

# Diagnostic Imaging in TMJ Osteoarthritis: A Case Report and Overview

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Received March 18, 2015; Revised April 11, 2015; Accepted April 23, 2015

**Abstract** Osteoarthritis is the most common degenerative joint disease affecting human body and most of this disability is attributable to the involvement of hips or knees. In rare instances, it can influence the temporomandibular joint. Osteoarthritis is strongly associated with ageing. Sometimes, patients may display signs and symptoms of osteoarthritic disease with no radiologic evidence of any joint pathology or vice versa. The diagnosis is essentially based on clinical and radiological examination. However, laboratory tests and radiographic examination are also useful to exclude other temporomandibular joint diseases. Erosion, sclerosis, flattening, osteophytes, joint mice and Ely's cysts were some of the radiographic findings in the present case. CT is the imaging modality of choice for evaluating bone involvement and for diagnosing and establishing the degree of the disease, which was performed in the present case. Here we present a rare and a characteristic case of osteoarthritis of the temporomandibular joint diseases.

**Keywords:** temporomandibular joint, osteoarthritis, computed tomography, osteophyte, condyle

**Cite This Article:** Prasannasrinivas Deshpande, Karthikeya Patil, Mahima V. Guledgud, and Reema Sharon D'souza, "Diagnostic Imaging in TMJ Osteoarthritis: A Case Report and Overview." *International Journal of Dental Sciences and Research*, vol. 3, no. 3 (2015): 56-59. doi: 10.12691/ijdsr-3-3-4.

## 1. Introduction

Osteoarthritis is a chronic non-inflammatory degenerative condition of joints [1] also known as degenerative joint disease, degenerative arthritis or osteoarthrosis, reflects both the non-inflammatory and inflammatory changes that may take place in the temporomandibular joint (TMJ). The word 'osteoarthritis' originated from the Greek word "osteo" meaning "bone", "arthro" meaning "joint" and "itis" meaning "inflammation". [2] Although the "itis" in the term osteoarthritis is a misnomer, as inflammation is not a conspicuous feature as seen in rheumatoid or autoimmune types of arthritis. Some clinicians term this condition as osteoarthrosis to denote the lack of inflammatory response. [2] Osteoarthritis is estimated to be the fourth leading cause of disability and leading cause of pain worldwide. [3] It is defined pathologically and radiologically by reduced joint spaces secondary to loss of cartilage due to sclerosis of subchondral bone and osteophyte formation. [4] It is seen commonly affecting the knee and hips [3] It is one of the most common forms of arthritis affecting the TMJ. [5] However, the prevalence of Osteoarthritis is only 10 -17% in patients with TMJ pain. [6] The incidence increases with age and generally affects women more commonly than men [3].

We report a rare case of primary osteoarthritis affecting the left TMJ with characteristic clinical and radiological findings in an elderly female patient.

## 2. Case Report

A 70 year old female patient reported with a chief complaint of pain in left TMJ region since 1 year. The pain was insidious in onset, moderate in intensity, aggravated on chewing food and during excessive mouth opening. There was no history of associated toothache, trauma, swelling, episode of dislocation, paresthesia, neurological deficit or deficient hearing. There was history of associated clicking in the TMJ and also pain in knee joints and slip disc in lumbar region of spine since 5 years. The patient's medical and family histories were insignificant. Patient had no parafunctional or deleterious habits.

General physical examination revealed a well built and nourished patient with vital signs within normal limits. The regional lymph nodes were non-palpable.

