

Assessment and Analysis for Internal Derangement of Temporomandibular Joint

Bhaskaran Sathyapriya Professor,

Department of Anatomy,

Sree Balaji Dental College & Hospital,

Bharath Institute of Higher Education & Research, Chennai.

*Govindarajan Sumathy¹, Chandrakala B², Abishek Raj P³, Dhinesh R³, Bhaskaran Sathyapriya**

1. Professor and Head, Department of Anatomy, Sree Balaji Dental College & Hospital, Bharath Institute of Higher Education & Research, Chennai.

2. Senior Lecturer, Department of Anatomy, Sree Balaji Dental College & Hospital, Bharath Institute of Higher Education & Research, Chennai.

3. Graduate student, Sree Balaji Dental College and Hospital, Bharath Institute of Higher Education and Research

**Professor, Department of Anatomy, Sree Balaji Dental College & Hospital, Bharath Institute of Higher Education & Research, Chennai.*

Abstract:

Temporomandibular joint (TMJ) is a complex, sensitive, and highly mobile joint. Temporomandibular disorders (TMD) are a class of degenerative musculoskeletal conditions associated with morphologic and functional deformities. The most frequent structural cause of TMD are Internal derangement, which involves progressive slipping or displacement of a component of temporomandibular joint called articular disc. It is a piece of cartilage located between the condyle and fossa of the joint. The disc can degenerate or even tear. Because of the displacement and high mechanical need of TMJ, the internal derangement disorder often progressively worsen over time. In the mechanically demanding and biochemically active environment of the TMJ, therapeutic conservative and surgical approaches can restore joint functionality and has become a necessity.

Introduction:

Temporomandibular disorders” (TMDs) is a collective term for conditions that involve pain and/or dysfunction of the temporomandibular joint (TMJ), and the related structures.[1] TMD is defined as a muscular and articular disorder.[2] This TMDs are contributed by the displacement of the intra articular disc. This displacement of the disc may further lead to clicking and popping sounds at the Temporomandibular joint.

Anatomy:

The temporomandibular joint is the articulation between the mandible and the cranium as shown in fig. 1. The mandibular head (condyle), glenoid (mandibular) fossa, and articular eminence form the TMJ. These joints serve as one anatomic control for both mandibular movement and the occlusion, surrounded by a capsule which consists of fibrous material, and a synovial lining. TMJ is reinforced by the temporomandibular and sphenomandibular ligaments. The articular surface of the mandible is the upper and anterior surface of the condyle are lined by dense, avascular fibrous connective tissue. An articular disc is interposed between the temporal bone and the mandible that divides the articular space into upper and lower compartments. In a

physiologic joint, the disc is positioned between the mandibular head inferiorly and the articular eminence anteriorly and superiorly when the jaw is closed. When the jaw is opened, the disc slides into a position between the mandibular head and articular eminence. The attachments of the disc prevent luxation during opening. A triangular lateral ligament acts as a strong lateral stabilizer and inhibits the posterior translation of the mandibular head .

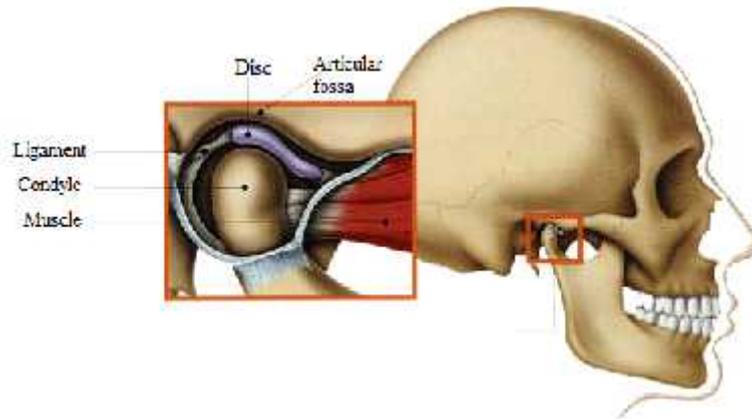


Fig. 1 Temporomandibular joint

Pathogenesis:

Inflammation mainly affects the posterior disc attachment. Several inflammatory mediators play an important role but matrix metalloproteinases (MMPs) are the early marker or detector to determine temporomandibular joint arthritis. Serotonin is the mediator of pain and inflammation is produced in the synovial membrane and in the synovial fluid which causes TMJ pain in cases of systemic inflammatory joint diseases .

