: 1
Regio Submandibula	Left: 1	Left: 0	Left: 0

In addition to occlusal therapy, infrared therapy is an effective non-invasive intervention for reducing muscle pain in patients with myogenic TMD.[11,12] This modality works by increasing local circulation, relieving muscle spasms, and lowering pain thresholds.[11] Several studies have shown that infrared therapy can significantly reduce pain intensity and improve mandibular function in TMD patients.[12]

The aim of this case report is to describe the management of a TMD case diagnosed as DDWR accompanied by local myalgia and arthralgia, through the fabrication of a stabilization splint using a wax record technique with aluminum wax to enhance centric relation accuracy, as well as the adjunctive use of infrared therapy.

Case Report

A 40-year-old male patient presented to the Department of Prosthodontics at the Dental and Oral Hospital, Universitas Sumatera Utara (USU), with a chief complaint of pain and discomfort in the left cheek and the left preauricular region, which had persisted for the past six months. The patient also reported fatigue during mastication on the left side, accompanied by a clicking sound during mouth opening and closing. There was no history of trauma; however, the patient reported experiencing significant academic stress and had parafunctional habits, including unilateral chewing and sleeping in a left lateral position figure 1.

At the first visit, a comprehensive objective examination was performed, including extraoral and intraoral assessments, evaluation of the masticatory muscles, temporomandibular joint (TMJ), and head and neck muscles. 'A series of questions based on the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) were administered to obtain the patient's TMJ-related medical history and to assist in classifying the type of temporomandibular disorder (TMD). Axis I examination included extraoral assessment, which revealed no abnormalities in facial form, nasal breathing, lips, or eyes. Intraoral examination showed a maximum mouth opening without pain of 45 mm and a maximum mouth opening with pain of 47.5 mm. Lateral movement was 6 mm to the right and 5 mm to the left. Protrusive movement was 5 mm and associated with pain. Joint clicking was present, while crepitation was absent, and mandibular deviation to the left side was observed. Palpation of the left masseter muscle, stylohyoid muscle, pterygoid muscles, temporalis tendon, and lateral pterygoid area elicited pain figure 2. Based on the psychosocial evaluation (Axis II), the anxiety questionnaire yielded a score of 9, indicating moderate anxiety (score range: 6–9). The results of the clinical examination are summarized in table 1.

Panoramic and temporomandibular joint (TMJ) radiographic analyses were performed. The panoramic radiograph revealed radiopaque areas on the occlusal surfaces of nearly all molar teeth, as well as generalized horizontal alveolar bone resorption affecting most dental elements. On TMJ radiographic evaluation figure 3A, it was observed that in the closed-mouth position, both mandibular condyles were located within the glenoid fossa. During mouth opening, the right

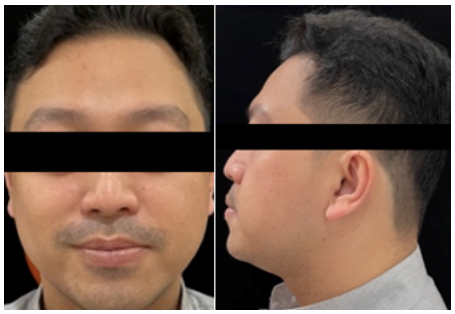

Figure 1. Extraoral photographs, frontal and left lateral views

DOI 10.46934/ijp.v7i1.338

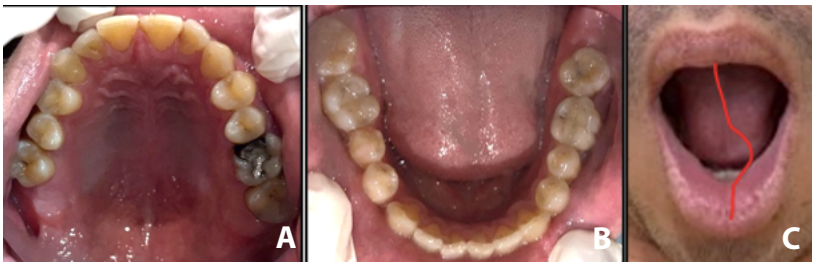

Figure 2. Intraoral photographs A. Maxillary arch, B. Mandibular arch, and, C. Left deviation during mouth opening

