Clinical and CT Scan Evaluation of Temporomandibular Joints with Osteoarthritis and Rheumatoid Arthritis

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ABSTRACT
Temporomandibular joint disorders refer to a complex and poorly understood set of conditions, manifested by pain in the area of jaw and associated muscles, and limitations in the ability to make normal movements like mastication, speech and swallowing. Arthritis as it affects other joints also affects temporomandibular joint (TMJ). The present study was undertaken to study the clinical aspects of patients with osteoarthritis and rheumatoid arthritis of TMJ supplemented by CT scan of joints to study the radiological changes and to find out if there was any correlation between them.

Keywords: Temporomandibular joint arthritis, Osteoarthritis, Rheumatoid arthritis.

INTRODUCTION
The craniomandibular articulation is a complex synovial system composed of two temporomandibular joints together with their articular ligaments and masticatory muscles. It is structurally the most complex synovial system in the body. The articulation is subject to ills that afflict other synovial joints as well as few that relate specifically to masticatory function.1 Temporomandibular disorder is an umbrella term under which multiple disorders are grouped.2 This study is based on the group “inflammatory disorders of the joint” and specifically on patients with rheumatoid arthritis and osteoarthritis involving temporomandibular (TMJ).

Arthritis means any inflammatory condition of the joint.3 Osteoarthritis (OA) represents a destructive process by which the bony particular surfaces of condyle and fossa become altered. It is generally considered to be body’s response to increasing loading of a joint. Osseous changes involving the condyle and temporal bone occur as squeal of disk displacement, frequently with longstanding disk displacement without reduction. The discrepancy that occurs between findings obtained by imaging and patient symptomatology highlights the need for effective clinical examination in determining which finding is significant.4

On the other hand, rheumatoid arthritis (RA) is an inflammation of synovial membranes that extends into surrounding connective tissues and articular surfaces. With damage to the joint tissues, several osseous changes can occur in the joint.5 It can cause painful symptoms of joint and surrounding structures and cause destruction of the temporomandibular articular surfaces if not evaluated and treated in time. Early intervention can reduce the severity of disease.

Computed tomography (CT) from its introduction in 1970s has evolved into an important diagnostic tool in the field of radiology. Its capacity to define osseous details without superimposition has made it superior to other imaging modalities like conventional radiology, tomography and MRI. It is of great help in three-dimensional imaging of the bony structures.5 The best application of CT of TMJ is a high-resolution examination of osseous abnormalities.6

This study was undertaken to clinically evaluate in depth, patients with signs and symptoms of osteoarthritis and rheumatoid arthritis of TMJ. This was complimented with CT scan to get in depth information on osseous changes that have occurred due to disease process.

AIMS AND OBJECTIVES
The study was carried out to evaluate patients with temporomandibular joint osteoarthritis and rheumatoid arthritis clinically and radiologically using computed tomography and to compare their findings.

The study was conducted on 25 patients with clinical signs and symptoms of TMJ arthritis. The patient sample was selected from the OPD of the Department of Oral Medicine and Radiology, Sharad Pawar Dental College and Hospital, Department of Orthopedics, AVBRH. The CT scan images were obtained from the Department of Radiology, ABVRH, Sawangi (M), Wardha.

For the selection of patients (15 patients with osteoarthritis and 10 patients with rheumatoid arthritis), following criteria were considered.

INCLUSION CRITERIA
The clinical inclusion criteria for the study group were assessed on following clinical characteristics, which were/are modification of those originally described by Okeson.2 Patients with TMJ pain at the preauricular region during mandibular movement, tenderness on palpation on one or both TMJ, history of joint sounds such as clicking or crepitus either in one joint or both the joints, limitation of mouth opening and presenting with deviation/deflection of the mandible on opening or closing were included in the study.
EXCLUSION CRITERIA
Patients having clinical evidence of internal derangement but with no radiographic evidence of arthritis, Myofacial Pain Dysfunction Syndrome, TMJ ankylosis were not included in the study. Also patients with known history of cervical spondylitis and pregnant females were not included in the study.