Evaluation And Diagnosis:

1. **History and Physical Examination:** Complete medical and surgical history taking of the patient, head and neck evaluation, general physical examination and clinical examination are essential.
2. **Radiographs:** This can provide the information include plain films, panoramic films, and tomograms (frontal and lateral) . The disc and associated soft tissue structures should also be imaged by Magnetic resonance imaging (MRI) or arthrography. Other radiological studies may also be indicated.
3. **Computed tomography (CT):** It is very useful to assess bone abnormalities like ankylosis, dysplasia, growth abnormalities, fractures, osseous tumors. A 3-D CT is a valuable diagnostic advancement for complex cases needing major reconstructive surgery. A stereo lithography model of a patient's maxillofacial skeleton can be fabricated utilizing 3-D CT technology .
4. **Magnetic Resonance Imaging (MRI):** MRI is used to assess soft tissues, bone marrow changes, disc position, morphology, mobility and joint effusion..Cine MRI has been used to study the static or anchored disc
5. **Arthrography:** MRI has largely replaced by arthrography as the primary imaging study for the pathology of the disc.

Treatment:

An internal derangement TMJ is treated with nonsurgical methods which includes medications, physiotherapy and occlusal splints in the initial stages.

1. **Non-Invasive Methods** (Non-surgical methods):

Non-Invasive Methods (Non-surgical methods) such as modification of the diet, occlusal splints, physical therapy, pharmacotherapy, transcutaneous electrical nerve stimulation (TENS) and stress reduction technique followed by surgical methods such as arthroscopy, reconstruction arthroplasty (disc repositioning), meniscectomy, and repair of perforation of disc. The surgical treatment is based on change of the morphology and position of the disc, removal of the disc with or without replacement.

2. Physical Therapy:

Physical therapy is used by TMD patients to keep the synovial joint lubricated, and to maintain the jaw motion. One of the exercises for the jaw is to open the mouth to a comfortable fully-open position and then apply a slight additional pressure to open the mouth fully. Another exercise includes stretching the jaw muscles by doing various facial expressions. Avoiding extreme jaw movements, taking medications, applying moist heat or cold packs, eating soft foods are other ways that may keep the disorder from worsening. Range of motion exercises guided by physiotherapist or the surgeon is a valuable adjunct after joint surgery. [3]

3. Splints :

They are plastic mouthpieces that fit over the upper and lower teeth. They prevent the upper and lower teeth from coming together as shown in Fig.3. Dental occlusal splinting has been the mainstays of TMJ disorder treatment for years, although there is no clear evidence that malocclusion of the upper and lower teeth cause tmj pain. [4]. Bruxism also causes the TMJ dysfunction due to tooth attrition and subsequent malocclusion; myofascial strain, fatigue or fibrosis of masticatory muscles and capsulitis and adhesions within the TMJ joint space. Splints are effective in reducing the intensity of pain for patients



Fig. 3 Splints

4. Pharmacotherapy:

The pharmacologic agents which are commonly prescribed nonsteroidal anti-inflammatory drugs (NSAIDs) to reduce inflammation. Muscle relaxants also be prescribed for treatment of muscle pain and spasm. To increase their benefit, muscle relaxants combinations with NSAIDs are used. Pain relief through the use of non steroidal anti inflammatory drugs (NSAIDs) might result from reduction of peripheral sensitization by decreasing the fatigue, overload, and release of inflammatory components in masticatory muscles and the TMJ.[5]

5. Arthroscopy:

Lysis of adhesions and joint lavage are the most commonly performed TMJ arthroscopic surgical procedures to relieve painful hypo mobility. The objective is to eliminate restrictions on the disc and lateral capsule, to wash out micro debris resulting from the breakdown of the articular surfaces, to irrigate the joint by enzymes and prostaglandins and to stimulate the normal lubricating action of the synovial membrane. The Arthroscopy (fig. 4) in addition, the presence of fibrous adhesions in the superior joint space limits normal translatory function of the disc condyle complex. The Arthrocentesis and Arthroscopy are equally effective methods in terms of pain, whereas arthroscopy is superior in terms of functional or mechanical results.[6]



Fig. 4 Arthroscopy

6. Arthrocentesis:

Nitzan introduced arthrocentesis, simplest and minimal invasive form of surgery in the TMJ (Fig. 5). It release the articular disc and to remove adhesion between the disc surface and the mandibular fossa by means of hydraulic pressure from irrigation of the upper chamber of the TMJ. It is very effective procedure in patients with persistent or chronic closed lock and anchorage in the upper articular space. Lavage of superior joint space with saline exerts its effects through its ability to eliminate joint effusion to reduce the symptoms.