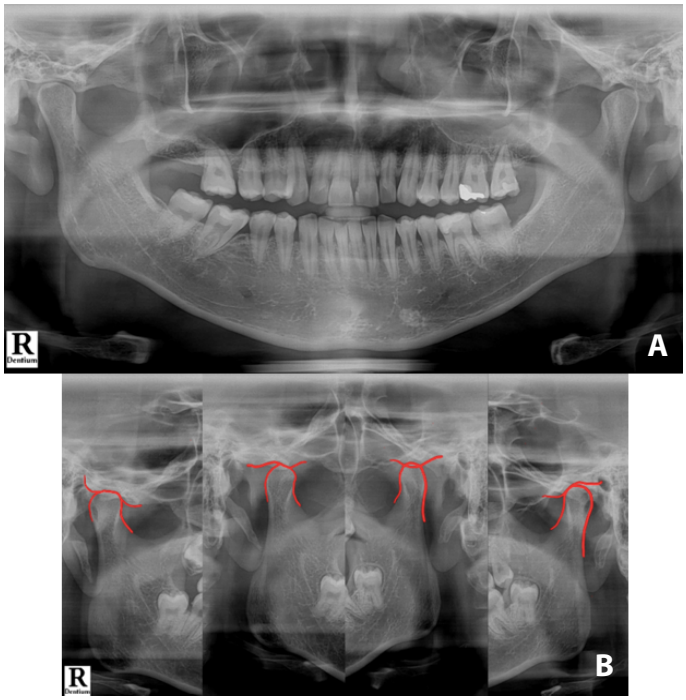

Figure 3. A. Panoramic radiograph, B. TMJ Radiograph

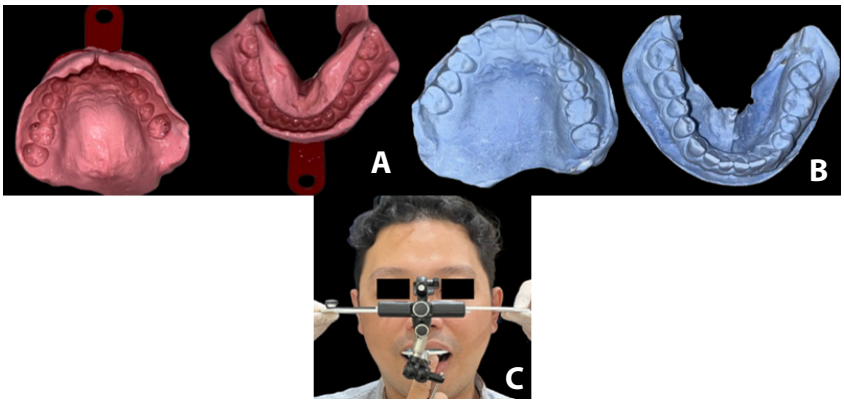

Figure 4. A. Impression result, B. Working model, C. Initial bite registration procedure

mandibular condyle was positioned at the level of the articular eminence, whereas the left mandibular condyle was located anterior to the articular eminence.

The diagnosis was established as disc displacement with reduction (DDWR) accompanied by local myalgia and arthralgia. The etiological factors included parafunctional habits such as unilateral chewing on the left side, sleeping in a left lateral position, and carrying a bag on the left shoulder, in addition to psychological stress. DDWR was diagnosed based on the presence of a clicking sound in the left temporomandibular joint during mouth opening and closing, along with mandibular deviation to the left. Local myalgia was determined due to pain upon palpation of the masticatory muscles (masseter) without referred pain. Arthralgia was identified based on pain elicited during palpation of the left intra-auricular region.

Phase I treatment consisted of patient education regarding the avoidance of parafunctional habits, such as unilateral chewing, bruxism, and sleeping on the left side. This was followed by infrared therapy applied to the left masseter and temporalis muscles. In addition, occlusal splint therapy was initiated, with a stabilization splint selected due to the absence of limitation in mouth opening and the lack of jaw locking during mandibular movements. The fabrication of the stabilization splint began with dental impressions using irreversible hydrocolloid material in a stock tray, followed by the preparation of working models using type III dental stone figure 3B. Subsequently, an initial bite registration was performed using an elastomeric bite registration material (polyvinyl siloxane) to mount the maxillary cast on a semi-adjustable articulator figure 4A and figure 4B.

Subsequently, a working bite registration was performed for mounting the mandibular cast. The registration was obtained using three layers of baseplate wax, with a thickness adjusted to the patient's freeway space, previously determined through assessment of the vertical dimension at rest and occlusion (3 mm). The wax was softened in warm water and adapted onto the occlusal surfaces of the maxillary arch without applying pressure. Excess wax was trimmed according to the patient's arch form, followed by intraoral try-in. Marking points were then created on the inferior surface of the wax at the canine and molar regions using the tip of a tweezer. The working bite registration was recorded in centric relation. The patient was first trained to perform mandibular movements, including protrusive and retrusive motions, with or without operator assistance, repeated 2–3 times. Once the patient became accustomed to the movement, aluminum wax was applied to the marking points, and the patient was instructed to occlude without operator assistance. After the material had hardened and a stable mandibular position was achieved, the registration record was removed and evaluated for accuracy figure 4C.

