

# TMD & its Role in Orthodontics “TMD an Entity Affecting Every Aspect of Life”: A Review

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**Abstract:-** One of main cause of non-dental head and neck pain is temporomandibular disorders (TMD). Its aetiology is complex, and its pathology is not fully known. As patient knowledge and interest in oral health have increased, orthodontists have been more interested in the connection between occlusal factors, orthodontic therapy, and TMD. The goal of this article is to provide a quick overview of the anatomy of the temporomandibular joint, TMD, and their complicated aetiology as well as their role in orthodontics.

**Keywords:-** Temporomandibular joint, orthodontics, pain, TMJ, TMD, Temporomandibular disorders

## I. INTRODUCTION

A wide spectrum of signs and symptoms are seen in “Temporomandibular disorders (TMD)”. TMDs has been classified based on anatomical changes, etiology, frequency of signs and symptoms.<sup>1</sup>

Patients who comes with TMD commonly suffer muscular and joint discomfort on palpation and joint noises when moving lower jaw. The multifactorial aetiology of TMD is includes emotional stress, occlusal interference, tooth loss, dys-function of muscles of mastication, postural deviation, structural changes in TMJ.<sup>2</sup>

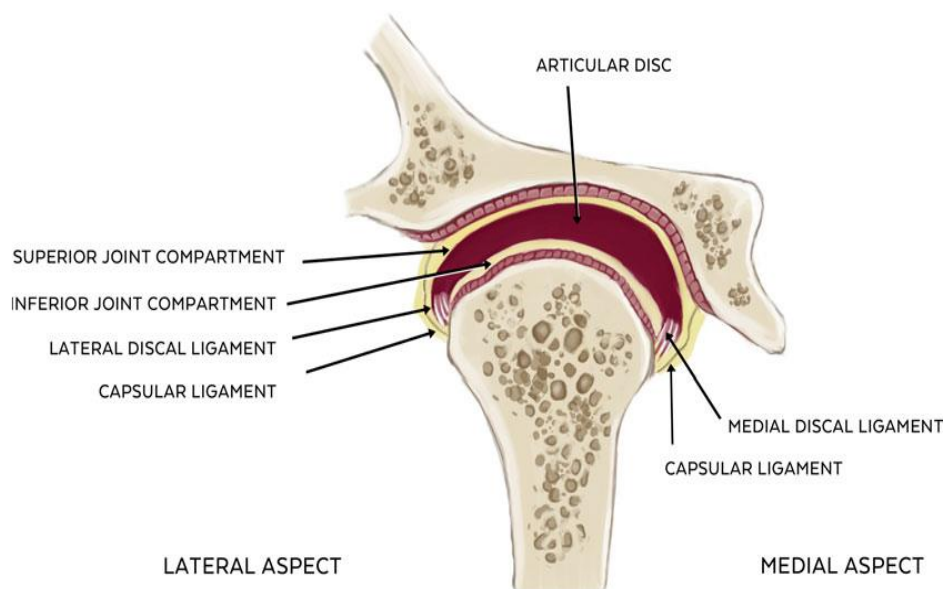
Among these, obstruction is regarded to be one of the most common etiological causes. Numerous types of dental interventions, including routine orthodontic treatment, have been considered as reasons for TMD.<sup>3</sup> Currently, the possible relationship between orthodontic therapy and the signs and symptoms of TMD is still a matter of debate among orthodontists, the dental community, and dental patients. The purpose of this article is therefore to critically evaluate the evidence for a possible association between malocclusion, orthodontic treatment and TMD.

## II. STRUCTURAL ANATOMY OF TMJ

The temporomandibular joint (TMJ) is a ginglymoarthrodial joint with mixture from articulating and gliding movements, permitting the mandible to slide and rotate in the parasagittal plane in functional & para-functional movements.<sup>4</sup>

Bilateral TMJs are composed of an articular disc placed between the mandibular condyle and the articular eminence of the glenoid fossa. All three articulating surfaces are constituted of an avascular, non-innervated thick fibrous tissue & fibro-cartilage.<sup>5</sup>

Capsular ligament’s main function is to stabilize the joint during mandibular motions by connecting one bone to another in the joint (Figure 1)



TEMPOROMANDIBULAR JOINT - ANTERIOR ASPECT

Fig. 1: Illustrates the right temporomandibular joint (frontal view)

### III. TMJ FUNCTIONAL CHARACTERISTICS

According to C. Greene (2018)<sup>6</sup>, Direct contact doesn't occur between the mandibular condyle and glenoid fossa during mandibular movements; instead, the condyle shows a functional link with the articular eminence across which it moves when mandible is in motion.