Fig. 5 Arthrocentesis

7. Discectomy And Disc Replacement:

Discectomy (Fig. 6) used to regain the mandibular motion and to reduce orofacial pain, and may be followed by disc replacement. It has been shown in 5- 10-year postoperative follow-ups to increase mandibular motion in patients previously showing no improvement with non-invasive management modality. Some Surgeons have a strong perception that replacement of the disc should be performed with appropriate biomaterial to reduce the severity of TMJ remodelling and improve the long term outcomes after TMJ discectomy.[7]



Fig. 6 Discectomy

8. Joint Reconstruction:

Several techniques have been proposed for reconstruction of portions of the joint or the entire joint itself. A hemiarthroplasty (Fig 7) may be used to replace the superior articulating joint surface. But after the total joint replacement, expecting pre-morbid, fully functional condition is unrealistic.[8]



Fig. 7 Hemiarthroplasty

9. Intra Articular Injection Of Corticosteroids:

Intra articular injection of corticosteroids alone or after arthrocentesis provides long-term palliative effects on subjective symptoms and clinical signs of TMJ pain. Injections with a high molecular weight hyaluronic acid were significantly more effective in decreasing pain intensity than injections of corticosteroids in osteoarthritic joints.[9] Drugs like Morphine, Fentanyl, Bupivacaine, Corticosteroids and SH are used for the management of TMJ disorders. Corticosteroids have a potent anti-inflammatory action on synovial tissue and well known to reduce effusion, decrease pain and brings about an increase in range of motion of synovial joints.

10. Low Level Laser Therapy:

Clinical studies of LLLT used on patients with disc derangement have shown clinical benefits in terms of reduction in pain and clicking. LLLT is usually used clinically for treatment with therapeutic doses and output power are less than $35\text{J}/\text{cm}^2$ and 500mW respectively.[10] The application of laser beams diminishes pain while simultaneously reducing muscle contraction. When a local effect is desired, laser is effective by stimulating microcirculation and local cell tropism. Disadvantage has been the high cost compared to the conventional therapies and the fast development in the field.

Conclusion:

Temporomandibular disorders are frequent and wide spread in general population. TMJ internal derangement is most frequent type of TMD, and is characterised by several stages of dysfunction involving the condyle-disc relationship. The chief complaint is usually pain, which can manifest itself in different ways: head ache, jaw ache, ear ache, facial pain. In early stages of conditions, treatment may involve eating a soft diet and reducing strain on the jaw with the use of a splint or bite guard. Non-steroidal anti-inflammatory drugs or muscle relaxants may be prescribed. Physical therapy and stress management may also be helpful in managing the condition. If the derangement becomes more severe or refractory to conservative and non-surgical treatment, it may be necessary to surgically repair, reposition or possibly remove and consider replacing the disc or joint. Currently low level laser therapy and tissue engineering show a promising rise in prognosis.

References:

[1]De Leeuw R, Klasser G, editors. Orofacial Pain: Guidelines for Assessment, Diagnosis, and Management. 5th ed. Chicago: Quintessence Publishing Co., Inc; 2013.

- [2]Laplanche O, Pe' deutour P, Duminil G, Bolla M, Mahler P. Dysfonctionnements de l'appareil manducateur. Paris : Encycl Med Chir, Odontologie, 23-435-E-20, 2001.
- [3] Clark GT, Adachi NY, Dorman MR: Physical medicine procedures affect temporomandibular disorders: A review. J Am Dent Assoc 1990;121:151.
- [4]. Okeson JP, for the American Academy of Orofacial Pain. Orofacial Pain: Guidelines for Assessment, Diagnosis, and Management. Chicago, Ill.: Quintessence Pub, 1996.
- [5] Costigan M, Scholz J, Woolf CJ. Neuropathic pain: a maladaptive response of the nervous system to damage. Annu Rev Neurosci 2009;32:1-32
- [6] Goudot P, Jaquinet AR, Hugonnet S, Haefliger W, Richter M. Improvement of pain and function after arthroscopy and arthrocentesis of the temporomandibular joint: a comparative study. J Craniomaxillofac Surg 2000;28:39-43
- [7] E. Helgeland, S. Shanbhag, T.O. Pedersen, *et al*; Scaffold-based temporomandibular joint tissue regeneration in experimental animal models: A systematic review
Tissue Eng B Rev, 24 (2018), p. 300
- [8] L G Mercuri , Alloplastic temporomandibular joint replacement: rationale for the use of custom devices (2012 sep)
- [9] Bjornland T, Gjaerum AA, Moystad A. Osteoarthritis of the temporomandibular joint: an evaluation of the effects and complications of corticosteroid injections compared with injection with sodium hyaluronate. J Oral Rehabil 2007;34:583- 9
- [10] Chang W.-D., Lee C.-L., Lin H.-Y., Hsu Y.-C., Wang C.-J., Lai P.-T. A meta-analysis of clinical effects of low-level laser therapy on temporomandibular joint pain. *Journal of Physical Therapy Science*. 2014;26(8):1297–1300. doi: 10.1589/jpts.26.1297