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Altered Morphology Of Temporomandibular Joint Apparatus As Per Cone Beam Computed Tomography: Case Series

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Abstract

The relatively low-dose, high-spatial-resolution characteristics of Cone beam computed tomography (CBCT) is being increasingly used in dentomaxillofacial imaging for viewing minute bony changes in the Temporomandibular Joint(TMJ) apparatus which is otherwise not evident in conventional radiographs. In this paper we discuss a series of 4 cases where the arthritic changes occurs in the TMJ apparatus, especially the condyle due to post traumatic injuries, due to myofascial pain dysfunction syndrome and chronic degenerative changes that occurs in patients with long standing TMJ pain.

Keywords: Temporomandibular joint apparatus, Cone beam computed Tomography. Arthritic changes

Introduction

Cone Beam Computed Tomography(CBCT) has motivated many research in the study of TMJ morphological changes. CBCT images provide high-diagnostic-quality, accurate and detailed information on all pathological conditions modifying the structure or the shape of joint surfaces. It also facilitates the assessment of joint space changes and mechanical impingements.[1]The examination of Temporomandibular joint (TMJ) using CBCT was reported only a couple of years ago. It is of great diagnostic potential when compared to conventional radiographic examinations.[2]In particular, CBCT is the method of choice in detection of congenital and developmental malformations, traumatic bony injuries, miniscule changes of degenerative joint disorders, periarticular bony defects associated with arthritis (periarticular erosions, osteolytic focuses, ankylosis), joint remodelling and tumors.[1]The present report will give an insight on altered morphology of TMJ as interpreted by CBCT and its diagnostic value in cases of chronic degenerative arthritis, Fracture and Mal-union and Myofascial pain dysfunction syndrome

Case:1

A 15-year-old male patient reported with gradual restriction of mouth opening since15 days with a history of trauma to his chin 6 months back. On clinical examination, mouth opening of 3 cm and deviation of mandible to left side was noted. Normal condylar movements were appreciated on the right condyle while the condylar movement was not appreciable on the left side and patient was advised CBCT to evaluate theleft TMJ.

CBCT of left TMJ revealed altered shape and size of the condyle with exophytic nodular projection in the medial aspect. Reduced height of the condylar head and loss of convexity of the superior surface. Altered surface of the articular tubercle with accentuated articular fossa and joint spaces(Fig 1) features suggestive of altered left TMJ apparatus due to left condylar fracture mal-union.

Case:2

A 45 - year old female patient came to the department with a chief complaint of limited mouth opening and mild pain since 3-4 months. She gave a history of swelling in the right face region due to trauma 1-year back which regressed on its own. Clinical examination revealed mild pre-auricular tenderness, deviation of mandible towards right side.

CBCT of the right TMJ revealed altered morphology of the right condyle with increase in anteroposterior width and length of the condyle. Presence of anterior beaking and medial deep cleft suggested the malunion of fragment. Increased articular space was evident and the condylar head was well corticated with no erosions suggestive of right condylar malunion with functional remodelling of the right TMJ (Fig 2).

Case:3

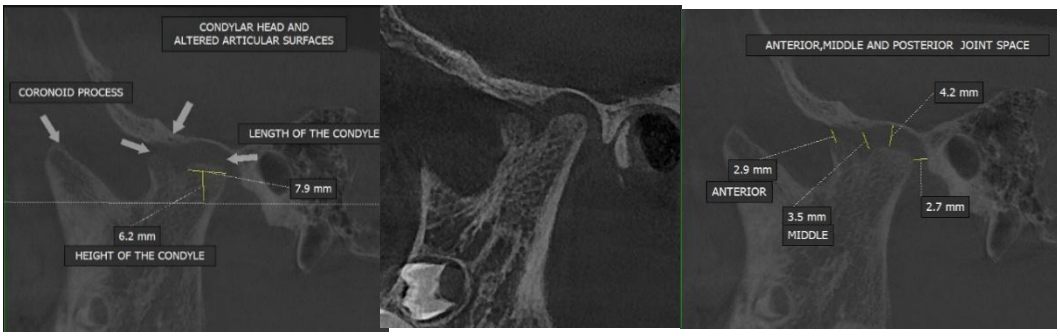
A 23-year-old female patient reported with a complaint of pain while opening the mouth since a month. On examination tenderness was noted in preauricular region, masicatory muscles along with deviation of mandible towards left, it was clinically diagnosed as Myofascial pain dysfunction syndrome and treated for the same. CBCT revealed altered morphology of the condyle (small erosions in the right condyle and flattening of the left head of the condyle) with normal articular fossa (Fig 3)