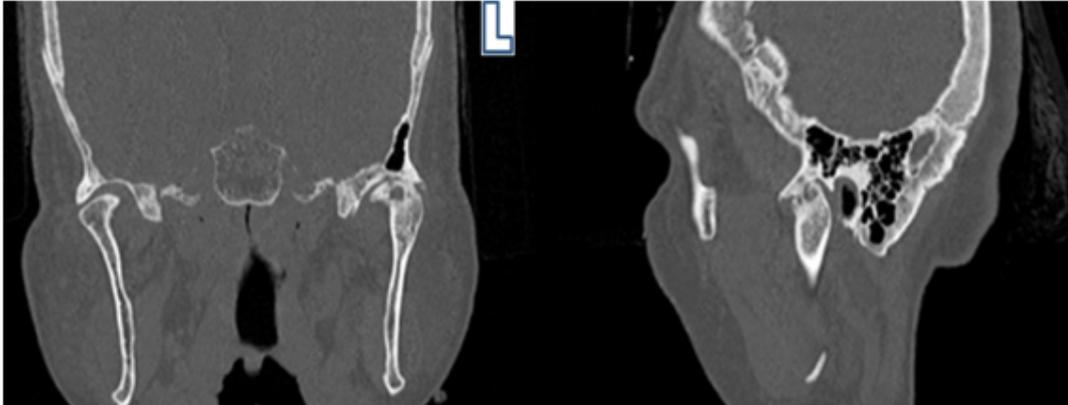
Extra-oral examination revealed no gross facial asymmetry or mandibular deviation. The mandibular protrusive and lateral excursive movements were slightly restricted and accompanied by moderate pain. The maximal mouth opening measured was 41 mm. Bilateral condylar movements were palpable with moderate tenderness present on the left side of TMJ while opening the mouth. A grating sound was elicited during functional jaw movements on left TMJ, however on auscultation grating sound was detected bilaterally. Muscles of mastication were non-tender. Intra-oral examination revealed missing 36, generalized moderate attrition,

moderately compromised periodontal condition with no occlusal derangement on the left and right side.

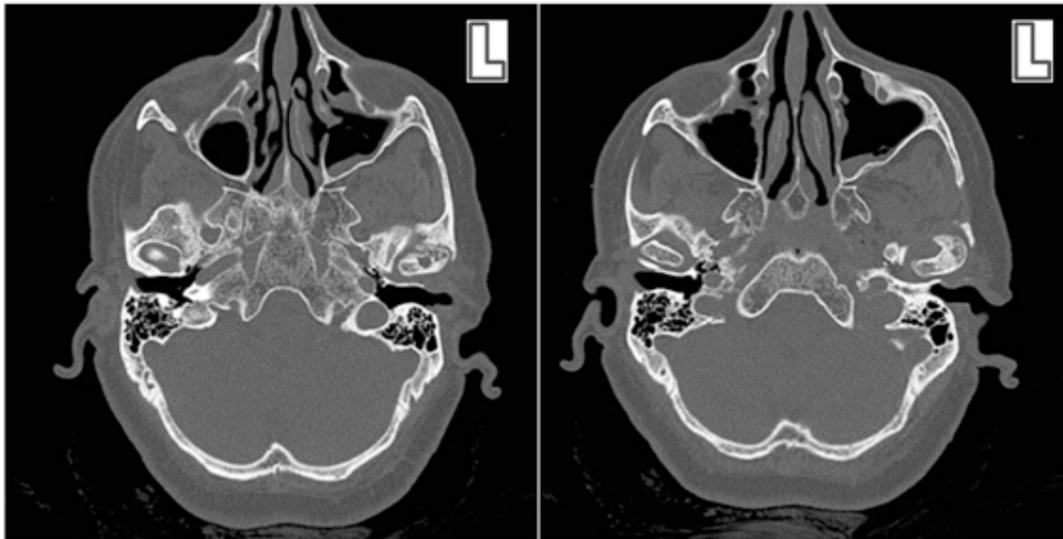
Based on the history and clinical examination a provisional diagnosis of Osteoarthritis of the TMJ was made with differential diagnosis list including Rheumatoid arthritis, Gouty arthritis, Septic arthritis,

Tubercular & Syphilitic arthritis of left TMJ were considered.

A screening panoramic view showed reduced joint space on the left side of TMJ with irregular superficial resorption of condylar head and loss of joint architecture on the left side compared to right.



**Figure 1.** A and B – Computed Tomography – Coronal and Sagittal views of left joint showing reduced joint space, erosion of condyle head with loss of shape, osteophyte formation and sclerosis of articular eminence. Ely's cyst is evident in both the views. Erosion of the articulating surface on lateral and anterior aspects with complete obliteration of joint space



**Figure 2.** A and B – Computed Tomography - Axial view showing erosion and loss of structure on antero-medial aspect of the condyle.



**Figure 3.** Computed Tomography – Sagittal view of TMJ showing free floating calcified body in the anterior joint space often known as 'joint mouse'

Computed tomography (CT) of TMJ in coronal, sagittal and axial sections showed evidence of reduction of joint space in left side. Condyle showed advanced erosion of

head with flattening and osteophyte formation on lateral aspects. Further evidence of moderate shape loss with sclerosis of articular eminence was noted. Multiple subcortical cysts, also known as Ely's cysts in condylar process and loose floating body within joint space known as 'joint mouse' was evident in left TMJ. No pathology was noted on the right side of condyle. The radiological findings were suggestive of osteoarthritis of left TMJ (Figure 1A, Figure 1B, Figure 2A, Figure 2B and Figure 3)

The blood uric acid level was within normal limits (4.1mg/dl) and test for Rheumatoid Arthritis was negative. Tuberculin and VDRL tests were also negative. Patient refused to undergo any further investigations which were advised.

