

Review

Management of Temporomandibular Disorders in Patients with Fixed Dental Prosthesis

Razin Subahi^{1*}, Mohammad Alkhateeb², Abdullah Al Fehaid³, Mohammed Alghnami⁴, Zahrah Alfaraj⁵, Zahra Alhuwayji⁶, Abdulaziz Aloliwi⁷, Hanin Al-Qahtani⁶, Abdullah Alhojailan⁸, Eman Aldajani⁹, Raed Al Khulban¹⁰

¹ Department of Prosthodontics, Al Thager Hospital, Jeddah, Saudi Arabia

² General Dentist, Ok Clinics, Riyadh, Saudi Arabia

³ Dental Department, Prince Sultan Military Hospital, Riyadh, Saudi Arabia

⁴ College of Dentistry, King Saud University, Riyadh, Saudi Arabia

⁵ General Dentist, Eastern Smiles Clinics, Qatif, Saudi Arabia

⁶ General Dentist, Armed Forces Hospital Southern Region, Khamis Mushait, Saudi Arabia

⁷ General Dentist, Almeswak Dental Clinics, Riyadh, Saudi Arabia

⁸ College of Dentistry, Majmaah University, Majmaah, Saudi Arabia

⁹ College of Dentistry, Al Farabi Colleges, Riyadh, Saudi Arabia

¹⁰ College of Dentistry, King Khalid University, Abha, Saudi Arabia

Correspondence should be addressed to **Razin Subahi**, Department of Prosthodontic, Al Thager Hospital, Jeddah, Saudi Arabia. Email: dr-razin.subahi@hotmail.com

Copyright © 2023 **Subahi**, this is an open-access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Received: 6 September 2023, Revised: 16 September 2023, Accepted: 16 September 2023, Published: 25 September 2023

Abstract

Managing temporomandibular disorders (TMD) in patients with fixed dental prosthesis presents a multifaceted dilemma for healthcare professionals. TMD involves a range of issues impacting the muscles used for chewing, the temporomandibular joint (TMJ), and associated structures, frequently resulting in discomfort, limited jaw mobility, and joint sounds. This review explores the prevalence and classification of TMD, highlighting the significance of considering psychological factors in chronic pain conditions. Diagnosis involves a comprehensive history-taking and clinical examination to identify contributing factors. Conservative, evidence-based treatment modalities are recommended for TMD management. Among them, occlusal splints are commonly used and evaluated. Dental prostheses, including dentures, implant-supported prostheses, and full mouth rehabilitation, play essential roles in restoring occlusion and improving oral function for TMD patients.

Keywords: *Temporomandibular disorders, Masticatory muscles, Temporomandibular joint Occlusal splints*

Introduction

Temporomandibular disorders (TMD) include a variety of conditions that affect the musculoskeletal and neuromuscular components of the masticatory muscles, the temporomandibular joint (TMJ), and associated structures (1). The most important feature is pain, followed by restricted or limited jaw movement, and joint noises during jaw movement (2). The diagnostic criteria for TMD are divided into two primary groups: intra-articular disorders, which include problems within the TMJ such as disc displacement, arthralgia, arthritis, and arthrosis; and muscle disorders, alternatively referred to as myogenous TMD. The muscle disorders can be subdivided into the following groups: local myalgia, characterized by pain limited to specific areas during palpation; myofascial pain, which leads to pain extending within the palpated muscle territory; and myofascial pain with referral, where the pain spreads beyond the boundaries of the masticatory muscles. Using a combined sample of 2518 participants, a systematic review and meta-analysis revealed that the prevalence of TMD might vary from 25.2% to 34.9%, with a predominance of myofascial pain diagnoses (10.3–15.4%) (3). Even though the exact cause remains uncertain, it is widely acknowledged that several triggering, predisposing, or risk factors play a role. These factors include postural and parafunctional habits, repetitive minor injuries, direct and indirect trauma, as well as psychological elements such as depression and anxiety (4). Myofascial discomfort can produce chronic and recurring pain, which can limit daily living activities and lower quality of life in terms of dental health (5). The diagnosis and management of TMD, the most common cause of non-dental pain in the maxillofacial region, remains a challenge for clinicians to this day, despite extensive clinical research into the topic (6). This is because TMD is a broad term comprising different conditions with complex etiologies, and symptoms that vary in intensity. Interestingly, certain signs and symptoms may resolve on their own without any treatment, while others persist for extended periods despite trying all available treatment options. When diagnosing chronic pain conditions, it is important

to take the psychological aspect into account, including emotional distress. Considering this component can lead to improved management of the condition (7). Feelings of anxiety, frustration, and depression can play a role in both the onset and the continuation and exacerbation of pain (7, 8). Numerous treatment modalities have been proposed over the years, with some becoming obsolete while others are gaining popularity. Nevertheless, it seems that there is no single solution for every case, as many different symptoms are included in TMD (6).