The maxillary and mandibular casts were subsequently mounted on a semi-adjustable articulator based on the obtained bite registration figure 5. Occlusal analysis was then performed, followed by the fabrication of a stabilization splint wax-up on the maxillary cast with a thickness corresponding to the wax record (3 mm),

DOI 10.46934/ijp.v7i1.338

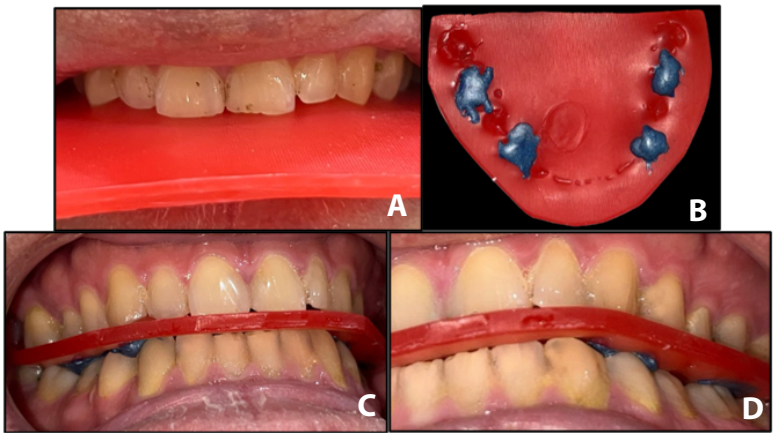

Figure 5. A. Maxillary occlusal registration using 3 mm wax thickness, B. Aluminum wax applied to the marking points, C and D. Working bite registration procedure.

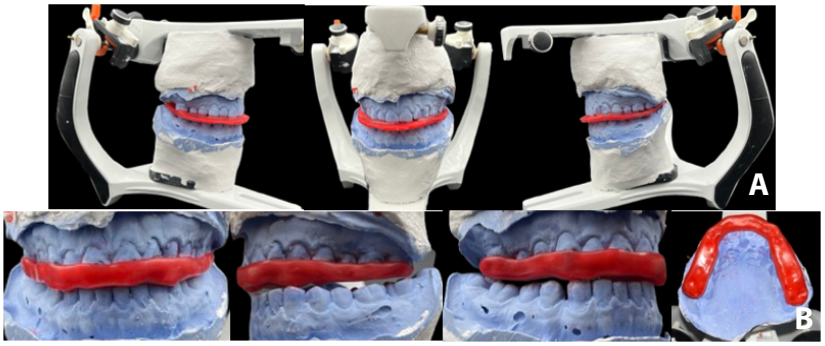

Figure 6. A. Mounting of maxillary and mandibular casts on a semi-adjustable articulator, B. Wax-up of the stabilization splint on the cast.

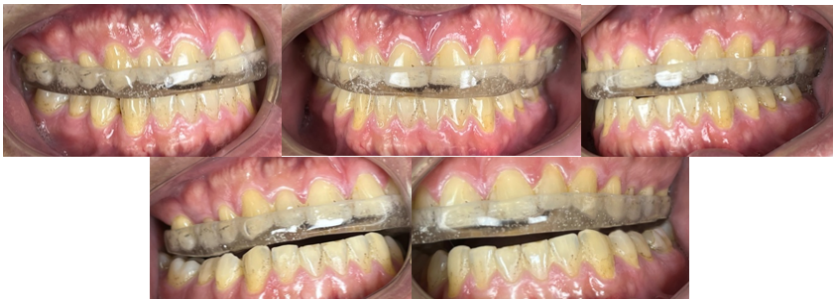

Figure 7. Insertion of the occlusal splint.

Figure 8. Application of infrared therapy on the left facial region.

incorporating canine guidance and a flat occlusal surface figure 6. After completion of the wax-up, the splint was processed using clear heat-cured acrylic resin through flasking and curing procedures. This was followed by finishing and polishing to achieve a smooth surface and ensure patient comfort during use. Once completed, the splint was inserted intraorally, and necessary adjustments were made to ensure even distribution of occlusal contacts and to eliminate any interferences figure 7. In addition, infrared therapy was administered to the left side of the face as an adjunctive treatment figure 8.