Then they were subjected to detailed case history and examination.

The patients were classified as painful or painless by self-reported TMJ pain during function. Pain scores were recorded according to their severity ranging from 0-III for the absence to severe pain respectively.

A detailed examination of TMJ was carried out that included range of mouth opening, tenderness of joint, clicking, crepitus, deviation and deflection. All the muscles of mastication were palpated for tenderness, and positive findings were noted down.

INTRAORAL EXAMINATION
Detailed examination was done with special relevance to missing teeth, mobility in teeth, attrition, abrasions, dental occlusion suggestive of parafunctional habits. Prosthetic rehabilitation if any in the oral cavity was also assessed.

RADIOGRAPHIC EXAMINATION
Prior consent was obtained from each patient to undergo radiographic examination. Conventional radiographic examination was done using orthopantomograph and right and left transcranial projections to screen the patients.

Bilateral temporomandibular joint CT scans were obtained for all 25 patients. CT scanning was carried out in direct axial and coronal planes with contiguous slice thickness of 1 mm using bone window (Figs 1A to 2B). The scans were carried out on TOSHIBA Xvision GX spiral single slice CT scanner, Department of Radiology, AVBRH at 120 kV and 200 mA with acquisition time of 1 second.

All CT scans were evaluated in details. Each condyle and glenoid fossa was evaluated for changes like erosion, flattening, sclerosis, osteophyte formation, and subchondral cyst formation. Changes in joint space were also recorded.

The clinical data thereafter was correlated with the CT scan findings for each joint and subjected to statistical evaluation.

RESULTS, OBSERVATION AND DISCUSSION
The present study was conducted on 25 patients with clinically diagnosed TMJ arthritis, which included 15 patients with osteoarthritis and 10 patients with rheumatoid arthritis in an attempt to correlate clinical evaluation with CT evaluation of TMJs in these patients. The clinical symptoms included pain, tenderness, clicking, crepitus and deviation (Graph 1).

Mean age of 25 patients was 51.46 years. Mean age of the patients with osteoarthritis was 48.73 ±14.07 years. Troller PA concluded that osteoarthritis of mandibular condyle occurs after 42 years of age.7 In a radiographic study of TMJ in young patients, Wiberg B and Wanman A8 indicated osteoarthritis a result of TMJ pathosis. These results suggest that the occurrence of TMJ osteoarthritis in the present study is age related and not due to TMJ pathosis.

The mean age for (54.2 ± 7.62 years) in our study was on a higher side as compared to other studies by Ardic F et al (45.3 ± 13.5 years),9 Voog U et al (41 years)10 and Gynther G, Tronje G (44 years).11

The female to male ratio of the study group for osteoarthritis was 3.16:1 and that for rheumatoid arthritis was 4:1. Thus, the findings suggest that in both osteoarthritis and rheumatoid arthritis, there is a marked predilection for females. This predilection is more in patients with rheumatoid arthritis. These findings were
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comparable with previous studies by Wiber B and Wanman A, Ardic F et al, Emshoff R, Gynther G and Tronje G.

In the patient with osteoarthritis, the mean duration of disease process and TMJ symptoms was found to be 3.36 years. It generally involves a single joint whereas in rheumatoid arthritis, multiple joints of the body are commonly affected, TMJ being the last joint to be involved. In the present study in patients with rheumatoid arthritis, the mean duration of general disease was found to be 11.2 years while the duration of TMJ symptoms was found to be 1.7 years. These findings are similar to findings of Voog U, et al. One of the probable reasons might be that the patients with rheumatoid arthritis are mostly under long-term drug treatment for their general disease status. Though, when involvement of TMJ occurs, there is a rapid bone involvement in a short duration of time. Whereas in patients with osteoarthritis, the duration of symptoms is more, radiological bone involvement is slow and not that severe.

Thus, in patients with osteoarthritis, the disease was restricted to TMJ only and in patients with rheumatoid arthritis, there is late involvement of the temporomandibular joint.