When it comes to treating patients with TMD, it is important to consider that the primary goals are reducing pain, improving TMJ function, and alleviating reflex masticatory muscle spasms and discomfort (9). It was previously believed that occlusal therapy was the basis for the management of TMD, and dentistry assumed the major responsibility for diagnosis and treatment. Since dentistry has clarified the multifactorial nature of TMD, hypotheses implying malocclusion as the sole etiologic factor have been either disproved or abandoned (10).

Methodology

This study is based on a comprehensive literature search conducted on July 28, 2023, in the Medline and Cochrane databases, utilising the medical topic headings (MeSH) and a combination of all available related terms, according to the database. To prevent missing any possible research, a manual search for publications was conducted through Google Scholar, using the reference lists of the previously listed papers as a starting point. We looked for valuable information in papers that discussed the management of temporomandibular disorders in patients with fixed dental prosthesis. There were no restrictions on date, language, participant age, or type of publication.

Discussion

The TMJ is formed by the articulation of the mandible and the temporal bone of the cranium. The condylar process, along with the condylar neck, forms the mandibular component, and the squamous part of the temporal bone (glenoid fossa and the

articular tubercle) forms the cranial part of TMJ (2). The articulating surfaces are covered by fibrocartilage and separated from each other by an articulating disc (meniscus). The two joint cavities formed by the articulating disc are lined by a synovial membrane. This articulating surface, along with the disc and joint cavities, is surrounded by a joint capsule (11). The joint functions with the aid of muscles and ligaments attached to the joint capsule, the neck of the condyle, and the body of the mandible (2). The trigeminal nerve's mandibular branch V3 provides the nerve supply to the TMJ. Sensory innervation to the joint comes from the auriculotemporal and masseteric branches, while the motor nerve supply to the masticatory muscles also originates from V3 (11). The blood supply to TMJ is from branches of the external carotid artery, mainly the superficial temporal artery, and venous drainage via the venous plexus surrounding the capsule.

TMJ possesses several unique characteristics that distinguish it from other joints in the body. Firstly, the TMJ functions as a unit of two joints on each side of the skull, connected by the mandible, which results in the two TMJs working in unison and lacking independent functionality. Secondly, TMJ exhibits distinctive movement, combining hinge and translation motions, and is described as a

ginglymo-arthroidal joint. Thirdly, the movement range of TMJ is limited by the musculoskeletal structure and the alignment of the upper and lower teeth, known as the occlusal relationship. Fourthly, the disc separating TMJ is exceptional, composed of hyaline cartilage internally and fibrous cartilage externally, providing increased toughness and resilience compared to discs in other joints. Lastly, the presence of the articulating disc divides each TMJ into two synovial joint cavities, effectively allowing each TMJ to function as two separate joints, resulting in a total of four joints operating in a coordinated manner. The combination of these unique attributes makes the TMJ a crucial joint, facilitating essential functions such as chewing, speech, and facial expressions (2).

Risk factors for developing TMD

Macro-trauma refers to events resulting in head trauma, including accidents, falls, sports injuries, forceful intubation, physical abuse, the removal of third molars, and other long dental procedures. Microtrauma includes awake and sleep bruxism and other parafunctional habits, including chewing gum, nail biting, and lip and cheek biting. Trauma can be both a predisposing and initiating factor in the development of TMD (2). **Table 1.**

