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Diaspora of Pathology and Radiology Involving Temporomandibular Joint from a Clinician Perspective - A Review

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Abstract: With the help of imaging technology, the imaging of temporomandibular joint is seen a great success. Due to its superior contrast resolution and capability to get perfect imaging of the function of a particular joint, the magnetic resonance imaging is mostly used for the imaging techniques. Along with magnetic imaging, ultrasound imaging and computed tomography are other two imaging techniques used. The topic discussed here is especially on the art imaging of the temporomandibular joint. Normal temporomandibular joint appearance by the imaging technique and the internal derangement of temporomandibular joint is discussed in this article.
Key words: imaging, temporomandibular joint, internal derangement, computed tomography, magnetic resonance imaging

INTRODUCTION:

The pain in temporomandibular joint is very common in people and only few people will take medication related to it[1,2]. The pains and pathology related to the bone and the joints are commonly seen now-a-days in many people. To image the temporomandibular joint, various imaging techniques are used like computer tomography, ultrasound imaging and magnetic resonance imaging which in short is called as MRI. MRI is mostly used imaging technique as it gives the accurate imaging of temporomandibular joint. The temporomandibular joint is developed only after the eighth week of gestation in the embryos. But, when compared to the diarthrodial joints, the temporomandibular joint is underdeveloped at birth and this eventually continues to develop in the early childhood as the jaw is mostly used for chewing and sucking.

Imaging appearance of normal temporomandibular joint by MRI:

From the magnetic resonance imaging technique, the normal appearance of temporomandibular joint is seen precisely. The T1 signal intensity is highly seen in marrow

fat in the condyle. The T1 signal intensity and T2 low signal intensity are seen in the disc and cortical bone because short T2 and low proton density are seen[3]. In centrally hydrated vertebral disc and central portion of the disc, high proton density and high T2 signal intensity are seen[1,4]. Higher signal intensity is seen on the posterior attachment of the disc when compared to the muscle on T1 and proton density. As there is presence of loose areolar tissue, the posterior band of the disc is hyperintense. The posterior band and the attachment junction both are above the condylar head in 12 o' clock position in the closed mouth position. In between the articular eminence and the condyle and the posterior band, lies the intermediate zone in open mouth position. In this open mouth position, the retrodiscal tissue and the posterior band are highly and clearly seen[1,5]. With the help of a thin hypointense and linear fibrous band, the inferior belly of lateral pterygoid attaches to the anterior surface of the condylar neck. To the anterior band of the disc, the superior belly of lateral pterygoid is attached[6]. The disc is in crescent shape in the coronal plane. The medial borders of the disc are attached to the condylar head and the lateral borders of the disc are attached to the temporomandibular joint capsule[1,6].

Internal derangement of temporomandibular joint:

Internal derangement in short is written as ID. It is defined as the fault of the joint which interferes with the functions of the smooth joint resulting in articular noises and articular pain due to the abnormalities seen in condyle, articular disc and articular eminence[7]. In few cases, the most common cause of internal derangement is disc displacement[8]. And in few other cases, the adhesions in the joint and loose bodies can give rise to internal derangement. While doing MRI technique, in most of the patients (almost 80%) the disc displacement is seen[9,10,11]. MRI technique is widely used for the diagnosis of internal derangement with 95% accuracy in locating the disc position[12].

Disc displacement:

Based on the relation of the mandibular condyle with displaced disc, the disc displacement is categorised as anterior, posterior, lateral, medial, anterolateral, and anteromedial[13]. The most common disc displacement seen in 80% of the patients are anterior or anterolateral[11]. The displacement of the disc may be either partial or complete[9]. In partial disc displacement, the medial or lateral portions of the disc is displaced where as in complete disc displacement, the entire mediolateral portion of the disc is displaced. There is another disc displacement called as rotational disc displacement in which the medial portion stays in normal position but the lateral portion of disc is displaced in the anterior area[14]. On basis of the relation between disc and condyle on opening of the mouth, the displacement of disc is described as anterior displacement with no reduction (ADNR) and anterior displacement with reduction (ADR). There is jaw deviation and partial mouth opening seen in ADNR. In ADR, reciprocal click is seen. On opening of the mouth, the disc which is displaced anteriorly goes back to its normal position that give rise to a sound reciprocal click, thus it is a partial displacement of the disc in ADR. The process of closed lock involves limited opening of the mouth and affected jaw deviation to the side and this is seen in ADNR. While opening the mouth over years, the reduction is seen in lateral deviation, as well there is dislocation of the disc due to the holes

seen in the tissue of the disc and due to this, the disc's posterior band retains on the anterior side of the condyle[15]. ADNR is highly associated with the structural changes in the temporomandibular joint. The temporomandibular joint disorder associated with ADR eventually rises to ADNR. The injury related with the posterior side of the displacement of the disc is most commonly seen. The internal derangement of the disc is normal in the early stages, but later it changes to tear shaped or biconvex or round disc as posterior band of the disc gets enlarged and thickened and anterior band of the disc gets thinner and thinner. And this in turn, indicates the sign of the disc disease[16]. On opening of the mouth, the disc has a biconcave shape until it stays on condylar top[17]. Also by the use of MRI technique, it is demonstrated that the disc disease involves flattening of the disc, tear shaped disc, holes seen in the disc as well there is decline in the signal intensity seen in the disc[18]. As well MRI is also used in knowing the displacement of the disc at its posterior band. The displacements are grouped under 2 categories namely sideways displacement in which medial and lateral disc displacements are included and the other one is rotational displacement in which antero medial and antero lateral disc displacements are included[19]. These above displacements can be either partial or complete as well characterised with or without reduction of the disc.