Hence she was referred to a rheumatologist for evaluation of other musculoskeletal symptoms in the body and was also diagnosed with osteoarthritis affecting other joints. She was advised physiotherapy and non steroidal anti-inflammatory drugs (aceclofenac and paracetamol). For TMJ osteoarthritis, she was advised soft diet,

limitation of jaw function and use of a bite appliance. Following treatment, patient gained relief and is currently under follow up. Patient has not reported with any fresh complaints of pain till date.

### 3. Discussion

Osteoarthritis (OA) is a chronic degenerative disorder of the weight bearing joints like hips, knees, feet, spine and hands mostly seen in the elderly females. [3] This common joint disease has prevalence of 22% to 39% in India. [7] Osteoarthritis with no known cause is referred to as primary osteoarthritis, which is mostly related to aging. [7] Primary osteoarthritis can be localized, generalized or erosive. Secondary osteoarthritis is caused by underlying disease or condition like previous inflammatory arthritis or joint infections, avascular necrosis, intra-articular fracture, gout, metabolic or endocrine disorders like hemochromatosis, Wilson's disease, diabetes, acromegaly, hyperparathyroidism, congenital anomalies etc. [4] The present case had no history of previous joint inflammation or medical conditions, ruling out secondary osteoarthritis.

Abnormal stress distribution on articular surfaces due to occlusal imbalance causes functional impairment of the TMJ's leading to osteoarthritis [8,9] which was not seen in the present case. Patients may experience stiffness in the TMJ on waking up in the morning, severe joint pain both during functional jaw movements and at rest in all directions, limited mouth opening, pain in masticatory muscles, muscle fatigue, reduced range of movements, joint noise, particularly grating or grinding. [10] Crepitations with or without clicking may be present on jaw movement [11].

The degenerative process in joint is the effect of free radicals and cytokines like interleukin-1b and TNF-  $\alpha$  which activate the protease receptors and subsequently lead to cartilage erosion, osteophyte formation, sclerotization of subchondral bone and disc perforation in severe cases [10].

Elevated levels of pyridinoline (Pyr) and deoxypyridinoline (Dpyr) collagen cross-links in urine samples, are known markers of bone and cartilage turnover in osteoarthritis of the TMJ [11].

Sometimes, patients may display signs and symptoms of severe osteoarthritic disease with no radiologic evidence of any joint pathology or vice versa. [10,12] Radiographically, structural bony changes of the contours of the articular surfaces with moderate shape loss and severe sclerosis is noted. [13] Osteoarthritic bony changes include flattening, sclerosis, erosion or resorption of condylar head, osteophytes formation which later lead to development of subchondral cysts named Ely's cysts, [1] [13] erosion of mandibular fossa, reduced joint space, [14] biochemical and morphological alterations of the synovial membrane and joint capsule. [7] A piece of loose cartilage and bone floating medial to the joint space, known as "joint mice" can be noted. [15] The present case showed no evidence of resorption of mandibular fossa. If there is significant amount of bone loss, the posterior teeth begin to contact heavily. These teeth act as fulcrum by which the mandible rotates, collapsing posteriorly and opening anteriorly resulting in an anterior open bite. [8] Although significant condylar resorption was noted in the present case, there was no anterior open bite.

When osteoarthritis involves extremities, locomotor disability is noted. In hands bony lumps often develop at the ends of their fingers called 'Heberden's nodes'. However, such a finding was not seen in the present case [1].