Case: 4

A 42-year-old male patient came with a complaint of pain in the right and left TMJ since 20 years, he was a known diabetic and hypertensive since 2 years and gave a history of TENS therapy 20 years ago for TMJ pain. On examination pterygoid sign was positive and clicking sound was heard while opening the mouth. OGP showed altered morphology of the condyle. CBCT was advised where left temporomandibular joint apparatus showed flattened and widened condylar head, radiopaque projections from the anteromedial surface and articular surface with limited joint space, posteriorly radiopacities merging with articular surface, sub-surface radiolucencies were seen in the condylar head, reduced density/altered trabeculations were seen in the condylar head. Right TMJ revealed altered morphology of the superior surface of the condylar head with loss of cortication. Condylar head showed sub surface porosities or rarefaction of bone and less dense areas, anterior sloping of condylar head was seen, minimum joint space was present with slightly altered articular surface with deepened articular fossa features were suggestive of chronic degenerative arthritis (Fig 4)

Fig:1-CASE:1-15Yrs/M- Altered left TMJ apparatus due to left condylar fracture & mal-union

SAGITTAL SECTIONS



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Coronal Sections

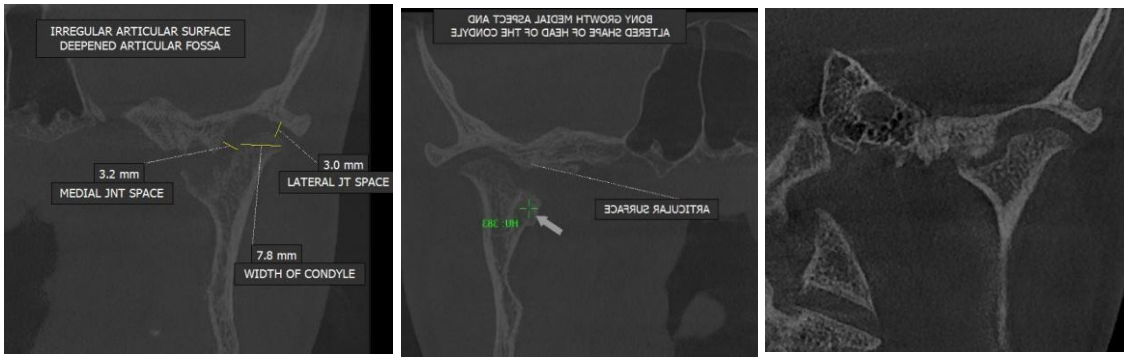

Fig 2: CASE 2:45Yrs/F-Right condylar mal-union with functional remodelling of the right TMJ