Table 1. TMD signs and symptoms			
TMD Signs and Symptoms	Common Symptoms	Less Common Symptoms	Common Signs
Facial pain	Reduced hearing or feeling of blocked ears	Sharp pain in ear	Temporomandibular joint sounds
Restricted jaw movement	Headache	Neck/shoulder	Restricted opening or jaw deviation upon opening
Pre-auricular pain	Difficulty eating	Occlusal disturbance	Masseteric hypertrophy
Bruxing/ clenching	Bruxing/ clenching	Pain with swallowing	Tenderness muscle of mastication
Earache pain	Earache pain	Retro-orbital pain	Tenderness TMJ
Toothache/sensitivity/ Tooth mobility	Sleep disturbance		Tenderness to percussion of teeth
Paresthesia/swelling of face	Paresthesia/swelling of face		
Tinnitus	Tinnitus		

Taking a comprehensive pain history and conducting a thorough examination are important steps in diagnosing TMD. The treating clinician needs to approach the patient with an open and understanding attitude, creating a congenial environment to build rapport and gather accurate information. By asking a series of carefully formulated questions, the clinician can gain insight into the nature of the pain, its triggers, duration, frequency, and aggravating or relieving factors. Additionally, other symptoms and potential contributing factors, such as trauma, tooth grinding, joint noises, headaches, stress, and lifestyle changes, are evaluated to understand the underlying factors involved (2).

The patient's responses and comprehension of the pain history are important in formulating an accurate diagnosis and guiding appropriate management strategies. Understanding the patient's pain history and relevant contextual factors ultimately leads to better long-term outcomes and more effective pain management for individuals with TMD.

Clinical examination

A structured and methodical clinical examination is crucial in assessing patients with Temporomandibular Disorders (TMD). This examination involves critical components, including observation of the patient's facial symmetry, muscular hypertrophy, and evidence of habits like nail biting or jaw posturing. Jaw movements are assessed, looking for limitations, deviations of the mandible during opening or closing, and signs of trismus (2). TMJ is palpated in both open and closed positions to identify irregularities in joint movement and to listen for joint sounds. Examination of the dentition is an essential aspect of the clinical assessment, aiming to detect evidence of attrition, wear facets, cracks, fractured teeth or restorations, periodontal mobility, fremitus, reduced occlusal vertical dimension, and loss of posterior molar support. The assessment also includes evaluating oral health and hygiene.

Proper documentation of all relevant findings in the patient's clinical record is critical for accurate diagnosis and appropriate management. Facial asymmetry may indicate altered condylar morphology due to congenital abnormalities, pathological processes, or degenerative diseases. Observations like masseteric hypertrophy may suggest parafunctional habits, while limitations in mouth opening or jaw deviations during function may signal underlying TMJ or musculature disorders requiring further investigation. Palpation of the TMJ and muscles of mastication may reveal tenderness, supporting the involvement of TMD. Furthermore, examination of dentition helps rule out odontogenic causes and can provide additional evidence for diagnosing conditions such as bruxism.

A comprehensive clinical examination aids in developing a comprehensive understanding of the patient's condition, leading to effective treatment planning and better management of Temporomandibular Disorders.

Management of TMD

According to the American Association of Dental Research, it is strongly recommended that unless there are specific and justifiable indications to the contrary, treatment of TMD should be based on the use of conservative, reversible, and evidence-based treatment modalities (12). Once a diagnosis of TMD has been established, the dental practitioner needs to recognise whether management falls within their scope or if a referral to a specialist is indicated. It is crucial to prioritise the identification of high-risk patients, particularly in dental settings. Subjecting such patients to lengthy procedures, like an extended dental visit, could potentially trigger or worsen an underlying or undiagnosed TMD. Concerning the management of patients with TMD, it should be taken into consideration that the main objectives are decreasing pain, increasing TMJ function, and reducing reflex masticatory muscle spasm and pain (9). The conservative approach is regarded as the initial treatment option for TMD (13, 14), Incorporating physical therapy (15), biofeedback (16), pharmacological drugs (17), TMJ

injections (18), occlusal splints (19, 20), laser therapy (21), and extracorporeal shockwave therapy (ESWT) (22).

The fixed dental prosthesis used in management of TMD

Bite Adjustments:

Dental prostheses, especially occlusal splints, can be adjusted to optimize the occlusion and alleviate pressure on TMJ. This process is known as occlusal equilibration (23).