In majority of the typical population, the joint's range of movements extends past the articular eminence. The fibrocartilage that covers the condyle expands along the posterior slope of the eminence, around it, and onto the anterior slope during jaw opening. When mouth is closed, it is not functionally tied to the glenoid fossa, but rather sits in a high zone on the hillock.

As a person matures, the components of the masticatory system matures as well. Occlusal wear, structural changes in muscles as response to functional demands, and as a result, changes in TMJ occurs.

### IV. CONSIDERATIONS REGARDING THE ETIOLOGY OF TEMPOROMANDIBULAR DISORDERS

In the past 20–30 years, five etiologic factors, including emotional stress, occlusal condition, deep pain, trauma and para-functional activities like clenching & bruxism, have received substantial research support.<sup>7</sup>

Occlusal variables have been connected with TMDs for decades. The static connection of the teeth is not highly connected with temporomandibular joint disorder, contrary to conventional assumption.

Muscle spasm and pain are induced by sudden Change in the Occlusal Condition produced by a faulty restoration or crown. This muscle problem worsens, especially if it persists and is not treated.

The amount of orthopaedic stability in the masticatory system keeps everything in balance, but the condition is regarded orthopedically unstable when strong chewing, biting or bruxism is present; therefore, the joints must remain in a stable position. In the absence of this, continuous loading might lead to structural changes in the joints. Various studies shows that elevated levels of emotional stress might be a causal role in TMDs.

### V. PATHOLOGY OF THE CONDYLAR RESORPTION

Condyle is covered by a fibrocartilage layer. This tissue breaks down during Idiopathic condylar resorption, and then resorption of outer osseous cortex of the condyle begins.<sup>8, 9</sup> And it's characterized by presence of resorption lacunae and outer cortical layer disappearance. Narrowing and shortening of condylar process and decrease in the

ramal length are some other changes that are observed<sup>8</sup>. Demineralization of the cortex of condyle results in the opening of the bite and rotation of the mandible<sup>9</sup>.

### VI. ROLE OF DISC IN CONDYLAR RESORPTION

Main function of TMJ disc is that it acts like a shock absorber at the time of load bearing mandibular movements, also lubricating surfaces for better mandibular movements<sup>10, 11</sup>.

Degenerative changes are seen when the disc is displaced without reduction or damaged results in condylar resorption<sup>12, 13</sup>.

### VII. IMAGING FOR CONDYLAR RESORPTION IN PATIENTS

Detailed history of disc displacement & TMJ discomfort is an important factor, since patients with TMD symptoms shows displaced discs on imaging<sup>14, 15</sup>. Also history of trauma in facial region when TMJ is involved is one of the possible and important cause for condylar resorption<sup>16</sup>.

The anatomy of the condyle can be examined using an orthopantomogram (OPG). Condyle will appear short or thin with flat superior or anterior curvature<sup>17</sup>. In many cases distal inclination of the condyle can also be seen<sup>17, 18, 19</sup>.

Lateral cephalometric radiographs shows mandibular divergence relative to maxilla the cranial base. Cone Beam Computed Tomography (CBCT) has high cost and increased amount of radiation compared to OPG and cephalometric radiograph, But its clarity and absence of superimposition of adjacent structures makes them relevant and popular. It increases doctor's ability in appreciating detailed pathologic characteristics of condyle like the dense outer cortical layer disappearance, flattening, erosion and presence of sub-cortical cyst etc<sup>20, 21</sup>.