Physical therapy in the form of infrared therapy was applied to the left masseter and temporalis muscles starting from the initial visit, with a duration of 15–20 minutes per session, three times per week for two weeks. The patient was instructed to wear the splint during nighttime and to continue infrared therapy while avoiding parafunctional habits. Follow-up evaluations were conducted two weeks after splint insertion and continued periodically to reassess symptoms from the initial to subsequent visits until the patient's complaints resolved.

Outcome evaluation at 2 and 6 weeks demonstrated a significant improvement in mouth opening and a reduction in muscle tenderness, as summarized in table 2.

Discussion

The management of disc displacement with reduction (DDWR) accompanied by local myalgia requires a conservative approach that comprehensively addresses both joint and muscular abnormalities.[6] DDWR is characterized by a clicking sound resulting from disc recapture during mouth opening, whereas myalgia arises from prolonged hyperactivity of the masticatory muscles.[3,4] An accurate diagnosis can be established using the DC/TMD approach, which integrates clinical (Axis I) and psychosocial (Axis II) evaluations.[6] In the present case, the patient exhibited joint clicking and tenderness on palpation, along with parafunctional habits and stress as predisposing factors, thereby necessitating a multidisciplinary treatment approach.[5]

Psychosocial evaluation using DC/TMD Axis II plays an important role in identifying the contribution of stress and parafunctional habits to pain and dysfunction.[6] Previous studies have shown that TMD patients with mild to moderate psychological burden can achieve significant improvement through education and behavioral management.[7] Patient education aims to reduce parafunctional habits, such as unilateral chewing and improper sleeping posture, thereby decreasing masticatory muscle activity.[5] Therefore, initial management should focus on behavioral modification as a fundamental strategy for symptom control.[8]

Infrared therapy, as part of non-invasive physiotherapeutic modalities, has been widely used to

DOI 10.46934/ijp.v7i1.338

reduce muscle pain in patients with temporomandibular disorders, particularly those of myogenic origin. The mechanism of action of infrared therapy involves increased local vasodilation, which enhances blood circulation, improves oxygen supply, and facilitates the removal of pain-inducing metabolites. In addition, its thermal effect can decrease the activity of pain-related afferent nerves and reduce muscle spasm, thereby promoting relaxation of the masticatory muscles.[12] A clinical study by Kui et al. demonstrated that physical therapy, including infrared therapy, significantly reduced tenderness and improved mandibular function in TMD patients after several treatment sessions. These findings are consistent with other studies reporting that continuous heat therapy provides significant analgesic effects in musculoskeletal pain, including the masticatory muscles.[11]

A stabilization splint was selected due to its ability to evenly distribute occlusal forces, stabilize mandibular position, and reduce stress on the temporomandibular joint. The maxillary acrylic splint creates a more balanced occlusal surface, contributing to improved functional harmony. Regular use of the splint, particularly during nighttime, has been shown to reduce the frequency of joint clicking, alleviate joint pain, and enhance overall patient comfort.[9]

The use of aluminum wax in centric relation recording represents a technical modification aimed at improving the stability and accuracy of bite registration in the fabrication of stabilization splints.[13] Aluminum wax exhibits greater rigidity compared to conventional baseplate wax, allowing it to maintain the mandibular position without deformation during the recording procedure. This dimensional stability is particularly critical in TMD cases, where even minor inaccuracies in centric relation registration may lead to occlusal discrepancies and reduce the effectiveness of the splint.[14] The literature suggests that more stable registration materials provide better reproducibility of mandibular position on the articulator and enhance the accuracy of prosthodontic outcomes. Furthermore, a study by Abduo and Lyons reported that the accuracy of vertical dimension and maxillomandibular relationship recording is highly influenced by the stability of the material used during bite registration procedures.[10] Aluminum wax was selected in this case due to its rapid setting properties and its ability to maintain the mandible in centric relation without distortion. This technique contributes to a more precise mounting of the working models on the articulator.[13]

The determination of the vertical dimension was based on the patient's freeway space to maintain comfort during speech and at rest. Mounting was performed in centric relation as the foundation for fabricating the acrylic splint. The splint was designed to provide even occlusal contact distribution in the centric position, along with canine guidance during eccentric movements. This design aims to reduce excessive loading on the temporomandibular joint and masticatory muscles.[9]

