

## Temporomandibular Joint Involvement in Rheumatoid Arthritis

### Relationship with Disease Activity

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Involvement of temporomandibular joint (TMJ) in rheumatoid arthritis (RA) patients is described, but the incidence varies greatly. In this study our aim was to determine the frequency and character of TMJ involvement in RA patients asymptomatic for this joint, to investigate the relationship with disease activity, and to evaluate the early diagnostic value of imaging techniques. Twenty patients were included in this study, ten were evaluated with computed tomography (CT) and ten with magnetic resonance imaging (MRI). Among the 20 patients 45% had TMJ involvement detected by imaging techniques. The most frequent pathological signs were osteophyte formation, erosion of the mandibular condyle and decreased joint space (40%). Age, duration of disease, number of swollen joints, CRP and RF levels were found to be correlated with TMJ involvement. It is concluded that TMJ involvement may be detected even in asymptomatic patients with RA and there is a positive correlation between the severity of disease and involvement of TMJ.

**Key words:** rheumatoid arthritis, temporomandibular joint, computed tomography, magnetic resonance imaging

Rheumatoid arthritis (RA) is a systemic disease of inflammatory nature. The disease may involve any joint of the body, but often starts in the peripheral joints. Abnormalities of the temporomandibular joint (TMJ) in patients with RA are well recognized, but their incidence as reported in the literature varies greatly, from 5 to 86 per cent(1). This variation might be due to different types of examination, the selection of patients and the use of different criteria for classifying the joint. The most commonly reported symptoms include pain, swelling, crepitus, stiffness on opening mouth and limitation of movement (1–4).

Radiologic examination of the TMJ is difficult owing to the location and the relation to the other cranial structure. The usual radiographic findings in the joint are erosion and flattening of the condylar head, limitation of mobility and flattening of articular eminentia, but these abnormalities are not characteristic for RA (1,2,4). The TMJ symptoms occurring in patients with RA have been reported to depend on the severity and duration of the systemic disease(3,5).

More recently the noninvasive imaging techniques of computed tomography (CT) and magnetic resonance imaging (MRI) have been used to clarify the anatomy of the TMJ (6–8).

The aim of this study was to determine the frequency and character of TMJ involvement in asymptomatic RA patients, to investigate any relationship be-

tween disease activity and TMJ involvement, and to evaluate the early diagnostic value of CT and MRI.

### Material and Methods

Twenty patients with RA based on the criteria of American Rheumatism Association were included in the study. Patients were selected consecutively among RA patients referred to our out-patient clinic for diagnostic examination and treatment. Our series consisted of eighteen female and two male patients with a mean age of 48.1 years (26–68 years). The mean duration of disease was 10.1 years (2–24 years). None of the patients had symptoms of TMJ and none had severe neck pain and limitation.

Morning stiffness, number of swollen joints, Steinbrocker's functional classification and the number of slow acting antirheumatic drugs used were noted as measures of disease activity. Erythrocyte sedimentation rate (ESR), C-reactive protein (CRP) and rheumatoid factor (RF) were studied as indicators of inflammation.

All patients were asked whether they had experienced stiffness, clicking, diurnal or nocturnal pain and tenderness in the TMJ. During physical examination limitation of opening, palpable or audible clicking, deviation, and tenderness of the joint while the patient was performing the full range of mandibular movements were recorded.

Plain radiographs were taken from TMJ bilaterally in two positions, open and closed mouth. The twenty patients were divided into two groups of 10 patients each, selected at random. Ten of the patients (Group 1) underwent CT examination of the TMJ with a Philips

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Table I: Clinical and laboratory findings of rheumatoid arthritis patients

	Group 1 (n=10)	Group 2 (n=10)
Age	48.1 years	49.5 years
Disease duration	10.1 years	7.7 years
Female/Male	10/0	8/2
Functional classification	Grade 1=4 Grade 2=5 Grade 3=1	Grade 1=2 Grade 2=7 Grade 3=1
Morning stiffness	82.5 minutes	58.5 minutes
Number of swollen joints	8.6 joints	5.2 joints
DMARD use	8 patients	9 patients
Corticosteroid use	None	1 patient
ESR	38.2 mm/hr	33.6 mm/hr
CRP	15.6 mg/dl	13.4 mg/dl
RF	(+) 5 patients (-) 5 patients	(+) 6 patients (-) 4 patients