The TMJ soft tissues, such as the condylar head surface integrity, the location and condition of the articular disc, joint effusion, and marrow edema, can be examined using magnetic resonance imaging (MRI). However, it is unable to produce diagnostic images of the condyle and eminence, which are evident in CBCTs.

### VIII. CLASSIFICATION OF TMDS

The majority of temporomandibular disorders fall into either muscle pain disorders or intracapsular diseases. Muscle pain syndromes are significantly greater in prevalence than the other two conditions.<sup>23</sup> Myofascial pain is a localized myogenic pain disorder characterised by hyper-sensitive bands of tight, localised muscle tissue known as "trigger points." Fig. 2,3,4.

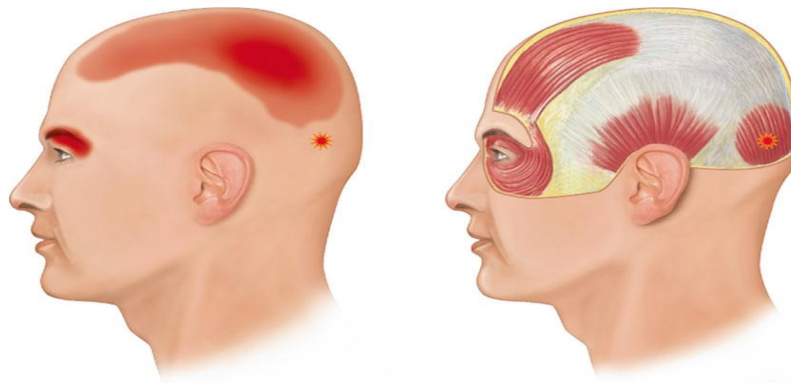


Fig. 2: In TMD, a trigger point in the occipital belly of the occipito-frontalis muscle causes referred headache behind the eye.<sup>7</sup>

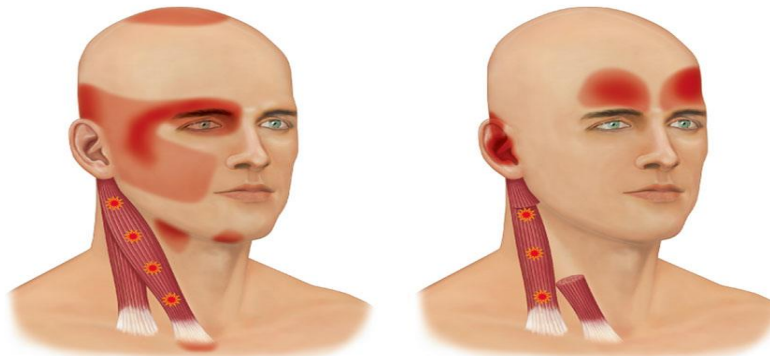


Fig. 3: Sternocleidomastoid trigger points referred pain to the pre-auricular region, the eye, the forehead, and the ear.<sup>7</sup>

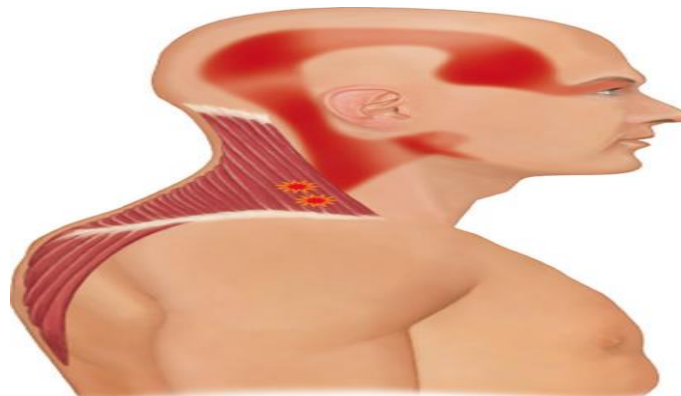


Fig. 4: X-marked trigger points in the trapezius muscle referred pain to behind the ear, the temple, and the angle of the jaw.<sup>7</sup>

**IX. TMD SCREENING**

History for TMDs	Clinical examination of TMDs
Do you have trouble opening your mouth?	Examination for facial asymmetry.
Do you notice noises from the jaw joints while opening & closing?	Examination of masticatory action
Do you feel pain in or behind or around your ears or cheeks?	Palpation for pain of joints and muscles
Do you feel discomfort on chewing? Or discomfort on opening wide your mouth?	Palpation for aberrant motions, clicks, and crepitus (incoordination)
Does your bite make you feel uncomfortable/ abnormal?	
Have you had a facial, head, or neck injury?	
Have you had arthritis before?	
Have you ever received treatment for TMD?	