Evaluation at two weeks post-therapy demonstrated an increase in maximum mouth opening and a reduction in tenderness upon palpation. The patient also reported improved comfort during mastication, speech, and sleep quality. These findings are consistent with previous studies indicating that a combination of patient education, physical therapy, and stabilization splint therapy results in significant improvement in patients with non-traumatic TMD.[9,11]

Conclusion

The management of disc displacement with reduction (DDWR) accompanied by local myalgia can be effectively achieved through a conservative approach. Infrared therapy plays a role in reducing masticatory muscle pain (myalgia), while a stabilization splint functions to stabilize occlusion and decrease the load on the temporomandibular joint. The working bite registration using a combination of baseplate wax and aluminum wax facilitates the achievement of a stable mandibular position in centric relation, in accordance with the patient's vertical dimension requirements. The treatment outcomes demonstrated a reduction in muscle pain, along with improved comfort and mandibular function. These findings suggest that a combination of patient education, physical therapy, and appropriate splint fabrication can provide significant clinical improvement in patients with temporomandibular disorders.

References

1. Okeson, Jeffrey P. Management of Temporomandibular Disorders and Occlusion. 8th ed. St. Louis: Elsevier; 2019.
2. Valesan LF, Da-Cas CD, Réus JC, Denardin ACS, Garanhani RR, Bonotto D, et al. Prevalence of temporomandibular joint disorders: a systematic review and meta-analysis. Clinical Oral Investigations. Springer Science and Business Media Deutschland GmbH; 2021. p. 441–53.
3. Manfredini D, Lombardo L, Siciliani G. Temporomandibular disorders and dental occlusion. A systematic review of association studies: end of an era? Evid Based Dent. 2017 Oct 27;18(3):86–7.
4. Urits I, Charipova K, Gress K, Schaaf AL, Gupta S, Kiernan HC, et al. Treatment and management of myofascial pain syndrome. Best Practice and Research: Clinical Anaesthesiology. Bailliere Tindall Ltd; 2020. p. 427–48.
5. Shah JP, Thaker N, Heimur J, Aredo J V., Sikdar S, Gerber L. Myofascial trigger points then and now: A historical and scientific perspective. PM and R. Elsevier Inc.; 2015. p. 746–61.
6. Schiffman E, Ohrbach R, Truelove E, Look J, Anderson G, Goulet JP, et al. Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) for Clinical and Research Applications: Recommendations of the International RDC/TMD Consortium Network * and Orofacial Pain Special Interest Group † HHS Public Access. J Oral Facial Pain Headache. 2014.
7. Durham J, Newton-John TRO, Zakrzewska JM. Temporomandibular disorders. BMJ (Online). BMJ Publishing Group; 2015. doi:10.1136/bmj.h1154 PubMed PMID: 25767130.

DOI 10.46934/ijp.v7i1.338

8. Wilkowicz W, Byś A, Zieliński G, Gawda P. The impact of stress on psychological and physiological aspects of health of patients with tmd: A literature review from 2015–2020. Polish Annals of Medicine. Collegium Medicum University of Warmia and Mazury; 2021. p. 82–7.
9. Al-Moraissi EA, Farea R, Qasem KA, Al-Wadeai MS, Al-Sabahi ME, Al-Iryani GM. Effectiveness of occlusal splint therapy in the management of temporomandibular disorders: network meta-analysis of randomized controlled trials. Int J Oral Maxillofac Surg. 2020 Aug 1;49(8):1042–56.
10. Abduo J, Lyons K. Clinical considerations for increasing occlusal vertical dimension: A review. Australian Dental Journal. 2012. p. 2–10.
11. KUI A, TISLER C, CIUMASU A, ALMASAN O, CONDOR D, BUDURU S. Effect of Low Level Laser Therapy (LLLT) on muscle pain in temporomandibular disorders – an update of literature. Balneo Research Journal. 2020 Feb 20;(Vol.11, No1):14–9.
12. Ahmad SA, Hasan S, Saeed S, Khan A, Khan M. Low-level laser therapy in temporomandibular joint disorders: a systematic review. Journal of Medicine and Life. Carol Davila University Press; 2021. p. 148–64.
13. Schindler HJ, Türp JC. Occlusal Splints for Painful Craniomandibular Dysfunction.
14. Chandu GS, Faisal Khan M, Mishra SK, Asnani P. Compression resistance of interocclusal recording media … Chandu GS et al Original Research Conflicts of Interest: None Source of Support: Nil Evaluation and Comparison of Resistance to Compression of Various Interocclusal Recording Media: An In Vitro Study. Journal of International Oral Health. 2015.

DOI 10.46934/ijp.v7i1.338