

# Temperomandibular Joint Disorder

Karthavya .S

**Abstract:** *Introduction:* Temporomandibular joint (TMJ) connects the mandible or the lower jaw to the skull and regulates the movement of the jaw. It is a bi-condylar joint in which the condyles, located at the two ends of the mandible, function at the same time. The TMJ is one of the most complex as well as most used joint in a human body. The important functions of the TMJ are mastication and speech (1, 2, 3). Temporomandibular joint and muscle disorders, commonly called "TMJ," are a group of conditions that cause pain and dysfunction in the jaw joint and the muscles that control jaw movement. (4)

**Keywords:** regulate the movement of jaw, bicondylar joint, fibrocartilage

## 1. Introduction

Temporomandibular joint (TMJ) connects the mandible or the lower jaw to the skull and regulates the movement of the jaw. It is a bi-condylar joint in which the condyles, located at the two ends of the mandible, function at the same time.

## 2. Anatomy

TMJ, a joint that connects the mandible to the skull and regulates mandibular movement, is a bi-condylar joint in which the condyles, located at the two ends of the mandible, function at the same time. The movable round upper end of the lower jaw is called the condyle and the socket is called the articular fossa. Between the condyle and the fossa is a disc made of fibrocartilage that acts as a cushion to absorb stress and allows the condyle to move easily when the mouth opens and closes.(5,6)

The features that differentiate and make the TMJ a unique joint are its articular surfaces covered fibrocartilage instead of hyaline cartilage. The bony structure consists of the articular fossa; the articular eminence, which is an anterior protuberance continuous with the fossa; and the condylar process of the mandible that rests within the fossa. The articular surfaces of the condyle and the fossa are covered with cartilage (6). A dense fibrocartilaginous disc is located between the bones in each TMJ. The disc divides the joint cavity into two compartments (superior and inferior) (6, 7). The two compartments of the joint are filled with synovial fluid which provides lubrication and nutrition to the joint structures (7, 8). The disc distributes the joint stresses over broader area thereby reducing the chances of concentration of the contact stresses at one point in the joint. The presence of the disc in the joint capsule prevents the bone-on-bone contact and the possible higher wear of the condylar head and the articular fossa (9, 10, 11, and 8). The bones are held together with ligaments. These ligaments completely surround the TMJ forming the joint capsule

## 3. Function of TMJ

The most important functions of the TMJ are mastication and speech. Strong muscles control the movement of the jaw and the TMJ. The temporalis muscle which attaches to the temporal bone elevates the mandible. The masseter muscle closes the mouth and is the main muscle used in mastication (12) Movement is guided by the shape of the bones, muscles, ligaments, and occlusion of the teeth. The TMJ

The TMJ is one of the most complex as well as most used joint in a human body. The important functions of the TMJ are mastication and speech (1, 2, 3). Temporomandibular joint and muscle disorders, commonly called "TMJ," are a group of conditions that cause pain and dysfunction in the jaw joint and the muscles that control jaw movement. (4)

undergoes hinge and gliding motion (13). The TMJ movements are very complex as the joint has three degrees of freedom, with each of the degrees of freedom associated with a separate axis of rotation. Rotation and anterior translation are the two primary movements. Posterior translation and mediolateral translation are the other two possible movements of TMJ.14

## 4. Temporomandibular Disorder (TMD)

Temporomandibular disorder (TMD) is a generic term used for any problem concerning the jaw joint. Injury to the jaw, temporomandibular joint, or muscles of the head and neck can cause TMD. Other possible causes include grinding or clenching the teeth, which puts a lot of pressure on the TMJ; dislocation of the disc; presence of osteoarthritis or rheumatoid arthritis in the TMJ; stress, which can cause a person to tighten facial and jaw muscles or clench the teeth; aging (14, 15). The most common TMJ disorders are pain dysfunction syndrome, internal derangement, arthritis, and traumas (16, 17). TMD is seen most commonly in people between the ages of 20 and 40 years, and occurs more often in women than in men (17, 18).

## 5. Disc Displacement

Coordinated movement of condyle and disc is essential to maintain the integrity of the disc. Disc displacement is the most common TMJ arthropathy and is defined as an abnormal relationship between the articular disc and condyle(19). As the disc is forced out of the correct position there is often bone on bone contact which creates additional wear and tear on the joint, and often causes the TMD to worsen (20) Disc displacement generates a popping sound when the disc is first forced out of alignment as the mouth opens up and then again as the disc is forced back into place as the mouth is closed. Clinically, this popping sound or clicking is regarded as an initial symptom of the temporomandibular joint internal derangement (TMJ-ID) (20).

