Review Article

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Temporomandibular Joint: A Short Insight

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Abstract

Temporomandibular joint is a synovial articulation, formed by condyle of the mandible and glenoid (mandibular) fossa and articular eminence of temporal bone at the base of the skull. It differs from other joints of body because it shows the properties of both hinge and sliding joint so it also called as ginglymo-arthrodial joint. Temporomandibular joint abnormalities affect 5-12% of the population. The correct diagnosis of early abnormalities of this joint is of paramount importance because they can result in temporomandibular joint disorders. In the present article, a short insight is presented on Temporomandibular joint with emphasis on its anatomy, physiology & applied aspect.

Keywords: Temporomandibular Joint; Mastication; Condyle; Attachments; Ligaments.

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Introduction

Temporomandibular joint disorders constitute a number of functional and pathological changes affecting not only the temporomandibular joint, but also the masticatory muscles and eventually all other parts of stomatognathic system [1]. Despite years of extensive basic and advanced clinical research, clinicians continue to encounter considerable difficulties in the management of many of these temporomandibular joint disorder conditions. To a large extent, it is related to the lack of accurate diagnosis [2,3]. Various diagnostic techniques for temporomandibular disorders are there like; plain and panoramic radiography, conventional and computerized tomography (CT) scan, arthrography, magnetic resonance imaging (MRI) and radionuclide imaging. Otherincludes electro-diagnostic tests such as jaw-tracking devices, electromyography, thermography, sonography for evaluation of the joint sounds and vibration analysis [4]. Imaging of temporomandibular joint allows a clinician to evaluate the integrity and relationships of temporomandibular joint, osseous components, confirm the extent or progression of joint disease and evaluate prognosis. The results of imaging studies are then correlated with the patient's history and clinical findings in order to arrive at an accurate diagnosis and treatment plan [5]. Choice of imaging technique will depend on the specific clinical problem, whether hard or soft tissue to be imaged, radiation dose, cost, availability of the image technique, and the amount of diagnostic information provided by the technique [6].

Imaging the temporomandibular joint is technically difficult due to the position of the joint relative to other radiologically dense and complex anatomical structures of the cranium.

Diagnostic Imaging of Temporomandibular joint is necessary to supplement an adjunct to the

information obtained from the clinical examination. The purpose of temporomandibular joint imaging is; to evaluate the integrity and relationship of the hard and soft tissues, to confirm the extent or stage of progression of known disease & to evaluate the effect of treatment.

Review of Literature

An extensive research was done in pubmed and scopus data bases on Temporomandibular joint – A short insight using following meshwords like temporomandibular joint, mastication, condyle, attachments, ligaments from the year 1991 till 2011 and 87 articles were found out of which 10 articles were reviewed as per the relevance for the present research paper.

Anatomy of the temporomandibular joint:

The anatomy of the temporomandibular joint can be understood best by considering the osseous structures, soft tissues, and functional anatomy separately as directed by Murphy. A thorough understanding of the radiographic anatomy and morphology of the temporomandibular joint is essential so that a normal variant is not mistaken for an abnormality.

Temporomandibular Articulation:

The TMJ articulation is classified as a ginglymo-diarthrodial joint, because it is a joint that is capable of hinge-type movements (ginglymos) and gliding movementswith the bony components enclosed and connected by a fibrous capsule. The articulation is formed by the mandibular condyle which forms the lower part of the joint occupying a hollow in the temporal bone (the mandibular or glenoid fossa) [7].

The bony components of the joint from the side:

Condyle: The condyle is a bony, ellipsoid structure connected to the mandibular ramus by a narrow neck.The condyle is approximately 20 mm long medio-laterally and 8 to 10mm thick antero-posteriorly. The shape of the condyle varies considerably; the superior aspect may be flattened, rounded, or markedly convex, whereas the mediolateral contour is usually slightly convex.

These variations in shape causes difficulty with radiographic interpretation, hence lay importance of understanding the normal anatomy. The extreme aspects of the condyle are called the medial pole and lateral poles.There are five types of shape of condyle (A) Flat, (B) Round, (C) Angled, (D) Convex and (E) Concave.