KE Alexiou et al described a four point rating scale to describe the severity of erosion in the condylar head as follows: [14]

0: absence of erosion

1: slight erosion, when decreased density is observed only in the cortical bone

2: moderate erosion, when decreased density is observed only in the cortical bone and extends to the upper layers of the adjacent bone

3: extensive erosion, when decreased density is observed in the cortical bone and extends below the upper layers of the adjacent subcortical bone

A four point rating scale was also used to identify the severity of osteophyte formation in the condylar head as follows

0: absence

1: slight, when marginal bony outgrowth on the condyle was less than 1 mm

2: moderate, when marginal bony outgrowth on the condyle was less than 1-2mm

3: extensive, when marginal bony outgrowth on the condyle was more than 2 mm

Osseous changes of the mandibular fossa were described as

1: erosion

2: sclerosis

3: resorption

Joint space was described as: (1) increased, when the distance between the condylar head and mandibular fossa was more than 4mm; (2) normal, when the distance between the condylar head was between 1.5 – 4mm (3) reduced, when the distance between the condylar head was less than 1.5mm (4) bony contact between condylar head and mandibular fossa. All the above measurements were performed subjectively on the lateral slices at the closest distance between condyle and mandibular fossa using Cone Beam Computed Tomography (CBCT) software [14].

The TMJ degenerative disorders do not differ physiologically or histologically from those seen in the weight bearing or other body joints wherein there is an initial phase of cell proliferation and increased metabolic activity in which active repair of joint takes place. Following this is progressive collagen destruction and loss of cartilage, which gradually begins to show fissures. This disappearance of the cartilage leaves the underlying bone at the joint surface [16].

The diagnosis of OA may be a diagnostic challenge as numerous TMJ pathologies can mimic similar clinical features. Diagnosis of osteoarthritis solely depends on radiographic findings. [16] Various imaging modalities like orthopantomogram, transpharyngeal, transcranial, conventional tomography, computed tomography, MRI, cone beam computed tomography are considered to appreciate the various changes in TMJ and render a diagnosis of osteoarthritis [17].

According to Meng JH et al, transcranial projection was found to be inferior compared to panoramic radiography, transpharyngeal and CBCT [18].

Panoramic and conventional radiographs may identify irregular TMJ changes, but are limited in diagnosis, because of the anatomical superposition that prevents accurate view of the bone components. Orthopantomograph as a screening radiograph was taken in the present case which showed degenerative changes in the left TMJ. However, finer details can be assessed in 3 dimensional imaging like CT and CBCT. CBCT has been considered as an alternative imaging modality for the diagnosis of degenerative changes of the TMJ, with its lower radiation dose being the major advantage over CT.

The recently revised Research Diagnostic Criteria for Temporomandibular Joint disorders include image analysis criteria for various imaging modalities. It was reported that computed tomography has the best positive percentage agreement for the diagnosis of TMJ OA. In accordance with these guidelines, 42.6% of Temporomandibular Disorders patients presented with tomographic evidence of TMJ OA changes with bone erosions and osteophytes. Group III of axis I of this classification includes the subcategory osteoarthritis. [18] All these criteria's were almost satisfied in the CT images of present case.

MRI (Magnetic resonance imaging) is an excellent diagnostic tool for changes in the synovial membrane and articular cartilage which are vital in diagnosis of diseases affecting these soft tissues in joints like rheumatoid arthritis.

Erosions of the condyles are present in Rheumatoid arthritis, Gouty arthritis, Psoriatic arthritis, septic, tubercular and syphilitic arthritis. Serological tests were negative for the above mentioned conditions in present case, hence were ruled out. Contemplating over the differential diagnosis considered in this case, extensive investigations for which the patient consented were carried out. Alongside, a detailed history, thorough general and local clinical examination and further consultation from rheumatologist for other joint symptoms along with TMJ, a final diagnosis of osteoarthritis was made.

Management options for TMJ osteoarthritis include reassurance, soft diet, [12] occlusal equilibration with occlusal splint therapy for alteration of behavioral pattern, [11] physiotherapy, [19,20] NSAIDs to alleviate pain, injection of corticosteroids and surgical modalities. Stabilization splints are usually preferred to reduce the loading force to the condyle and to protect the condyle from further resorption, [17] hence patient was advised to wear occlusal splints. Diclofenac sodium when compared with occlusal appliances showed a similar pain reduction. Glucosamine has also been used in the management of TMJ OA and has been found to be just as effective as ibuprofen. [21] No single modality is known to completely alleviate pain in such conditions.

#### 4. Conclusion

Osteoarthritis is a rarity in general dental practice. However, it can be routinely encountered in specialized oral medicine and oral surgery practice. Oral health care practitioners should have thorough knowledge as most temporomandibular disorders have a narrow spectrum of clinical features with overlapping signs and symptoms. Extensive diagnostic work up is pivotal to render early and appropriate treatment to avert functional tribulations and enhance the standard of living in affected individuals.

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