Table 1: The recommended (1982) strategy for screening patients for TMJ problems

From the Report of the President's Conference (1982)<sup>24</sup> on the examination, diagnosis, and treatment of TMDs

## X. TMD AND ITS BIOPSYCHOSOCIAL CONSIDERATION

Functional disorders, in which pain is the primary symptom, also called idiopathic pain syndromes and medically unexplained symptoms.

An individual's trait anxiety is characterised by a broad pattern of bodily dysregulation and anxiety. A person's propensity to interpret a specific somatic experience as potent, unpleasant, or disruptive is known as somatosensory amplification.<sup>25</sup> & hyper-vigilance is a heightened awareness of the difference between the perceived sensation and "normal"

Psychosocial variables typically play a role in initiating dysfunctional behaviour and are a contributor to TMD. TMD should be treated with behavioural therapies ranging from automatic massage of the muscles of mastication, with the orthodontist providing proper teaching, monitoring, and reinforcement to ensure sufficient compliance and adherence.<sup>26</sup>

## XI. THE ROLE OF TMD IN ORTHODONTICS

The association between orthodontics and TMD requires extensive empirical investigation.

In general, orthodontic therapy has not been found to cause TMD. In general, orthodontics is considered "TMD neutral" because it does not treat TMD nor cause it.<sup>27</sup>

Although, Orthodontics does not protect patients with malocclusion from developing TMD.<sup>28</sup>

Given this, orthodontists and other dental specialists are unable to suggest to patients and parents of adolescents that orthodontic treatment is required to correct a child's malocclusion and reduce the likelihood that they would have TMD in the future. The prevalence of TMD has not been proven to increase with the use of any specific orthodontic procedure or technique, including headgear therapy, braces, or tooth extractions.<sup>28, 29</sup>

As part of a standard orthodontic evaluation, OPG and lateral cephalometric radiographs are typically obtained. Currently accessible imaging techniques include MRI, CT scans, and CBCT scans.

## XII. TMD INFORMED CONSENT IN ORTHODONTICS

Before beginning orthodontic treatment, the patient must provide informed consent. Patients/parents must be continuously made aware of the risk factors that pertain to each individual patient/family.

## XIII. ORTHOGNATHIC SURGERY AS A FACTOR OF RISK

LeFort I osteotomy is frequently used to treat Class II open bite malocclusion, which often involves maxillary impaction. This procedure uses bilateral sagittal split osteotomies (BSSO) to cause mandibular closure rotation and displacement.

LeFort 1 and BSSO both result in a sudden repositioning of the condyles in the fossae, changing the mechanical load on the temporomandibular joints' direction and amplitude.

Majority of the individuals, the joints renew and adapt to this shift; but, in certain patients, the functional demands of these abrupt anatomical alterations exceed the remodelling ability of their TMJ, and their condyles resorb, appearing as TMD.<sup>30, 31</sup>

Occlusal splints are created for stabilizing the joint for the treatment of joint discomfort and dys-function, as well as preparatory to orthognathic surgery.

## XIV. MANAGEMENT OF TMD SIGNS AND SYMPTOMS IN ORTHODONTIC PRACTICE

Orthodontists are likely to encounter individuals with TMD symptoms requiring professional treatment in the course of their work. These patients could either have been referred to the orthodontist's office by another dentist, or they could have developed TMD while receiving orthodontic treatment. Pain and dysfunction are the two key clinical characteristics of most TMDs. Although there may be other signs and symptoms that need medical attention, these two are the most common reasons for patients to seek treatment. After the discomfort has been alleviated, a functional improvement might be anticipated. If an orthodontist is required to deliver basic treatment for TMD, i.e. After a patient has received conservative treatment for their pain and dysfunction, the therapy they receive should be supported by research and evidence.<sup>32</sup>

In contrast to the conventional dental-focused approach, TMD treatments increasingly follow a bio-psychosocial model.

