

Internal Derangement of Temporomandibular Joint-A review of Anatomy, Clinical manifestations, Diagnosis and Management.

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Abstract - Internal derangement of temporomandibular joint is referred to as a pathologic entity. It represents displacement of an articular disc from its normal anatomic position. This article includes a brief description of the anatomy of TMJ, various clinical presentations associated with anterior disc displacement. Appropriate management ranges from conservative care & non surgical therapy to surgical interventions, are described also.

Key Words: Internal derangement, disc displacement, temporomandibular disorders, joint noises, disc displacement with reduction and without reduction.

1. INTRODUCTION

Temporomandibular disorders (TMDs) means problems related with temporomandibular joint, muscles of mastication & associated structures also. TMDs represent oro-facial pain, limitation in mandibular movement, pain during mandibular function. It also includes various joint sounds like catching, clicking, popping, snapping etc^[3,5]

1 ANATOMY OF TEMPOROMANDIBULAR JOINT:

- TMJ is a compound joint, composed of 4 articulating surfaces- 1) glenoid fossa of temporal bone, 2) mandibular condyle, 3) superior & 4) inferior surface of articular disc.^[1]
- TMJ is also a synovial joint because synovial membrane lines the inner aspect of the joint. It secretes synovial fluid which lubricates the joint during movement. It also provides nutrition to the avascular joint.^[1]
- Articular disc is a fibrocartilaginous band present between condyle and articular eminence of temporal bone.^[1] It is a biconcave elliptical shaped disc. It is thin at the centre and the posterior border is thicker as compared to the anterior border.^[1,5] It divides the joint cavity in two parts- 1) superior joint cavity and 2) inferior joint cavity. It adapts itself according to the joint movement, because of its flexibility.^[1,2,4]

- TMJ is also called- ginglymoarthrodial joint. The inferior joint cavity allows hinge or rotational movement, hence called 'ginglymoid'. And the superior cavity allows sliding movement, so that it's called an 'arthrodial joint'.^[1,2,3]
- Mandibular fossa or glenoid fossa is a concave depression of temporal bone. It is present between posterior slope of articular eminence and post glenoid tubercle. The bone in the center of articular fossa is very thin, hence it is not a major stress bearing area for TMJ.^[1]
- The articular eminence is a small projection on the zygomatic arch. It provides attachment for collateral ligaments. It has 3 parts- descending slope, a transverse ridge and an ascending slope.^[3]
- Mandibular condyle is of elliptical shape.^[3] It provides attachment for collateral ligaments. On the medial aspect of condyle, there's a depression called- pterygoid fovea. It provides attachment for lateral pterygoid muscle.^[1]
- Both temporal bone and condyle are covered with thick, avascular fibro-cartilage. It is different from other joints because they are covered with hyaline cartilage.^[2]
- Fibrocartilage shows less damage over time and has capacity to repair and regenerate. It is composed of fibro-chondrocytes, fibroblast-like cells, type I collagen fibers and proteoglycans.^[1,2]
- The TMJ is covered with highly vascular fibroelastic connective tissue capsules.^[2] The inner surface of the capsule is lined with a synovial membrane. It's a vascularised, thin, smooth tissue without epithelium. It has the capacity to regenerate after an injury. Synovial fluid resembles an ultrafiltrate of plasma. It helps in lubrication of joints and reduces friction during joint movement, nourishes the joint & phagocytose the debris. The volume of synovial fluid in the upper compartment is about 1.2 mL and in the lower compartment it's about 0.9 ml. It

consists of more albumin than globulin, hyaluronic acid, PMNs & lubricin.^[1,3]

- Retrodiscal tissue is a bilaminar structure. It is highly vascular and innervated. Articular disc blends with it posteriorly. Superior retrodiscal lamina is made up of elastic fibers and is attached with a tympanic plate. It limits the excessive translators movement of condyle. The inferior lamina is made up of collagen fibers. It is connected with an articular disc on the articular surface of the condyle. It may prevent extreme rotational movement of condyle.^[1,2]
- There are 3 functional ligaments and 2 accessory ligaments are associated with TMJ. 3 functional ligaments are- 1) collateral ligament, 2) capsular ligament, 3) temporomandibular ligament. Accessory ligaments are- sphenomandibular ligament and stylomandibular ligament.^[4]

