



## TEMPOROMANDIBULAR DISORDER – AN ENIGMA

**Bhuwan Saklecha<sup>1</sup>, Maj Amit Jain<sup>2</sup>, \*Pawankumar Dnyandeo Tekale<sup>3</sup>, Rahul Sharad Kulkarni<sup>4</sup>, Vishwas Diwakar Acharya<sup>5</sup>, Ravindra Gedam<sup>6</sup>, Dr. Chetankumar O. Agrwal<sup>7</sup>**

<sup>1</sup>Senior Lecturer, Department of Orthodontics, Index Institute of Dental Sciences, Indore, Madhyapradesh, India.

<sup>2</sup>Army Dental Corps, Pune, Maharashtra, India.

<sup>3</sup>Orthodontist and Private Practice, Dnyanita Orthodontic Care, Aurangabad, Maharashtra, India.

<sup>4</sup>Senior Lecturer, Department of Prosthodontics, Index Institute of Dental Sciences, Indore, Madhyapradesh, India.

<sup>5</sup>Senior Lecturer, Department of Oral Medicine and Radiology, Dr Hedgewar Rugna Sewa Mandal, Dental College and Hospital, Hingoli, Maharashtra, India.

<sup>6</sup>Senior Lecturer, Department of Oral Pathology and Microbiology, Triveni Dental College and Hospital, Bilaspur, Chhattisgarh, India.

<sup>7</sup>Orthodontist and Private Practice, Pune, Maharashtra, India.

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**\*Correspondence for  
Author**

**Dr. Pawankumar**

**Dnyandeo Tekale**

Orthodontist and Private

Practice, Dnyanita

Orthodontic Care,

Aurangabad, Maharashtra,

India.

### ABSTRACT

**Introduction:** Temporomandibular disorder (TMD) is defined as “functional disturbances of the masticatory system”. It has been a matter of controversy for a long time, yet it is imperative to have a sound knowledge about it for physiological reestablishment of the stomatognathic system. **Etiology:** The etiology of TMDs is multifactorial which includes occlusal factors, trauma, stress, parafunctional habits etc. which may lead to degenerative changes in the TMJ. **Diagnosis:** With proper history, physiological evaluation and

in chronic cases behavioural or psychological assessment, TMDs can be diagnosed. Various imaging techniques including various radiographs, lateral and computed tomography, joint arthrography and Magnetic resonance imaging (MRI) techniques are used to confirm the diagnosis. However, recently MRI has become the gold standard for evaluation of soft tissue and the positional abnormalities of the joint disc. **Management:** The noninvasive management of non specific TMDs includes, patient education, exercise therapy and occlusal appliance therapy.

**KEY WORDS:** Temporomandibular disorder, TMD, computed tomography, MRI.

## INTRODUCTION

The interrelationship between Orthodontics and Temporomandibular Disorders (TMD) has attracted an increasing interest in Dentistry in the last years, becoming subject of discussion and controversy. In a recent past, occlusion was considered the main etiological factor of TMD and orthodontic treatment a primary therapeutical measure for a physiological reestablishment of the stomatognathic system. However after reviewing the literature it has been concluded that orthodontic treatment cannot be considered a contributing factor for the development of TMD.<sup>[1]</sup> Nevertheless, it is important to perform, during the diagnostic phase of the pre-orthodontic patients, a full assessment of the presence or absence of signs and symptoms of TMD. Thus it becomes imperative to have a sound knowledge about the TMD.

The temporomandibular articulation is composed of bilateral, diarthrodial temporomandibular joints (TMJs). Each joint is made up of a mandibular condyle and its corresponding temporal cavity (glenoid fossa and articular eminence). The TMJ and its associated structures play an essential role in guiding mandibular motion and distributing stresses produced by everyday tasks such as chewing, swallowing, and speaking. TMJ may be characterized figuratively by nature of its evolution, as a “special creation” in mammals and not an adaptation of a previously existing structure. TMJ is considered the second most difficult anatomical structure to analyze, with the spinal column being the most difficult.<sup>[2]</sup>

TMD are a class of degenerative musculoskeletal conditions associated with morphologic and functional deformities.<sup>[3]</sup> TMD is a collective term embracing a number of clinical problems that involve the masticatory musculature, the TMJ and associated structures, or both (1). TMD can be specific (with an underlying pathology like a neoplasm, inflammation, growth disturbance or underlying systemic disease) or nonspecific.