## XV. SELF-DIRECTED PATIENT CARE AND EDUCATION

It's commonly seen that individuals with TMDs are frequently anxious about their condition, particularly if they were told to believe they have a structural disorder that requires major medical operations.

By reassuring patients that the same types of conservative muscle treatments are employed in other areas of the body, most diseases will not require irreversible procedures.<sup>33</sup>



**XVI. CARE AT HOME INSTRUCTIONS**

Patient-directed TMD treatment consists of actions restrict patient to perform jaw function and para-functional activities.

Also, patients with TMDs should be advised & instructed to keep their teeth apart and keep their jaws relaxed. Patients should be made aware of the connection between tension and stress and relaxation exercises because musculoskeletal pain is frequently driven on by these factors<sup>33</sup>.

Patients should minimise or cease behaviours such as gum chewing, yawning, screaming, singing, and cheerleading. They can restrain yawning by supporting their jaw and avoiding needless clicking movements.

**XVII. PSYCHOLOGICAL TREATMENT STRATEGIES**

Although stress and tension may contribute to the arrival or persistence of TMD symptoms, these patients are not generally referred to a psychologist. Instead, cognitive behavioural therapy, a simpler strategy, should be examined. Cognitive behavioural therapies aim to raise the patient's awareness of the mind-body connection by teaching the patient how to regulate stress and the body's reaction to stressful situations.

**XVIII. DENTAL APPLIANCES (SPLINTS)**

Numerous studies demonstrate that this mechanical approach to TMD therapy, which is exceedingly intrusive, expensive, and irreversible, is usually not required because most patients recover on their own. So, with the treatment objectives of muscle relaxation, restriction of oral habits, decrease in joint stress, and general symptom relief, the majority of modern authorities advise splint therapy as a temporary orthopaedic modality.<sup>34</sup>

At the time of examination	If the patient exhibits signs and symptoms of TMD, he or she should be advised that orthodontic therapy would not alleviate these issues. Current TMD symptoms & signs should be noted, & a thorough clinical examination & TMD history should be performed and documented. The start of orthodontic treatment should be delayed if the TMD is acute & severe and only be done after the condition is stabilized or resolved
At the time of treatment	Note the signs and symptoms of TMD. Informand reassure the patient that TMD is usually treated conservatively, & that symptoms do not always get worse with time. Orthodontic treatment should be delayed, & the orthodontist or a colleague with TMD expertise should manage TMD symptoms and indicators. 4. Orthodontic treatment may resume after signs and symptoms have been controlled or reduced, taking treatment modification into account (reducing the forces on headgear etc)
Post- treatment	Throughout the duration of the retention period, the patient should be watched for any signs or symptoms. If symptoms appear, the proper management needs to be given.

Table 2: A methodology for the treatment of TMD symptoms in orthodontics

**XIX. CONCLUSION**

TMD comprises a multitude of clinical issues with a complex aetiology that involve TMJ and muscles of mastication, as opposed to an occlusion-related issue.

Orthodontists may face temporomandibular problems on a regular basis. Because TMD is a complex entity, the idea being the patient's malocclusion is the primary etiological factor producing disorder is extremely invalid. The focus of treatment should be on treating the primary complainant with an accurate diagnosis and treatment plan, referral if TMD is not specialist, and informed consent.

Some orthodontic specialists are resistant to change and continue to adhere to unscientific notions from the past, resulting in the adoption of outmoded treatment methods. It's essential that orthodontists pay continual attention to new breakthroughs in research in order to give the patients the most appropriate and highest quality care.

*"TMD has damaged every part of my life, including my physical, emotional, financial, psychological, and professional well-being, as well as my relationships, my passions, my independence, and at times my dignity. It cut me off at the knees and altered the course of my life and my expectations for it. I had no choice but to accept it, and neither did anyone else. —Adriana V.*

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