Coronal Sections

Sagittal Sections

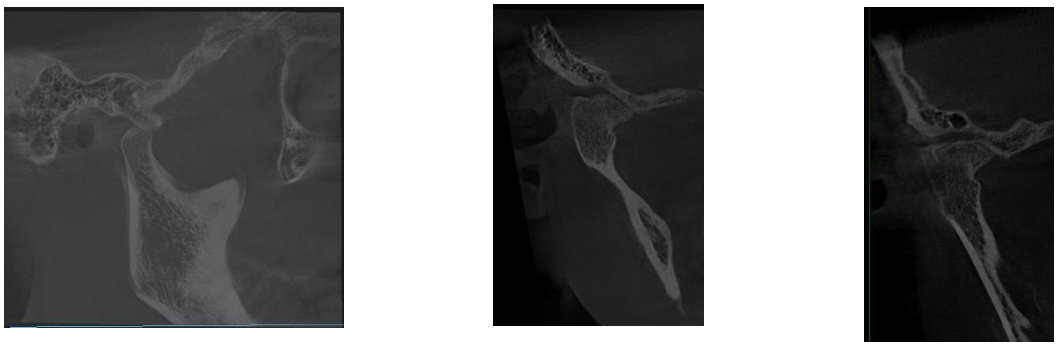

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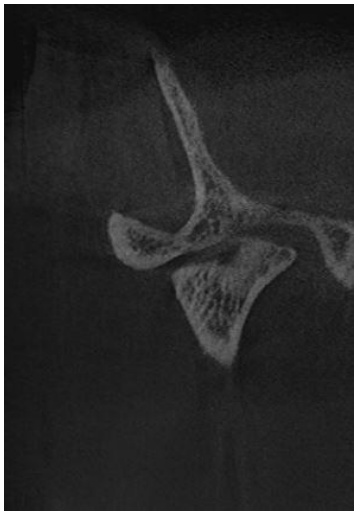
Fig 3: Case 3-23yrs/F- Altered morphology of the condyle with normal articular fossa

Coronal Section



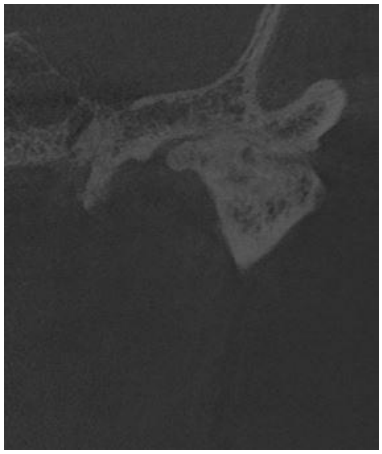
Sagittal Section

Fig 4: Case 4-42yrs/M- Features suggestive of chronic degenerative arthritis

Coronal Sections

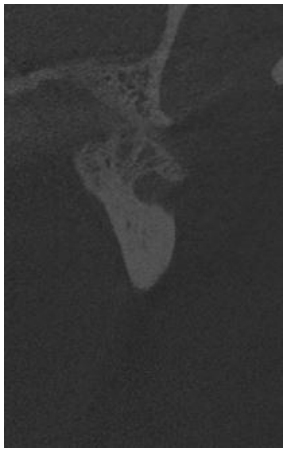
Left TMJ

(Flattened and widened condylar head)



Right TMJ

(condylar head shows sub surface porosities)



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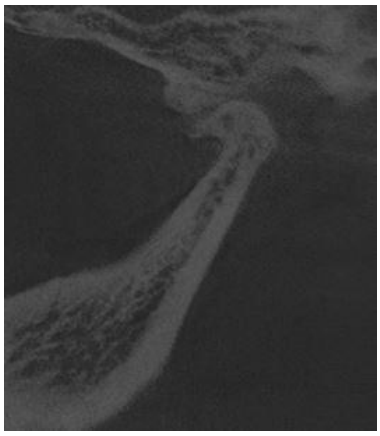
Sagittal Sections

Left TMJ

(Irregular radiopaque projections on medial surface)



Right TMJ

(Sloping of condylar head)

Discussion

The temporomandibular joint (TMJ) is a diarthrodial, ginglymoid joint which plays an important role in speech and mastication and is often susceptible to injury. The bony components like the condyle and the glenoid fossa and their associated fibrocartilage articular surfaces; the articular disk and the synovial lining of the superior and inferior joint space are the structures that can be damaged. The most common injury is the Condylar fracture constituting of around 25% of all mandibular fractures. Functionally limited mouth opening and excursive movements, deviation of mandible on opening to the fracture side, malocclusion, cross bite on the fracture side, supra eruption of the teeth on the opposite side and shorter lower facial third on the fracture side are seen.[3] Facial asymmetry, malocclusion, growth disturbance, (post traumatic arthritic changes) osteoarthritis and ankyloses are the late complications.