### Definition of TMD

Temporomandibular disorder is a term adopted by the American Dental Association in 1983 to facilitate coordination of research and communication.<sup>4</sup> While TMD has been defined as “functional disturbances of the masticatory system”, others include masticatory muscle disorders, degenerative and inflammatory TMJ disorders, and TMJ disk displacements under the umbrella of TMD. Certain medical conditions are reported to occasionally mimic TMD. Among them are trigeminal neuralgia, central nervous system lesions, odontogenic pain, sinus pain, otological pain, developmental abnormalities, neoplasias, parotid diseases, vascular diseases, myofascial pain, cervical muscle dysfunction, and Eagle's syndrome. Other

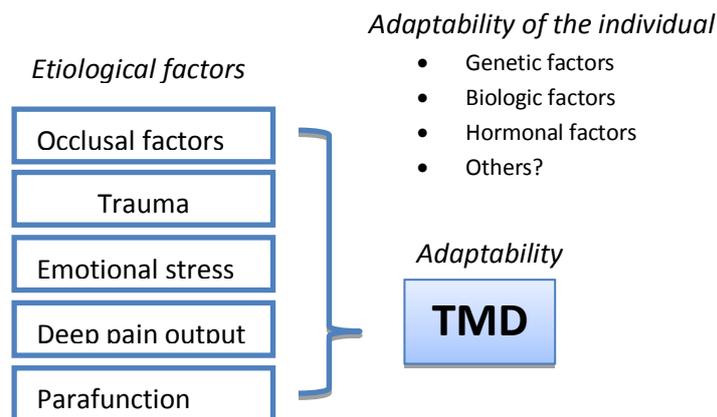
common medical conditions (eg, otitis media, allergies, airway congestion, and rheumatoid arthritis) can cause symptoms similar to TMD.<sup>[5]</sup>

### Epidemiology of TMDs

Signs of TMD appear in about 60 to 70% of the general population and yet only about one in four people with signs are actually aware of or report any symptoms. Furthermore, only about 5% of the population will have symptoms severe enough for them to seek treatment. It is suspected that TMD affects both males and females in almost equal numbers in general population although females are possibly more likely to seek treatment. Although, TMD may occur at any age, the most common time of presentation is early adulthood.<sup>[6]</sup>

### Etiology of TMD

TMDs have multiple etiological factors. Alterations in any one or a combination of teeth, periodontal ligament, the TMJ, or the muscles of mastication eventually can lead to TMD." Research is insufficient to predict reliably which patient will or will not develop TMD.



*Graphic model depicting relationship between various factors associated with onset of TMD<sup>5</sup>*

Etiologic factors suggested as contributing to the development of TMD are:

1. *Trauma*: This would include impact injuries such as trauma to the chin. A common occurrence in childhood because of falling, chin trauma is reported to be a factor in the development of TMD in pediatric patients.<sup>[7]</sup>
2. *Occlusal factors*: There is a relatively low association of occlusal factors and the development of TMD.<sup>[8]</sup> However, several features characterize malocclusions associated with TMD: skeletal anterior open bite,<sup>[9]</sup> overjet greater than 6 to 7 mm,<sup>[9]</sup> retrocuspal position (centric relation) to intercuspal position (centric occlusion) slides greater than 4

mm,<sup>[10]</sup> unilateral lingual cross bite,<sup>[9]</sup> 5 or more missing posterior teeth,<sup>[11]</sup> Class III malocclusion.<sup>[12]</sup>

3. *Parafunctional habits (eg, bruxism, clenching, and other repetitive habitual behaviour):*

Bruxism is thought to contribute to the development of TMD by joint overloading that leads to cartilage breakdown, synovial fluid alterations, and other changes within the joint.<sup>[13]</sup> These parafunctional habits may occur while the patient is asleep or awake.