The long axis of the condyle is slightly rotated on the condylar neck such that the medial pole is angled posteriorly, forming an angle of 15 to 33 degrees with the sagittal plane. The two condylar axis typically intersect near the anterior border of the foramen magnum in the submento-vertex projection [9]. Most condyles have a pronounced ridge oriented medio-laterally on the anterior surface, marking the antero-inferior limit of the articulating area. This ridge is the upper limit of the pterygoid fovea, a small depression on the anterior surface at the junction of the condyle and neck. It is the attachment site of the superior head of the lateral pterygoid muscle and should not be mistaken for an osteophyte (spur), which indicates degenerative joint disease.

Although the mandibular and temporal components of TMJ are calcified by 6 months of age, complete calcification of cortical borders do not be completed until 20 years of age. As a result, radiographs of condyles in children may show little or no evidence of a cortical border. In the absence of disease, the cortical borders in adults are visible radiographically. A layer of fibro-cartilage covers the condyle but is not visible radiographically [8].

Mandibular fossa: The mandibular fossa is located at the inferior aspect of the squamous part of temporal bone and is composed of the glenoid fossa and articular eminence of the temporal bone, which is sometimes described as the temporal component of the TMJ. The fossa and articular eminence develop during the first 3 years of life and reaches a mature shape by the age of 4 years and hence young infants lack a definite fossa and articular eminence. All aspects of the temporal component of the Temporomandibular joint may be pneumatized with small air cells derived from the mastoid air cell complex. Pneumatization of the articular eminence is seen radiographically in approximately 2% of patients. Like the condyle, the mandibular fossa is covered with a thin layer of fibro-cartilage.

Inter-articular disk: The inter-articular disk (meniscus) is composed of fibrous connective tissue which is located between the condylar head and mandibular fossa. The disk divides the joint cavity into two compartments, called as the inferior (lower) and superior (upper) joint spaces, which are located below and above the disk, respectively.

The junction between the posterior band and posterior attachment usually lies within 10 degrees of vertical above the condylar head. The disk and posterior attachment are collectively called the soft tissue component of the TMJ during mandibular opening, as the condyle translates downward and forward, the disk, also moves forward and rotates so that its thin central portion remains between the articulating convexities of the condylar head and articular eminence.

Laterally and medially, the inter-articular disk attaches to the condylar poles, helping to ensure a passive movement of the disk with the condyle, so that the condyle and disk translate forward together to the summit of the articular eminence. As the mandible opens, the condyle also rotates against the lower surface of the disk in the inferior joint space. On mandibular closing, this process reverses, with the disk moving back with the condyle into the mandibular fossa.

Posterior attachment (retro-diskal tissues): The posterior attachment consists of a bilaminar zone of vascularized and innervated loose fibro-elastic tissues. The superior lamina, which is rich in elastin, inserts into the posterior wall of the mandibular fossa. The superior lamina stretches and allows the inter-articular disk to move forward with condylar translation. The inferior lamina attaches to the posterior surface of the condyle. The posterior attachment is covered with a synovial membrane that secretes synovial fluid, which lubricates the joint. As the condyle moves forward, tissues of the posterior attachment expand in volume, primarily as a result of venous distention, and as the disk moves forward, tension is produced in the elastic posterior attachment. This tension is thought to be responsible for the smooth recoil of the disk posteriorly as the mandible closes [8].

TMJ bony relationships: Radiographic joint space is a general term used to describe the radiolucent area between the condyle and temporal component. This general term should not be confused with the terms superior joint space and inferior joint space described earlier, which refer to soft tissue spaces above and below the disk. The left and right condylar positions within the fossa can be determined and compared by the dimensions of the radiographic joint space viewed on corrected lateral tomograms. The condyle is positioned concentrically when the anterior and posterior aspects of the radiolucent joint space are uniform in width. The condyle is retruded when the posterior joint space width is less than the anterior and protruded when the posterior joint space is wider than the anterior [9].

However the diagnostic significance of mild or moderate condylar eccentricity is not clear, since condylar eccentricity is seen in one third to one half of asymptomatic individuals and is not a reliable indicator of the soft tissue status of the joint, particularly because the shape of the condylar head is not concentric to the shape of the fossa. But in cases of markedly eccentric condylar positioning it is an indication of some abnormalities. But in cases where there is - A) inferior condylar positioning (widened joint space) may be seen in cases involving fluid or blood within the joint space B) superior condylar positioning (decreased joint space or no joint space, with osseous contact of joint components) may indicate loss, displacement, or perforation of intra capsular soft tissue components. C) Marked posterior condylar positioning is seen in some cases of disk displacement, and D) marked anterior condylar positioning may be seen in juvenile rheumatoid arthritis.