## 6. Capsulitis and Synovitis

Inflammation of the capsular ligament may manifest with swelling and continuous pain localized to the joint. Movements that stretch the capsular ligament cause pain with resultant limitation of such movement. Significant inflammation may increase joint fluid volume. When this occurs, one may see an ipsilateral posterior open bite (lack of contact between maxillary and mandibular teeth) secondary to inferior displacement of the condyle (21). Similarly, inflammation due to trauma or abnormal function may affect the retrodiscal tissue. Edema in this area may cause anterior displacement of the condyle and an acute malocclusion with painful limitation of mandibular movements.

## 7. Causes

TMJ disorders may be caused by injuries, wear due to aging, and behavioral factors. A severe injury to the TMJ disorders. For instance, a heavy blow to the jaw could fracture the bones of the joint or damage the disc, disrupting the smooth motion of the jaw and causing pain or locking of the joint. Wear and tear of the TM joint due to aging can cause TMJ disorders, such as arthritis. Arthritis in the jaw joint may also result from injury. Certain behaviors or condition can sometimes cause TMJ disorders. For instance, regular gum chewing can lead to TMJ disorders in some people. Teeth grinding and teeth clenching can increase wear on the cartilage of the TM joint. This could lead to ear and jaw pain. Sometimes people who are under stress grind and clench their teeth. A malocclusion, or bad bite, may cause a person to chew mostly on one side of the teeth, sometimes causing TMJ disorder (22).

## 8. Diagnosis

Diagnosis of TMD is made by obtaining a detailed pain and psychosocial history, patient self-reports of his/her symptomatology, radiographs / CT / MRI, and a clinical examination. A simple screening examination for assessing TMD includes:

- 1) Measurement of the pain-free and maximal range of mandibular opening and lateral excursions,
- 2) Palpation of the TMJ for tenderness
- 3) Obvious TMJ clicking or crepitus
- 4) Palpation of masseter and temporalis muscles for tenderness
- 5) Presence of excessive occlusal wear, chipped teeth, fractured dental restorations
- 6) Measurable differences in facial / jaw asymmetry

In addition, the close association of anxiety / stress with TMD warrants referral for psychological assessment (23)

## 9. Signs and Symptoms

Pain particularly in the TM joint muscles is the most common symptoms. Other symptoms includes, limited movement or locking of the jaw, pain in the face, neck or shoulders, painful clicking, popping, or grating sounds in the

jaw joint when opening or closing the mouth, A sudden, major change in the way the upper and lower teeth fit together Symptoms such as headaches, earaches, dizziness, and hearing problem are sometimes related to TMJ disorders (22).

## 10. Treatment

### 10.1 Diet

Load reduction in the TMJ is achieved by modifying the patient's diet to reduce joint loading from forces of mastication. This is achieved primarily by a non-chewing diet such as liquid or pureed food. As the joint pain improves, the diet may be advanced (23).

### 10.2 Pharmacologic Agents

The nonsteroidal anti-inflammatory drugs (NSAID) are the mainstays in the pharmacological treatment of musculoskeletal disorders where pain and inflammation are prominent features. Low dose tricyclics are effective in controlling pain from nighttime bruxism, when doses are adjusted to provide improved sleep. After psychiatric consultation, if it is determined that clinical depression is an aggravating factor, antidepressant medication can be helpful as part of the treatment. Prolonged use of other medications such as tranquilizers, muscle relaxants, sedatives, and narcotic pain medications are seldom indicated. Narcotic pain medications are commonly used for a short period after surgery (25).

### 10.3 Physical Therapy (PT)

PT in conjunction with other methods of treatment is used to relieve musculoskeletal pain and improve. Range of motion Range of motion exercises, whether guided by a physical therapist or the surgeon, is a valuable adjunct after joint surgery (25).