4. *Posture:* Craniocervical posture has been associated with occlusion and with dysfunction of the TMJ, including abnormalities of the mandibular fossa, condyle, ramus, and disc.<sup>[14]</sup>

5. *Orthodontic treatment:* Current literature does not support that the development of TMD is caused by orthodontic treatment, regardless of whether premolars were extracted prior to treatment.<sup>[15]</sup>

Remodeling of the load-bearing joints is an adaptation process that is essential for appropriate stress distribution and function. It has been established that, while mechanically induced remodelling is progressive and regressive, it is a normal process early on. When the capacity for the joint to remodel has been exceeded, remodelling merges into osteoarthritis.<sup>[16]</sup> Characteristic osteoarthritic changes observed in the TMJ include alterations in the shape and overall size of joint components, specifically, a flattened fossa, a less pronounced articular eminence, decreased condylar volume, and a thickened disc. Degenerative remodelling in pathologic TMJs may result from either decreased adaptive capacity in the articulating structures or from excessive or sustained physical stress to the articulating structures. Such degenerative changes have been correlated with internal derangement of the TMJ disc.<sup>[17]</sup>

## DIAGNOSIS

The gold standard of diagnosis in TMDs consists of (1) patient history (2) physical evaluation, and in the most chronic cases, (3) behavioral or psychologic assessment.<sup>5</sup>

### *History*

A careful history should be taken. This should record the patient's first awareness of the symptoms, whether they were of gradual or acute onset and importantly whether there was any initiating event. Trauma is surprisingly rare as an initiating event when one considers how many assaults, sporting and road traffic accidents take place. Often a click can be present for many years only to suddenly disappear and locking to occur. This implies that the patient has had disc displacement with reduction (clicking) but the disc displacement had

suddenly got to a degree where the diagnosis changed to disc displacement without reduction (locking).

### ***Examination***

It is important to know what is 'normal' as only by knowing it the abnormalities will be detected. The examination should be kept in simple sequence with easy recording methods.

### **TMJ examination**

#### ***Range of movement***

The range of movement should be measured in the vertical and lateral dimensions. The method of measuring the range of mandibular movement, for example by use of a ruler, a Willis bite gauge or (most accurately) a Vernier bite gauge, is irrelevant as long as the technique is consistent.

#### ***TMJ tenderness***

- TMJ should be examined for tenderness in several ways, firstly by gentle palpation in the preauricular region. This gives only limited information.
- The best way of examining the joints for tenderness is by palpation via the external auditory meatus and then asking the patient to gently open and close the mouth. The disc and capsule of the TMJ have a poor nerve supply. The posterior bilaminar zone, however, is highly innervated. If there is disc displacement this area inevitably becomes stretched and may become interposed between the head of the condyle and the fossa of the temporal bone. This can lead to painful clicking and indeed it can be painful for the patient to bite their teeth together. If a patient complains of being unable to bring the molar teeth together without sharp shooting pain in the ear, then it should be recognised that disc displacement may be the possible cause.
- The third examination of the joints for tenderness should be gentle manipulation of the mandible to a retruded position. Again if there is disc displacement this will compress the sensitive posterior bilaminar zone and cause discomfort, usually deep within the external auditory meatus.

#### ***Joint sounds***

- Joint sounds can be detected by palpation but preferably should be detected with a stethoscope, ideally a stereo stethoscope. Note should be made of whether the *click* is painful or painless, single or multiple and early or late in the opening/ closing cycle. A

click varies quite significantly in an individual. If there is a true internal derangement the click is consistently present on opening and closing. If, however, the click is found in a patient with facial arthromyalgia, it may only be present in the morning after the patient has been parafunctioning during sleep due to increased muscle tone in the superior pterygoid muscle. The disc can then partially or completely reposition as the muscle relaxes and the click, which had been present on waking, would subsequently disappear as the day goes on. It is important to differentiate between a true internal derangement and a click associated with facial arthromyalgia, as the treatment will vary between the two diagnoses and treatment that might be applicable.