2. INTERNAL DERANGEMENT OF TMJ

According to the diagnostic criteria for temporomandibular disorders proposed by DC/TMD, various types of internal derangement of TMJ are described briefly. It is an easier adaptation from Schiffman et al.- diagnostic criteria for temporomandibular disorders (DC/ TMD) for clinical and research application.^[5,6,15]

- 2.1 Disc displacement with reduction: It represents a condition in which the disc is placed anterior to the condyle in closed mouth position. When a patient opens the mouth, the disc reduction occurs. Reduction means to assume a normal position in relation to the condyle and glenoid fossa. On opening the mouth, condyle passes over the posterior area of the disc & a clicking sound occurs. Clicks are reciprocal as it occurs during mouth opening and during closing. The range of motion is not limited because of disc reduction. This condition is usually unilateral. Pain is usually not present.^[1,6]
- 2.2 Disc displacement with reduction with intermittent locking: The condyle is anterior to the disc in closed mouth position, but it doesn't always reduce to its normal position. Hence intermittent locking of TMJ occurs. It will limit the mandibular movement intermittently. Patient needs to negotiate to unlock the TMJ. Joint noises like clicking, popping or snapping sounds occur during reduction of the disc.^[6]
- 2.3 Disc displacement without reduction with limited opening: In closed mouth position, disc is anterior to the condylar head but the disc is not reduced back to its normal position while opening the

mouth. It represents persistent limited mandibular opening instead of manipulation done by the patient. Hence it's called a 'closed lock'. Limited opening of mouth makes the patient unable to eat. Maximum opening with overbite is about < 40 mm. Overstretching of highly vascular & innervated retrodiscal tissue cause pain while forceful opening.^[1,6]

- 2.4 Disc displacement without reduction without limited opening: The disc is anterior to the condyle in closed mouth position and disc is not reduced to its original position on opening the mouth. Maximum mouth opening with vertical incisal overlap is about > 40 mm. Patient is unable to eat.^[6]
- 2.5 Anchored disc phenomenon: It's also called acute disc displacement. It represents sudden, severe persistent limited mouth opening, without reduction. Maximum mouth opening is about 10-30 mm. Patient experiences pain while forced mouth opening.^[1]

3. CLINICAL FEATURES AND DIAGNOSIS

- Internal derangement of TMJ is considered as a progressive disorder. The signs and symptoms are collectively called TMJ syndrome. They include- pain, joint noise like clicking or popping, reduction in mouth opening. Pain is significant in case of disc displacement without reduction.^[6,8] There may be secondary changes like retrodiscitis and capsulitis. As condyle is functioning on retrodiscal tissue instead of disc, there may be a chance of retrodiscitis. Internal derangement can be unilateral or bilateral. Unilateral cases manifest as deviation of the mandible on the affected side.^[1,2,6]
- Patient history and examination are utmost important to diagnose the disorder. It should include- examination of TMJ & muscle of mastication, maximal mouth opening, occlusion, presence of para-functional habit etc.^[2,8]
- The early stage i.e disc displacement with reduction is characterized by clicking. Joint noises may be audible or palpable. Clicking occurs while opening the mouth as well as while closing mouth. If the opening click is too early, it suggests minimal anterior disc displacement. If the click is too late, more displacement has occurred. When disc is non reducible, there's no contact between articulating surfaces of condyle and disc. Hence clicking will disappear or reduce its intensity.^[8]
- The clinician must evaluate the muscles of mastication. If there's any pain on palpation, trigger

points, localized tenderness, those will indicate myalgia.^[2]

- Radiographic evaluation: Conventional radiography & tomography cannot evaluate the disc. Arthrography & MRI are the techniques of choice. MRI can assess the condyle, fossa, eminence, the disc and its position, shape, density, size, perforation etc. MRI compares the images of disc and condyle in closed mouth and open mouth position & differentiate between the disc displacement with reduction from the disc displacement without reduction.^[1,2,7]