DMARD = Disease modifying antirheumatic drug

ESR = Erythrocyte sedimentation rate

CRP = C reactive protein

RF = Rheumatoid factor

350 Tomoscan (third generation). The TMJs were scanned in direct sagittal projection with the patients lying prone (9). The slice thickness was 1.5 mm. Both open and closed mouth series were obtained on each patient.

Ten patients (Group 2) underwent MRI examination of the TMJ where a Philips Gyroscan T5 model and 0.5 tesla MR imager was used. T1 and T2 weighted sagittal and axial images were obtained, then a T2 weighted dynamic study was performed. The section thickness was 3 mm.

All MR images and CT scans were examined blind by the same observer. A TMJ score established by Goupille et al (3) was used. The shape (convex, concave or flattened) and the height (normal, hypoplastic, hyperplastic) of the mandibular condyle were estimated. The presence or absence of the following features were evaluated: flattening of the articular eminence, bone demineralization, erosions and bone cysts of the mandibular condyle and articular fossa (none, 1,2 or more), condylar head resorption (none, mild, severe), mandibular fracture, decreased joint space (less than 0.5 mm), bony ankylosis, temporal or mandibular subchondral sclerosis, osteophyte formation, subluxation and calcification of the articular disk.

Correlation between the imaging scores and clinical and laboratory disease activity parameters were tested for statistical significance with Pearson's correlation matrix. The level of statistical significance was  $p < 0.05$ .

## Results

The clinical and laboratory characteristics of RA patients are given in Table I. Interview and clinical examination show an absence of symptom and signs of the TMJ. There was no statistically significant difference



Figure 1: Erosion of the mandibular condyle and osteophytosis of the TMJ on sagittal CT in RA.

between the groups according to age, clinical and laboratory parameters. TMJ score was  $1.7 \pm 1.5$  in Group 1 and  $0.3 \pm 0.6$  in Group 2.

In Group 1, investigated by CT, 7 patients (70%), in Group 2, investigated by MRI, 2 patients (20%) had different types of pathology. Among the 20 patients 45% had some TMJ abnormalities detected by CT or MRI. The most frequent pathological signs were osteophytosis (Figure 1), erosion of the mandibular condyle (Figure 1, Figure 2) and decreased joint space (40%). Three patients (15%) had subluxation of the TMJ, and one patient (5%) had articular disk calcification (Table II).

Age, duration of disease, number of swollen joints, CRP and RF levels were correlated with the TMJ score ( $p < 0.05$ ), but the correlation between TMJ scores and morning stiffness, functional classification and ESR were not statistically significant ( $p > 0.05$ ).

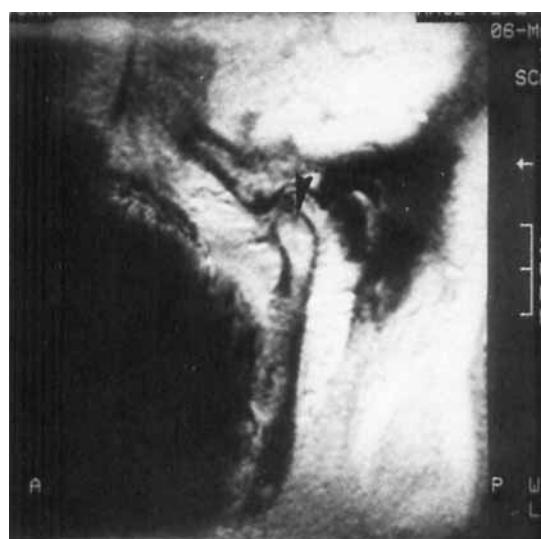


Figure 2: Erosion of the mandibular condyle of the TMJ on sagittal MRI in RA.