Any trauma to the mandible producing condylar fractures, sub condylar fractures, other mandibular fractures, or no fractures can be one of the initiating factors of osteoarthritis. Trauma to the mandible can induce an acute joint effusion, acute synovitis in patients who had mandibular fractures not directly involving the condyles. [4] 9 to 85% of patients with condylar fractures resulted in degenerative disease of the TMJ. [5] One study reports 40% of the patients were diagnosed with degenerative changes in the temporomandibular joint apparatus with or without mandible fractures within a duration of 6 months of trauma[6]

The diagnosis of condylar fractures is radiographically done by using PA view mandible, OPG etc. CT scan of temporomandibular joint allows precise evaluation of bony injury to the joint structures, MRI is a simple, non-invasive technique to image the nature of condylar structure and the soft tissue component of TMJ, more effectively than plain radiographs.[7] More recently CBCT has been found to be as accurate as computed tomography (CT) and also requires less radiation exposure. CBCT can provide a lot of information about osseous changes including displacement of the fractured segment and other late osteoarthritic changes like erosion, flattening, subchondral bone sclerosis, ankylosis and pseudocysts.[8]as in our first two cases where we can see altered morphology of the TMJ apparatus

Pain in the masticatory muscles and TMJ are among the commonest complaints of patients with Temperomandibular joint disorders[9]. Schwartz in 1959 described myofascial pain dysfunction syndrome (MPDS) as characterised by clicking, muscle tenderness, pain in the TMJ region and restricted mouth opening[10]. Presently, myofascial pain can be defined as “a regional myogenous pain condition characterised by local areas of firm, hypersensitive bands of muscle tissue known as trigger points” [11] The contributing factors for MPDS includes neurogenic, psychogenic and musculoskeletal, thus the role of conventional imaging modalities in the diagnosis of MPDS is limited.

A thorough clinical examination is the most reliable way to diagnose MPDS with imaging investigations

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assisting in ruling out other causative factors. OPG, CT and CBCT are useful in imaging bony articular surfaces for erosions and changes in the joint spaces. Miniscule osteo-degenerative changes in the head of the condyle and the TMJ apparatus is better appreciated in the CT and CBCT compared to OPG. MRI is the best modality for imaging the disc, capsule and TM joint ligaments. These imaging techniques are useful to rule out other contributing factors to the patient's pain like internal derangement and osteo-degenerative disorders. However, these features may often overlap with myofascial pain, often adding to confusion in diagnosis. MPDS in some patients specially with recurrences and remissions might result in TMJ Arthrosis, in such cases CBCT finding shows erosions and craters in the head of the condyle and increased joint space [9]as seen in our 3rd case where erosion and flattening of the head of the condyle was evident.

Osteoarthritis is an aging phenomenon, everyone older than 50 years of age is affected by osteoarthritis to some extent.[12] TMJ osteoarthritis is said to be found in 40% of older adults at microscopic and 14% at radiographic levels[12], however recent research has identified osteoarthritis in a majority of young patients with joint pain and dysfunction.[13]It was found that disc displacement with reduction which is a highly prevalent usually manifests without clinical symptoms unless pain occurs with noises or functional limitations, is likely to progress to osteoarthritis.[14]

It was found that degenerative condylar changes were seen more in patients with painful TMJ as compared to asymptomatic individuals. Flattening in 73.3% followed by osteophyte in 43.3% was thought to be the most frequent joint degenerative changes in symptomatic group, however in another study it was reported that sclerosis (30.2%) and surface erosion (29.3%) were the most frequent bony changes. It was noted that a combination of physiologic and degenerative changes may precipitate bony changes in TMJ, flattening and subchondral sclerosis were considered as physiologic remodelling, while condylar erosions and osteophyte formation as active degeneration. [8]

Conclusion

CBCT has a better diagnostic accuracy compared to other imaging modalities for the evaluation of bony changes in the TMJ apparatus in patients with Trauma, Degenerative joint disorders and also in disorders like recurrent MPDS with minute bony changes. However, the diagnostic information will be restricted to the osseous components of the TMJ and for soft tissue evaluation MRI is the imaging modality of choice.

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