Dentists frequently utilise occlusal splints, also known as bite plates or intra-oral appliances, to address TMD. They are usually made of acrylic and can be hard or soft. They can be designed to fit on the upper or lower teeth. They may cover all the teeth in one arch (a full-coverage splint) or only some (a partial-coverage splint). Splints are also termed according to their intended mechanism, such as the anterior positioning splint or the stabilisation splint (24). Throughout the years, the occlusal splint has emerged as the most common and extensively studied therapeutic option for treating TMDs (25). An occlusal splint may be the Michigan splint, the Tanner appliance, the Fox appliance, or the centric relation appliance (20).

Occlusal splints can play an important role in the short-term treatment of TMDs, but their long-term impact appears to be comparable to other therapeutic approaches.

Dentures:

For patients with missing teeth or severely damaged teeth, dentures can restore proper occlusion and improve chewing function. By replacing missing teeth and supporting the surrounding structures, dentures can help with TMD management.

Implant-Supported Prostheses:

Dental implants can be used to support fixed or removable prostheses, providing stable and functional replacements for missing teeth. Implant-supported prostheses can improve occlusal stability and enhance overall oral function in TMD patients.

Full Mouth Rehabilitation: In cases of severe TMD or occlusal issues, a comprehensive full mouth rehabilitation plan may be developed using various dental prostheses. This approach aims to achieve proper occlusion, balance the bite, and alleviate TMD symptoms.

Customized Restorations:

Dental restorations, such as crowns and bridges, can be tailored to improve occlusion and restore proper function in TMD patients with damaged or worn-down teeth.

It's important to note that dental prostheses alone may not be sufficient to address all aspects of TMD management. A comprehensive approach that includes patient education, lifestyle modifications, physical therapy, and other conservative treatments may also be necessary, depending on the severity and underlying causes of the individual's TMD. A thorough evaluation by a qualified dental professional or prosthodontist is essential to determining the most appropriate dental prostheses and treatment plan for each TMD patient. Additionally, regular follow-ups and adjustments may be needed to ensure the continued effectiveness of the dental prostheses in managing TMD symptoms.

Conclusion

The management of temporomandibular disorders (TMD) in patients with fixed dental prostheses is a challenging endeavour that demands a thorough and personalized approach. TMD includes a range of conditions affecting the muscles used for chewing, the temporomandibular joint (TMJ), and related structures, often resulting in pain, limited jaw movement, and joint noises. Psychological factors, like anxiety and depression, should be taken into account during the diagnostic phase since they can influence the development and duration of chronic pain conditions. Overall, TMD management requires the expertise of qualified dental professionals and prosthodontists to tailor treatment plans based on each patient's unique needs. Regular follow-up and adjustments may be necessary to ensure the ongoing effectiveness of the chosen

dental prostheses and other therapeutic modalities in addressing TMD symptoms.

Disclosure

Conflict of interest

There is no conflict of interest

Funding

No funding

Ethical consideration

Non applicable

Data availability

Data that support the findings of this study are embedded within the manuscript.

Author contribution

All authors contributed to conceptualizing, data drafting, collection and final writing of the manuscript.