Table II. Frequency of pathological findings in the two groups of RA patients

	CT (n= 10) n (%)	MRI (n = 10) n (%)
Erosion of mandibular condyle	6 (60%)	2 (20%)
Osteophytosis	7 (70%)	1 (10%)
Decreased joint space	7 (70%)	1 (10%)
Subluxation	2 (20%)	1 (10%)
Articular disk calcification	1 (10%)	-

## Discussion

The incidence of TMJ involvement in RA differ widely in literature and this variation might be due to different types of examination, the selection of patients, the use of different diagnostic techniques and the criteria of involvement. TMJ complaints may be overshadowed by RA symptoms elsewhere in the body.

Many diagnostic techniques were compared in the literature. Among the direct radiographic techniques transantral examination have been found to be the preferable method for detecting arthritis of the TMJ (10). CT is reported to be very sensitive in demonstrating bone structures, especially bone erosions of the mandibular condyle (7,11–13). Direct sagittal projection provides good visualization of the anterior, superior and posterior articular surfaces of the caput mandibulae. Both the position and functioning of the condyle and the articular disk can be examined and any changes in the mandibular fossa and articular tubercle are distinguishable(9,14). Axial plane MRI of the TMJ is of relatively little value for the assessment of disk displacement and osseous changes(15). Some reports indicated that axial CT scanning is efficient for depicting subtle bony abnormalities due to RA in different parts of the TMJ(7). CT allows many projections to be used that are not available with other radiographic methods and also offers a unique opportunity in addition to MRI to visualize structures other than bone possibly affected by RA(14).

Although valuable in moderate and severe rheumatic TMJ disease, MR imaging seemed less sensitive in early involvement. Indirect signs of synovial proliferation could be shown with arthrotomography. MRI may directly depict disk destruction with soft tissue replacement in addition to bone abnormalities(16). In another study a high correlation between MRI and tomographic findings was found with respect to a normal TMJ appearance, condylar cortical destruction and osteophyte formation(6). MRI was reported to be 95% accurate in the assessment of disk position and form and 93% accurate in the assessment of osseous changes (17). MRI has been shown to possess a better capability for diagnosing the TMJ disk(6). When compared with arthrography MRI was more sensitive than the single photon emission computed tomography and pla-

nar bone scintigraphy for detection of internal derangement of the TMJ(8).

The most characteristic radiographic signs of RA in the TMJ are reduced joint space and marginal cortical erosions. Later subchondylar cystic destruction and severe destruction of the subcortical bone can lead to complete loss of condyle. The reduced joint space is caused by destruction of the articular soft tissues (3,14).

Among our 20 patients 45% had some pathological signs of TMJ involvement, seven from the CT group and two in the MRI group. The most frequent pathological signs were osteophyte formation, reduced joint space and erosion of the mandibular condyle. No obvious restriction in opening of the mouth was observed in patients with RA, and this was consistent with other reports(1,3). RA joints significantly more often revealed bony changes on tomograms, erosions were predominant and have been considered an important radiographic feature of rheumatoid involvement (3,18). In our study the pathological findings were more frequent in patients investigated by CT and these results indicate that CT is more sensitive in the assessment of early TMJ abnormalities due to RA. Evaluation of the patients with both the imaging modalities may demonstrate the difference more clearly.

In this study we have investigated indicators of disease activity and functional state in RA which might be related to the severity of involvement of the TMJ. Some authors found correlations between TMJ involvement, articular indices, and ESR which indicated that the severity of involvement of the TMJ in RA depends on the extension and activity of the joint disease (5), and showed that the intensity of the destructive lesions of TMJ on CT scan in RA is correlated to the severity of the disease(3,5). They could not find a correlation between clinical symptoms and CT findings of TMJ. No clinical signs or symptoms was found to be specific of rheumatoid involvement, although joint crepitus was most frequently found (18). The incidence of TMJ lesions found increased with the duration of RA (1).

In our study MRI and CT scan scores were correlated with age, disease duration, the number of swollen joints, CRP and RF. It can be concluded that there is a positive correlation between the severity of RA and the severity of involvement in TMJ. High concentrations of serum acute phase reactants and high values of articular indices result in severe TMJ involvement.

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