In patients with osteoarthritis, decreased mouth opening was seen (86.66%). Average mouth opening was 31.4 mm. While in patients with rheumatoid arthritis also, decreased mouth opening was seen (60%). Average mouth opening was found to be 38.2 mm. Mouth opening was reduced in both patients with osteoarthritis and rheumatoid arthritis though the reduction was found to be more in patients with osteoarthritis. Reduced mouth opening has been observed in several studies of rheumatoid arthritis.

In patients with osteoarthritis, pain was mild (13.33%), moderate (20%), severe in (6.66%) and absent (60%). In patients with rheumatoid arthritis, pain was mild (30%), moderate joints (30%) and absent (40%).

In patients with osteoarthritis, unilateral involvement was more therefore the numbers of painful joints on function were more as compared to the joints with rheumatoid arthritis. Severe pain scores were only seen in patients with osteoarthritis.

In patients with osteoarthritis, those patients who had pain on mandibular function also had tenderness in the joints with same pain scores. While in the rheumatoid group, joint tenderness was more as compared to joints pain on function.

In patients with osteoarthritis, the most common clinical finding was joint crepitus (46%). Presence of crepitus differentiates patients with TMJ arthritis from patients with masticatory muscle disorders. It also indicates a morphological change in condyle and also suggests irreversible damage.

In patients with rheumatoid arthritis, joint crepitus was the second most common finding (65%). In a study by Franks A, joint crepitus was found in 63% of the cases. The present study showed similar findings.

The most common finding in patients with rheumatoid arthritis was joint tenderness (70%) followed by joint crepitus (65%) and pain on mandibular function (60%) and decrease in mouth opening. The most characteristic clinical signs of rheumatoid arthritis are palpatory tenderness of the joint and crepitus. In patients with
rheumatoid arthritis, we found a decreased range of motion in patients with joint tenderness similar to a study by Ardic F et al.16

In patient with osteoarthritis, joint pain or tenderness was the second most common finding in contrast to a study by Troller PA in which it was a primary finding.7 There is higher prevalence of joint pain in patients with TMJ osteoarthritis and this may be due to secondary inflammation of capsular tissue.17

The CT scans were then evaluated in patients with osteoarthritis (Figs 1A and B) and rheumatoid arthritis (Figs 2A and B) for erosion, sclerosis, flattening, osteophyte formation, subchondral cyst formation and joint space reduction (Graph 2). In the present study in patients with osteoarthritis, the most common finding was flattening (43.33%) similar to findings by Gynther G and Tronje G in their study on generalized osteoarthritis found flattening in 40% of cases, sclerosis in 35% of cases and osteophyte formation in 55% of joints. These findings are consistent with the findings of our study except for osteophyte formation that was found in 26.6% in this present study.13 Erosive lesions may indicate acute of early changes whereas flattening and osteophyte formation may indicate late changes in TMJ.8 Sclerosis and flattening reflect a stage of bone repair.18

Troller PA in his study found erosion in 93.3% and osteophyte formation 21% of the cases of osteoarthritis. Similar findings with regard to osteophyte formation(26.6%) were found in the present study while erosion was found in lower percentage (40%).7

In the present study in patients with rheumatoid arthritis, abnormal findings were found in 85% of CT scans. Predominant finding was erosion of condyle (85%) followed by condylar sclerosis similar to study by Ardic F et al,9 Voog U et al,19 Goupille et al,9 Gynther G, and Tronge G.13 Sclerosis is a sign of healing of joint in contrast to erosion, which indicated active bone disease. These findings are consistent with our findings except for subchondral cyst, which was seen in only 10% of the cases.