4 .MANAGEMENT

- The goals for the treatment of internal derangement are- 1) to reduce patient discomfort, 2) to reduce pain, 3) to increase the mouth opening, 4) to eliminate the joint noises etc.^[2]

4.1 Non surgical management

- Disc displacement with reduction: It doesn't require any major treatment if disc displacement is not accompanied with pain. Sudden click, loud joint noise, instability of the joint, manipulation during closing the mouth, these things make the patient anxious and fearful. In such cases, patient education is very much needed. The clinician should explain the reasons behind this to the patient in very easy language and no treatment is required.^[2,9]
- If a patient complains of painful clicking, then flat plane stabilization therapy & anterior repositioning splint can be used. Anterior repositioning splint maintains the mandible in anterior position. The clinician guides the mandible in forward direction, reducing the disc & replicating this position in the appliance. But it is not so effective. Symptoms may resolve but the disc remains displaced. It is advised to wear the appliance for full time & then use it for night time only. This appliance can cause posterior open bite & irreversible occlusal changes. Hence full time wearing isn't recommended sometimes.^[8,9]
- If pain & inflammation is there, NSAIDs are effective to reduce the pain and inflammation. Muscle relaxants, tricyclics, sedatives are also given.^[2,9]
- Disc displacement with reduction with intermittent locking: If locking occurs rarely, then management is the same as disc displacement with reduction without intermittent locking. If locking occurs frequently, then it is advised to perform certain mobilization movements like open, protrusive, retrusive, laterotrusive etc. Patients should

perform these exercises without allowing the disc to re-displace.^[5]

- Disc displacement without reduction with limited opening: Treatment depends on the degree of pain & limitation of joint movement associated with disc displacement. Patients with restricted mouth opening with pain, can be benefitted by manual manipulation and flat plane occlusal stabilization with NSAIDs. This reduces the pain and inflammation & also increases range of motion. It also reduces muscle activity and headaches related to sleep bruxism or clenching. Manual manipulation can be performed by holding the mandibular molars with thumbs bimanually. The affected side is pressed inferiorly and then brought anteriorly to seat the condyle on the disc.^[5,9]

4.2 Surgical procedure:

- Arthrocentesis: Patients with severe pain on mandibular movement, can be benefitted by arthrocentesis or arthroscopy. Arthrocentesis is a minimally invasive procedure. It provides lysis and lavage of the upper joint space.^[2] First bupivacaine or articaine with 1:100000 adrenaline is injected to anaesthetize the auriculotemporal nerve.^[14] This procedure uses two needles- one inflow needle and one outflow needle. First two points are marked. 1st point is marked at 10 mm from mid tragus and 2 mm below cantho-tragal line. The 2nd point is marked 10 mm from the first point. Using a 19 gauge needle, 2-4 ml Ringer Lactate solution is injected at the first point to fill the joint space. Another needle is injected at the second point to establish outflow of the solution. At least 300-400 ml solution is used in this procedure. This high pressure irrigation or lavage washes away inflammatory mediators, debris, cytokines, matrix metalloproteinase, eliminates intra articular adhesions and provides pain relief & improves range of motion in immediate postoperative periods. Several studies reported that success rate in treating internal derangement is 70- 95%.^[2,5,14]
- Arthroscopy: It is a more aggressive procedure with success rate 78-90% approximately. This procedure uses a standard operative arthroscope and cannula to lyse adhesions.^[2,5]
- Arthroplasty: It's an open joint surgical procedure. In this technique, the attachments of the disc are released & allow passive movement of the disc. This technique has several adverse effects including - swelling of the TMJ region, numbness, facial nerve injury etc. This procedure markedly improves the range of motion, reduces the pain & joint noises.^[2,5]

5. CONCLUSION:

Now a days, internal derangement is not so uncommon. Most of the patients adapt with minimal problems over the time. Conservative care, use of NSAIDs, muscle relaxant, can benefit the patient in most of the cases. Patient education should include- soft diet, awareness regarding para-functional habits like clenching & sleep bruxism, use of night guard, hot and cold pack etc. Postural training, massage or muscle conditioning, mobilization exercises can be beneficial for the patient. Surgical intervention is rarely needed.

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