Pseudodisc:

The pseudo disc is an adaptive reaction to the displaced disc which is in anterior band and along with it, the hyalinization of the connective tissue is also seen[20]. As well, the low signal intensity of the attachment which is present in posterior disc is seen[21].

Stuck disc:

The pathologic situation which is characterised by the immovable disc is called stuck disc. The stuck disc is seen in both closed and open positions of mouth. They are nearly said to be adhesions and may occur with or without displacement of the disc and due to the limited translation of the condyle, there seem to be dysfunctioning of the joint which is associated with the pain[22,23]. The stuck disc is mainly evaluated with the help of imaging technique called as sagittal oblique cine imaging.

Perforated disc:

The perforated disc is mostly seen in patients who have arthrosis disease and seen highly in women than in men[24]. The patients who have ADNR have more disc perforation than the patients who have ADR[25,26]. Displacement of disc, joint effusion, deformity of disc, condylar changes in bone, non-visualisation of the disc attached to the temporal posterior side are seen by the MRI[27]. By opacification of joint compartments, disc perforation can be found out by the use of MR artrogram and conventional techniques. When there is no presence of the stretching of the disc attached to the posterior temporal region when the mouth gets opened, then this is also a symptom of the disc perforation.

Joint effusion:

When large abnormal collection of intra-articular fluid is seen in symptomatic patients, then it is said to be the joint effusion which is mainly seen in painful joints[28,29]. The displacement of the disc and pain is seen in the patients with higher amount of effusion[30]. The effusions which are in larger proportions occupy both inferior and superior space in the joint. Arthrographic effect is referred to disc perforation including retrodiscal tissue due to the joint effusion which is in larger proportions[31]. In the patients who have temporomandibular joint internal derangement, hyperactivity is seen in the lateral pterygoid muscle which is shown by the electro-myographic studies[32]. Atrophy, and hypertrophy conditions are seen in the ADNR patients. These conditions are seen due to morphological variations in the lateral pterygoid muscle and are highly associated with the restricted opening of the jaw and pain[33]. The above conditions are seen by MRI. The superior part of lateral pterygoid muscle and anterior displacement of the disc are interconnected[34].

Avascular necrosis and osteochondritis dissecans:

The avascular necrosis and osteochondritis dissecans have more or less same pathophysiology seen in the condyle[35]. The above both conditions have the same pathological entity that includes disability of the jaw and the pain. The symptoms seen are earache, joint pain, headache, and masticator muscles spasm is also experienced by the patient[36]. MRI technique is used for the examination of avascular necrosis and osteochondritis dissecans in the condyle[36]. The radiological changes seen in condyle due to avascular necrosis and osteochondritis dissecans are mostly due to internal derangement and the joint effusion[37]. On MRI, the similar conditions and appearances are seen in both avascular necrosis and sclerosis of the condyle[38]. Acute osteochondritis dissecans is notified by the presence of central fragment which is hypointense.

Loose bodies:

The loose bodies are mostly seen in synovial joint and this may be due to the presence of either primary which is associated with cartilaginous metaplasia in synovium or secondary which is associated with insertion of osteo cartilaginousloose bodies in synovium[39]. Crepitation, pain, swelling in periauricle, and decreased mobility in the jaw are the symptoms seen while opening of the mouth in loose bodies condition[40]. MRI and high resolution computer tomography are helpful to know small loose bodies in the temporomandibular joint space[41,42]. The activity in the masticator muscle is seen due to the condyle which gets trapped along the slope of the anterior side of the articular eminence[43]. MRI technique can demonstrate the slope steepness as well as the height of the articular eminence along with the position and size of the disc[44]. MRI is usually needed in the chronic conditions. In acute conditions, imaging techniques are not needed as open lock which is nothing but inability by the patient to close the jaw after wide jaw opening is clearly seen. The open lock is due to condyle translation at the back of temporomandibular joint's anterior attachment.

Ankylosis:

Ankylosis is seen in temporomandibular joint because of bony fusion and adhesions which are fibrous in nature that results in restriction in motion of the jaw. Ankylosis is mostly occurred when there is any trauma surgery, infections which are previously seen, or seen in the patients with bifid mandibular condyles and idiopathic arthritis[45]. The bony fusion is evaluated with the help of three-dimensional computer tomography and to evaluate the adhesions, MR arthrography is highly necessary.

CONCLUSION:

To know the various pathologies, and accuracy of the diseases of temporomandibular joint, imaging is necessary like MRI, CT scan, and radiology. MRI is specially used when suspected pathology of temporomandibular joint is to be evaluated. Anatomy of temporomandibular joint, and biomechanics are highly important to recognise the specific disorders and treat them by using MRI. The internal derangement of temporomandibular joint and the position of the disc are mainly evaluated by MRI. CT scan is usually used in evaluating any disorder which involves the bones.

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