- The other, less commonly encountered joint sound is *crepitation*. This is usually indicative of degenerative joint disease, such as osteoarthritis or rheumatoid arthritis. One should be aware of the fact that rheumatoid arthritis rarely if ever presents in the TMJ as being the first joint affected and the patient would normally have a pre-existing history of rheumatoid arthritis in other joints.

### ***Muscle examination***

The muscles which should comprise part of the examination are the masseter, temporalis and lateral pterygoid. The masseter muscle is most often tender in patients who clench their teeth and the usual area of tenderness is either the origin over the anterior two thirds of the zygomatic arch or less usually at the insertion over the angle of the mandible. The temporalis muscle is usually tender in the anterior part of the origin in the temple. This muscle is usually tender in patients with bruxism.

The lateral pterygoid muscle is examined against resisted movement. If there is pterygoid spasm this will produce pre-auricular pain. It should be realised that this muscle cannot be palpated manually or digitally. Other method of examining the lateral pterygoid is by placing a finger up behind the maxillary tuberosity and pressing upwards. However, this is a very unreliable way of examining this muscle for several anatomical reasons.

Other muscles which are readily accessible include the sternomastoid. It is usually the origin of the sternomastoid which is tender. The digastric muscle is frequently tender over either the posterior belly, which causes discomfort behind the ascending ramus of the mandible under the earlobe, or the anterior belly of the digastric which runs from the hyoid bone to the symphysis of the mandible. This muscle is frequently tender in patients who parafunction on their front teeth.

The common signs of parafunction are scalloping of the lateral border of the tongue ridging of the buccal mucosa on the inside of the cheeks and abnormal attrition or tooth surface loss. Other features are repeated enamel or restoration fracture and otherwise unexplained dental hypersensitivity, either to percussion or temperature.

### ***Occlusal examination***

An occlusal examination<sup>[18]</sup> should record whether or not centric jaw relation/ retruded contact position CR/RCP and centric occlusion/intercuspal position CO/ICP, the habitual bite, are coincident. If not, where is the premature contact and is there a slide from CR to the habitual bite CO? If there is a slide is it a large or small slide, is it in the same sagittal plane or is it off to one side or the other? Is there anterior guidance on the canine teeth, which is the ideal, and are there any working or non-working side interferences up to and beyond the canine crossover position?

It is important to record whether there is freedom in centric occlusion. This is especially important when restoring anterior teeth with, for instance, crowns, as any retrusion of the mandible by placing restorations that are thicker than the teeth were originally could cause immediate TMD symptoms or trauma to the restored teeth due to the mandible being forced distally.

It is important to remember that pain, muscle and joint tenderness are subjective in their severity. What may be severe to one patient may not be to another. Joint sounds vary, not only with the stage and progress of the disease, but on a day to day basis and at different times of the day.

### ***TMJ Imaging***

Many diagnostic means have been indicated for the TMDs, including electro-diagnostic tests such as jaw tracking devices, electromyography, and thermography and vibration analysis. Radiographs have limited use in the identification of TMDs.<sup>[19]</sup> However, imaging techniques can be used to gain additional insight regarding the health and function of the joint. Four basic radiographs can be used for the evaluation of TMJ including; Panoramic view, Lateral Transcranial view, Transpharyngeal view and Transmaxillary AP view.

Lateral tomography, joint arthrography, computed tomography scanning and magnetic resonance imaging are often being used to confirm the diagnosis. In recent years MRI has

become the gold standard for evaluating the soft tissue and the positional abnormalities of the joint disk.<sup>[20]</sup>

### **Non-invasive management of non-specific TMDs**

#### ***Education***

Behavioural therapy is generally considered as a first conservative approach for the treatment of TMD.<sup>[21]</sup> The rationale for the therapy arises from the idea that parafunctional activity and psychosocial factors play a role in the pathogenesis of musculoskeletal pain.<sup>[22]</sup> The objectives of education are to reassure the patient, to explain the nature, the etiology and the prognosis of the problem, to reduce repetitive strain of the masticatory system (e.g. daytime bruxism), to encourage relaxation and to control the amount of the masticatory activity.