References

1. Ferrillo M, Giudice A, Marotta N, Fortunato F, Di Venere D, Ammendolia A, et al. Pain Management and Rehabilitation for Central Sensitization in Temporomandibular Disorders: A Comprehensive Review. *International journal of molecular sciences*. 2022;23(20).
2. Beaumont S, Garg K, Gokhale A, Heaphy N. Temporomandibular Disorder: a practical guide for dental practitioners in diagnosis and management. *Australian dental journal*. 2020;65(3):172-80.
3. Bueno CH, Pereira DD, Pattussi MP, Grossi PK, Grossi ML. Gender differences in temporomandibular disorders in adult populational studies: A systematic review and meta-analysis. *Journal of Oral Rehabilitation*. 2018;45(9):720-9.
4. Simoen L, Van den Berghe L, Jacquet W, Marks L. Depression and anxiety levels in patients with temporomandibular disorders: comparison with the general population. *Clinical Oral Investigations*. 2020;24(11):3939-45.
5. Bitiniene D, Zamaliauskiene R, Kubilius R, Leketas M, Gailius T, Smirnovaite K. Quality of life in patients with temporomandibular disorders. A systematic review. *Stomatologija*. 2018;20(1):3-9.
6. Li DTS, Leung YY. Temporomandibular Disorders: Current Concepts and Controversies in Diagnosis and Management. *Diagnostics (Basel, Switzerland)*. 2021;11(3).
7. Moreno-Fernández AM, Jiménez-Castellanos E, Iglesias-Linares A, Bueso-Madrid D, Fernández-Rodríguez A, de Miguel M. Fibromyalgia syndrome and temporomandibular disorders with muscular pain. A review. *Modern Rheumatology*. 2017;27(2):210-6.
8. Nicholas M, Vlaeyen JWS, Rief W, Barke A, Aziz Q, Benoliel R, et al. The IASP classification of chronic pain for ICD-11: chronic primary pain. *PAIN*. 2019;160(1):28-37.
9. de Souza RF, Lovato da Silva CH, Nasser M, Fedorowicz Z, Al-Muharraqi MA. Interventions for the management of temporomandibular joint osteoarthritis. *The Cochrane database of systematic reviews*. 2012;2012(4):Cd007261.
10. Litvak H, Malament KA. Prosthodontic management of temporomandibular disorders and orofacial pain. *The Journal of prosthetic dentistry*. 1993;69(1):77-84.
11. Patnaik V, Bala S, Singla R. Anatomy of temporomandibular joint? A review. *J Anat Soc India*. 2000;49(2):191-7.
12. Durham J, Newton-John TR, Zakrzewska JM. Temporomandibular disorders. *Bmj*. 2015;350.
13. Ferrillo M, Gallo V, Lippi L, Bruni A, Montrella R, Curci C, et al. The 50 most-cited articles on temporomandibular disorders: A bibliometric analysis. *Journal of Back and Musculoskeletal Rehabilitation*. 2023;36:279-97.
14. Ferrillo M, Nucci L, Giudice A, Calafiore D, Marotta N, Minervini G, et al. Efficacy of conservative approaches on pain relief in patients with temporomandibular joint disorders: a

systematic review with network meta-analysis. *CRANIO®*. 2022;1-17.

15. Armijo-Olivo S, Pitance L, Singh V, Neto F, Thie N, Michelotti A. Effectiveness of Manual Therapy and Therapeutic Exercise for Temporomandibular Disorders: Systematic Review and Meta-Analysis. *Physical Therapy*. 2016;96(1):9-25.

16. Florjanski W, Malysa A, Orzeszek S, Smardz J, Olchoway A, Paradowska-Stolarz A, et al. Evaluation of Biofeedback Usefulness in Masticatory Muscle Activity Management—A Systematic Review. *Journal of Clinical Medicine*. 2019;8(6):766.

17. Andre A, Kang J, Dym H. Pharmacologic Treatment for Temporomandibular and Temporomandibular Joint Disorders. *Oral and Maxillofacial Surgery Clinics of North America*. 2022;34(1):49-59.

18. Harba AN, Harfoush M. Evaluation of the participation of hyaluronic acid with platelet-rich plasma in the treatment of temporomandibular joint disorders. *Dental and Medical Problems*. 2021;58(1):81-8.

19. Deregibus A, Ferrillo M, Piancino MG, Domini MC, de Sire A, Castroflorio T. Are occlusal splints effective in reducing myofascial pain in patients with muscle-related temporomandibular disorders? A randomized-controlled trial. *Turkish journal of physical medicine and rehabilitation*. 2021;67(1):32.

20. Kuzmanovic P, Pficer J, 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.

21. Xu G-Z, Jia J, Jin L, Li J-H, Wang Z-Y, Cao D-Y. Low-Level Laser Therapy for Temporomandibular Disorders: A Systematic Review with Meta-Analysis. *Pain Research and Management*. 2018;2018:4230583.

22. Marotta N, Ferrillo M, Demeco A, Drago Ferrante V, Inzitari MT, Pellegrino R, et al. Effects of Radial Extracorporeal Shock Wave Therapy in Reducing Pain in Patients with Temporomandibular Disorders: A Pilot Randomized Controlled Trial. *Applied Sciences*. 2022;12(8):3821.

23. Palmer J, Durham J. Temporomandibular disorders. *BJA education*. 2021;21(2):44-50.

24. Wassell RW, Naru A, Steele J, Nohl F. Applied occlusion. *Quintessentials of Dental Practice*. 2008.

25. Glass EG, Glaros AG, McGlynn FD. Myofascial pain dysfunction: treatments used by ADA members. *Cranio : the journal of craniomandibular practice*. 1993;11(1):25-9.