Condylar movement: The condyle undergoes complex movements during mandibular opening. Initially there will be downward and forward translation (sliding) of the condyle, whereby the superior surface of the disk slides against the articular eminence and at the same time a hinge like, rotatory movement occurs with the superior surface of the condyle against the inferior surface of the disk.The extent of normal condylar translation varies considerably. In most individuals, at maximal opening the condyle moves down and forward to the summit of the articular eminence or slightly anterior to it. The condyle typically is found within a range of 2 to 5mm posterior and 5 to 8mm anterior to the crest of the eminence [5].

Applied Aspect: Reduced condylar translation, in which the condyle has little or no downward and forward movement and does not leave the mandibular fossa, is seen in patients who clinically have a reduced degree of mouth opening. Hypermobility of the joint - This may permit anterior locking or dislocation of the condyle if a superior movement also occurs above and anterior to the summit of the articular eminence [10].

Clinical examination of temporomandibular joint

Inspection begins with examiner standing directly in front of patient. The symmetry of size and functional lateral movements of jaws are noted. The movements should be executed easily without

muscle spasm or undue strain of facial muscle. The patient is instructed to carryout protrusive movements of mandible with the teeth separated. The examiner pays special attention to deviation of jaw from the midline and to jerky movements, the presence of abnormal non-symmetric and jerky movements such as the possibility of muscle disorder. Traumatic injury of the joint, infection of joint, muscle hyper tonicity and hypo tonicity and fractures of jaws are common causes of abnormal jaw movements.

Palpation of muscles and joint is best accomplished with the examiner standing behind the patient. Bilateral palpation is the method of choice. Since movements of joint demand contra lateral action of joint and muscle. The examiner feels for smoothness in the function of joints. fingers of both hands placed on TMJ area, the examiner ask the patient to make opening movements, right and left lateral movement with teeth apart and then protrusive movements and closing movements. The movements of the joints should be smooth and free of jerky and during abnormal action in lateral movements there is slight lateral shift of the joint on the side towards which the movement is being made. The opposite joint willmove forward and somewhat medially [7].

The possibility of conditioning and training the patients muscle should be considered before one unequivocally states that abnormal function exists or that there is loss of function. Even so conditioned movements are important findings since they have relationships to the muscles, joint and occlusion. Occasionally ankylosis of joint will produce abnormal findings on palpation of joint occlusal interferences also produce jerky and abnormal movements. The joint should also be palpated for swelling and tenderness [8]. The muscles responsible for movement of mandible are palpated for signs of tenderness, enlargement, spasm, and tonicity. The muscles that are suitably located by palpation are the anterior, middle and posterior portion of temporalis and masseter. The digastrics are less effectively palpated and external and internal pterygoids are less easily palpated. The known functions of the pterygoids allow their action to be grossly evaluated.

Intra-auricular And Extra-auricular Clinical Examination of TMJ

Auscultation of the joint can be accomplished simply by listening for any abnormal sounds of "snapping", "grating", or "clicking" that occurs during the movement just described. Stethoscope may be of value in its use for TMJ sounds.

Auscultation of right TMJ

Percussion of jaws may be of value when cavities, fractures, or reflexive movements of the mandible are to be evaluated. Percussion should be Indirect when testing for cavities and fractures of the bone and Direct when testing for reflex action of mandible.

History: History reveals that the management of TMD began with the ancient Egyptians, who manually treated jaw dislocations. In the fifth century BC, Hippocrates described a manual method of reducing mandibular dislocations. This early treatment of mandibular dislocation was followed by concern for what was termed as "fixation", consisting of extra-articular trismus or intra-articular ankylosis related to infection, trauma or arthritis. Initially surgical procedures were performed to treat ankylosis and then non-reducible and recurrent dislocations [10].

Conclusion

The anatomy and function of temporomandibular joint is the most intensively debated research fields in dental radiography. To understand the temporomandibular joint disorders, we must first understand the normal anatomical structuring of the joint. It is then only we can differentiate the abnormality from the normal anatomy. In the present review article, an attempt is made to describe commonly used examination techniques for the diagnosis of various temporomandibular joint disorders.

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