In this study in patients with osteoarthritis, the most commonly involved condylar surface was the anterior aspect, including the anterior, anteromedial and anterolateral surface of condyle. Osteophytes were mainly seen on the medial aspect which might be attributed to the plane of evaluation. While in patients with rheumatoid arthritis, the superior aspect of condyle including the superior, superomedial and superolateral surface showed more radiological involvement. Osteoarthritic change is more frequently observed in area of anterosuperior part of the mandibular condyle and this may be attributed to a close relationship between condylar osteoarthritic changes and loading during joint function.17 Erosion of condyle was predominantly found on the anterior surface followed by superior surface and posterior surface.7

In the present study, the condyle was predominantly affected in both patients with osteoarthritis and rheumatoid arthritis while the glenoid fossa was involved seen primarily only in cases of rheumatoid arthritis. The predominant finding was central erosion of the glenoid fossa. Gynther GW and Tronje G also in their study found radiographic changes primarily located in the condyle in patients with generalized osteoarthritis and rheumatoid arthritis.13 Overall in the study correlating the clinical and radiological involvement (Graph 3), positive CT findings were seen in 85% of joints with osteoarthritis and 88.8% of joints with rheumatoid arthritis. 50% of asymptomatic joints in both osteoarthritis and rheumatoid arthritis also showed positive CT scan findings. Radiographic changes were not seen in few cases of asymptomatic patients with osteoarthritis and rheumatoid arthrits.

Brooks S et al studied the prevalence of osseous changes in TMJ of 34 asymptomatic people without internal derangement using tomography and they found minimal flattening of the condyle in 35% cases.20 Similar findings were found in the present study. In our study, unilateral clinical and radiological involvement (33.33%) was most commonly seen affecting predominantly the right side while symmetric bilateral involvement (60%) was most commonly seen in patients with rheumatoid arthritis. Previous studies show symmetric bilateral TMJ involvement to be most common in cases of rheumatoid arthritis.19 Bilateral involvement and abnormalities like erosion and subcondylar cyst are suggestive of rheumatoid arthritis radiologically.19

In this study, severity of pain scores on mandibular in function and on joint palpation in both osteoarthritis and rheumatoid arthritis were similar. Joint tenderness was seen in few cases more in patients with rheumatoid arthritis while severe pain scores were found only in osteoarthritis. Pain on mandibular function might
be related to degenerative changes that occur at the articular surface of the condyle, since it is exposed to increased loading during mandibular function, while joint pain on lateral palpation may be a result of pathological changes at the lateral part of the condyle. These findings suggest a risk of increase in TMJ pain with radiological involvement in osteoarthritis.

Osseous changes are most likely found in patients who present with joint crepitus. When crepitus is present, irreversible degenerative change is likely to take place.

SUMMARY AND CONCLUSION

The prevalence of temporomandibular joint osteoarthritis and rheumatoid arthritis was higher in age range of 41 to 50 years. Females were predominantly affected in patients with osteoarthritis and rheumatoid arthritis. Temporomandibular joint involvement is late in patients with rheumatoid arthritis as compared to other joints of the body. Joint crepitus was the most commonly found manifestation in patients with osteoarthritis while in patients with rheumatoid arthritis joint tenderness was most common. Flattening of the condyle was the most common manifestation in patients with osteoarthritis while erosion of the condyle was predominantly seen in patients with rheumatoid arthritis. The right joint was more commonly involved clinically and radiologically in patients with osteoarthritis while bilateral clinical and radiological involvement was mostly seen in patients with rheumatoid arthritis. Asymptomatic joints may also show radiological changes in the form of flattening of the condyle in patients with unilateral osteoarthritis and rheumatoid arthritis. Whereas unilateral joints in symptomatic patients in temporomandibular joint arthritic cases may show no radiological changes on CT evaluation.

In conclusion from this study, positive correlation can be made between clinical findings like pain on mandibular function, tenderness, crepitus and reduced mouth opening with radiological changes seen on CT scan. One of the drawbacks of the study is that sagittal CT scan sections were not taken due to technical constraints that could have affected the detection of prevalence of osseous abnormality. Secondly soft tissue changes and early bone changes cannot be well appreciated by CT scan that is better visualized on MRI. Also as the CT scan procedure is expensive, the sample size was restricted. A further study examining a group of patients with osteoarthritis, rheumatoid arthritis and asymptomatic volunteers using both CT scan and MRI in a larger sample using similar clinical and radiological parameters needs to be conducted.

REFERENCES