Activity goals can be divided in three separate domains: the physical (exercise programme, number of exercises, duration and level of difficulty), the functional (tasks of everyday living or hobbies), and the social (social activities) domain.

Normal jaw muscle function should be explained, with emphasis on avoiding overloading of the masticatory system, which could be the major cause of the complaints. The patients should be advised to pay close attention to the jaw muscle activity, to avoid oral habits and excessive mandibular movements.

In acute conditions, they should avoid hard food, cut hard and tough food in small pieces, chew with back teeth on both sides, and avoid chewing gum. Patients must learn to keep the muscles relaxed by holding the mandible in the postural position (teeth apart), rather than in occlusion as this jaw position requires ‘unintentional’ muscle contraction.<sup>[23]</sup> Approaches aiming at changing maladaptive habits and behaviours such as jaw clenching and grinding of the teeth are important in treating painful tissues. Patients should be aware that habits do not change spontaneously and that they are responsible for the change.

#### ***Exercise therapy***

Physiotherapy intervention is efficacious for patients with TMD pain and restricted motion.<sup>[24]</sup> Exercise therapy is the cornerstone of rehabilitation of regional musculoskeletal disorders. It has been suggested that these exercises help to relieve musculoskeletal pain and to restore normal function by reducing inflammation, decreasing and coordinating muscle activity, and promoting the repair and regeneration of tissue.<sup>[5]</sup>

Massage therapy is a very old and frequently used kind of therapy. Self-massage is limited to the painful or tense masseter and temporalis muscles because they are both easily accessible. The patient is carefully instructed about the anatomic location of the affected muscle and is asked to exert an amount of pressure slightly higher than the initial pain sensation; the pressure has to be modulated proportionally to the level of pain experienced. The masseter muscles are massaged by slight rolling movements performed with the index, middle and ring fingers placed extra-orally over the masseter area and the thumb placed intra-orally exerting counter pressure during massage. The patient is instructed to find the painful area and to knead it for at least one minute; treatment time is related to the speed of adaptation. Thereafter, he/she has to stretch the muscle by pulling the thumb laterally starting from the origin of the masseter on the zygomatic arch up to the insertion on the mandibular angle. The right masseter muscle is massaged by the left hand and vice-versa. The temporalis muscles are massaged by slight circular movements performed with the ipsilateral index, middle and ring fingers or by pressing with one finger tip on the painful area in order to induce adaptation.

Superficial moist heat and cryotherapy can be used as palliative therapy. The patient is asked to apply moist heat or cold pads on the painful area. Heat at approximately 40–50° C (moderately warm) is applied bilaterally for 20 min once a day. To make the pad, a wet towel can be microwaved until it is warm, and wrapped around a hot water bottle to keep it warm longer. For cold, patients can use ice wrapped in a thin cloth and apply it on the painful area just until the onset of numbness (approximately 10 min).

Mobilization exercises have been very useful for TMJ problems when dealing with anterior disc displacement with or without reduction. The patient is instructed to perform lateral movements of the mandible in order to recapture the disc if it is possible. Thereafter, he/she has to perform little movements in protrusion, retrusion, and side by side, by holding a plastic small tube between teeth.<sup>[25]</sup>

### ***Occlusal Appliance Therapy***

Many types of occlusal appliances have been suggested for the treatment of TMDs. Two most commonly used are the stabilization appliance and the anterior positioning appliance. The stabilization appliance also called muscle relaxation appliance as it is primarily used to reduce muscle pain. The anterior positioning appliance also called orthopaedic repositioning appliance, as its goal is to change the position of mandible in relation to the cranium. Other

types of occlusal devices are the anterior bite plane, posterior bite plane and pivoting appliance. The appliance therapy is thought to reduce symptoms associated with TMD with following features: Alteration of occlusal condition, alteration of condylar position, increase in vertical dimension, cognitive awareness, change in peripheral input to CNS, natural musculoskeletal recovery or placebo effect.<sup>[5]</sup>

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