## References

- [1] Alomar, X., J. Medrano, J. Cabratosa, J. A. Clavero, M. Lorente, I. Serra, J. M. Monill, and A. Salvador. Anatomy of the temporomandibular joint. *Semin. Ultrasound CT MRI* 28:170–183, 2007
- [2] American Association of Oral and Maxillofacial Surgeons (AAOMS). The temporomandibular joint (TMJ). Retrieved on 10/14/2007, from <http://www.aaoms.org/tmj.php>
- [3] 3 Hebert, L. A. *Overcoming TMJ: There is Hope*. Greenville, ME: IMPACC USA, 1996
- [4] U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICE National Institutes of Health
- [5] American Association of Oral and Maxillofacial Surgeons (AAOMS). The temporomandibular joint (TMJ). Retrieved on 10/14/2007, from <http://www.aaoms.org/tmj.php>
- [6] Ide, Y., K. Nakazawa, T. Hongo, J. Taleishi, and K. Kamimura. *Anatomical Atlas of the Temporomandibular Joint*. Chicago: Quintessence Pub. Co., 1991

- [7] Tanaka, E., M. S. Detamore, K. Tanimoto, and N. Kawai. Lubrication of the temporomandibular joint.
- [8] Ann. Biomed. Eng. 36(1):14–29, 2008. doi:10.1007/s10439-007-9401-z
- [9] Hebert, L. A. Overcoming TMJ: There is Hope. Greenville, ME: IMPACC USA, 1996
- [10] Beek, M., J. Koolstra, L. van Ruijven, and T. van Eijden. Three dimensional finite element analysis of the cartilaginous structures in the human temporomandibular joint. J. Dent. Res. 80:1913–1918, 2001. oi:10.1177/002203450
- [11] Koolstra, J., and T. M. G. J. van Eijden. Viscoelastic behavior of the temporomandibular joint disc during
- [12] masticatory dynamics. J. Biomech. 39(Suppl. 1):49, 2006. doi:10.1016/S0021-9290(06)83740-1
- [13] Milam, S. B. Failed implants and multiple operations. Oral Surg. Oral Med. Oral Pathol. Oral Radiol. Endod. 83(1):156–162, 1997. doi:10.1016/S1079-2104(97)90107-4
- [14] Hylander, L. W. An experimental analysis of temporomandibular joint reaction force in macaques. Am. J. Phys. Anthropol. 51:433–456, 1979. doi:10.1002/ajpa.1330510317
- [15] Alomar, X., J. Medrano, J. Cabratosa, J. A. Clavero, M. Lorente, I. Serra, J. M. Monill, and A. Salvador. Anatomy of the temporomandibular joint. Semin. Ultrasound CT MRI 28:170–183, 2007
- [16] Dutton, M. Orthopaedic Examination, Evaluation, & Intervention. New York: McGraw Hill, 2004
- [17] Chase, D. C., J. W. Hudson, D. A. Gerard, R. Russell, K. Chambers, J. R. Curry, J. E. Latta, and R. W. Christensen. The Christensen prosthesis: a retrospective clinical study. Oral Surg. OralMed. Oral Pathol. 80:273–278, 1995
- [18] Cleveland Clinic. Health information. Retrieved on 09/21/2007, from <http://www.clevelandclinic.org/health>
- [19] Detamore, M. S., and K. A. Athanasiou. Structure and function of the temporomandibular joint disc: implications for tissue engineering. J. Oral Maxillofac. Surg. 61(4):494–506, 2003. doi:10.1053/joms.2003.50096
- [20] Detamore, M. S., K. A. Athanasiou, and J. Mao. A call to action for bioengineers and dental professionals: directives for the future of TMJ bioengineering. Ann. Biomed. Eng. 35(8):1301–1311, 2007. doi:10.1007/s10439-007-9298-6
- [21] Farrar, W. B., and W. L. McCarty, Jr. The TMJ dilemma. J. Ala. Dent. Assoc. 63:19, 1979.
- [22] Tanaka, E., D. P. Rodrigo, Y. Miyawaki, K. Lee, K. Yamaguchi, and K. Tanne. Stress distribution in the temporomandibular joint affected by anterior disc displacement: a three-dimensional analytic approach with the finite-element method. J. Oral Rehabil. 27(9):754–759, 2000. doi:10.1046/j.1365-2842.2000.00597.x
- [23] Okeson JP, ed: Fundamentals of Occlusion and Temporomandibular Disorders. St. Louis: C.V. Mosby; 1985
- [24] 1995-2012, The patient education institute, Inc. [www.Xplain.com](http://www.Xplain.com)
- [25] Pain Management Research Institute/Orofacial/Temporomandibular Disorder. Guidelines for Diagnosis and Management of Disorders Involving the Temporomandibular Joint and Related Musculoskeletal Structures I
- [26] Dionne RA Pharmacological treatments for temporomandibular disorders. Oral Surg Oral Med Oral Path 83: 134, 1997
- [27] Clark GT, Adachi NY, Dorman MR: Physical medicine procedures affect temporomandibular disorders: A review. J Am Dent Assoc 121: 151, 1990