

# Temporomandibular joint involvement and dental occlusion in a group of adults with rheumatoid arthritis

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The temporomandibular joint (TMJ) and dental occlusion were investigated clinically and radiographically in 59 patients aged 23-83 (mean, 58) years with general joint disease. Forty-nine had rheumatoid arthritis (RA), mostly of long duration. The patients were divided into four groups by type of dentition. Radiographic TMJ abnormality was found in about 4 of 5 patients with RA, in both the dentate and the edentulous group. The abnormality was mainly destructive with productive signs, but in the edentulous group erosive and asymmetrical changes occurred more often. Almost complete restriction of the condylar translation and severely restricted mouth opening ( $\leq 30$  mm) rarely occurred, although the translatory motion was restricted in several patients. Many of these had a satisfactory mouth opening ( $> 40$  mm). Occlusal changes—various degrees of anterior bite opening—were reported by about one fourth of both the dentate patients and the complete denture wearers. One patient had occlusal contact on the second molars only. Anterior bite opening occurred only in patients with radiographic TMJ abnormality, including 5 of the 6 patients with complete mandibular head destruction. □ *Occlusal changes; radiographic abnormality; rheumatic disease*

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Involvement of the temporomandibular joint (TMJ) has been reported since the term 'rheumatoid arthritis' (RA) was introduced in 1859 by Garrod (16), who believed that RA had a peculiar tendency to select the TMJ. In 1898, Bannatyne (2) reported a frequency of 68% in his series of 293 patients; he believed that TMJ affection was almost pathognomonic of RA. Though the reported frequency of clinical TMJ affection has varied from 4.7% (29) to 71.0% (8), most studies indicate that more than 50% of patients with RA exhibit clinical TMJ involvement (12, 15, 18, 28).

Radiographic TMJ abnormalities in RA were first described in 1941 by Zimmer (35), but the frequency of such involvement was not reported until 1958 by Cadenat & Blanc (6). They found that 10 of 14 patients (71%) had TMJ abnormalities. In later studies, including large series of patients, the frequency has varied from 19% (34) to 86% (12). Most studies indicate that radiographic TMJ abnormalities vary from 50% to 80% (8, 15, 18, 28). Examining TMJ autopsy

specimens of 10 patients with RA histologically, Blackwood (5) found arthritic abnormalities in 7.

In spite of the frequent TMJ involvement in RA, changes of the dental occlusion with anterior bite opening secondary to severe TMJ lesion has been shown in case reports only (7, 14, 17, 24, 32).

The possibility of a relationship between abnormalities of the TMJ and type of dentition or functional dental status should also be investigated to add information about the pathogenesis of TMJ lesions. Little attention has been paid to this aspect (15, 28).

The aim of the present study was to estimate the frequency of TMJ involvement and the occurrence of occlusal changes in a group of adults with RA and, further, to investigate any relationship between TMJ abnormalities and type of dentition.

## Materials and methods

### Patients

The series comprised 59 patients (47

women, 12 men) aged 23 to 83 (mean, 58) years, attending the Frambu Health Center near Oslo for a 4-week course. These courses, financed by the authorities, are open to all Norwegian citizens with RA and other joint diseases living at home. Forty-nine patients (40 women, 9 men) had RA (3 also had ankylosing spondylitis (AS)); 43 had classical or definite types (31), and 6 had uncertain, atypical, or possible juvenile types of RA (one also had AS). The mean age at onset of RA was 36 years (range, 17–75), and the mean duration of disease 22 years (range, 1–49). Of the remaining 10 patients, 2 men had only AS (disease duration, 13 and 25 years) and 8 (7 women) had severe primary arthrosis with a mean duration of 16 years (range, 3–30).

In addition, four patients with RA and evident anterior bite opening referred directly to the Department of Oral Radiology (disease duration, between 13 and 16 years) were included in this study.

#### *Interview and clinical examination*

All patients were asked whether they had experienced pain in the TMJ region and/or changes of the bite during the course of the disease. The use of systemic corticosteroid therapy was noted. Crepitus from the TMJ was recorded, and maximum mouth opening (also deviation) between the incisal edges of the front teeth was measured (in mm) with

a caliper and adjusted for overjet and open bite. Changes of the dental occlusion—that is, various degrees of anterior bite opening or 'loss of contact' at intercuspals position—were recorded. At the examination, 31 patients (24 with RA) had partial or full dentition; the remaining 28 (25 with RA) had complete dentures. The patients were interviewed and examined clinically by one observer (K.S.) at the Frambu Health Center.

The patients were divided into four groups by type of dentition, modified after Öberg et al. (27):

I. Complete or almost complete dentition, bilateral molar support (contact on at least one set of occluding molars on each side).

II. Reduced dentition, unilateral molar support.

III. Reduced dentition, without molar support.

IV. Edentulous with complete denture replacement.

The age of the patients and duration of disease in the different groups of patients with RA are shown in Table 1.

#### *Radiographic examination*

The TMJs were examined by orthopantomography and transantral and lateral transcranial techniques. Lateral tomography was done on a randomly selected group, comprising about one third of the patients,

Table 1. Age and disease duration (years) related to type of dentition (modified after Öberg et al. (27)\*) in 49 patients with rheumatoid arthritis

Type of dentition	Patient age		Disease duration	
	Mean	SD	Mean	SD
Dentate patients (no. = 24)				
Group I	46.6	10.9	18.9	10.2
Group II	54.7	9.0	21.3	6.4
Group III	55.5	9.7	16.7	10.9
Total	51.9	10.6	18.2	9.9
Edentulous patients (no. = 25)				
Group IV	63.5	10.1	24.9	11.0

\* Group I: complete or almost complete dentition, bilateral molar support (contact on at least one set of occluding molars on each side); Group II: reduced dentition, unilateral molar support; Group III: reduced dentition, without molar support; and Group IV: edentulous with complete denture replacement.

to compare the diagnostic value of the different methods (19). The radiographic abnormalities were divided into three groups: (a) bone erosion (destruction), (b) erosion with productive (reparative) changes, and (c) mainly productive changes. For details, consult Larheim et al. (19). The radiographic abnormality was described as complete mandibular head destruction, evident bone erosions, or small bone erosions. The translatory motion of the mandibular head was assessed as restricted when the head was situated at the posterior surface of the articular tubercle at maximum mouth opening (12). Complete or almost complete restriction of the condylar translation was always noted. Lateral cephalograms were made of patients with anterior bite opening to study possible future changes of the relationship between the jaws.

The radiographs were evaluated independently by two observers (T.A.L. and L.T.) without knowledge of the type of dentition or other clinical observations. In cases of disagreement, the films were reviewed by both observers together to arrive at a final diagnosis (19).

Owing to the small number of patients and the method of selection, statistical testing of the findings has not been carried out.

## Results

### *Patients with primary arthrosis or AS*

No symptoms or clinical abnormalities occurred, but radiographic TMJ abnormalities were found in three of the eight patients with severe primary arthrosis (Table 2). The TMJ abnormalities were mainly of a productive nature.

Both patients with AS reported pain in the TMJ region and had slightly restricted mouth opening (35–40 mm). No radiographic TMJ abnormalities were found.

### *Patients with RA*

*Dentate patients.* Previous or present pain in the TMJ region was reported by 18 of the 24 patients. Crepitus was found in four.

Slightly restricted mouth opening was found in eight (four with deviation). Three other patients (one with deviation) showed a mouth opening of 15, 25, and 30 mm.

Six patients reported that the bite had changed and the teeth 'did not fit together any longer'. Various degrees of anterior or bite opening with loss of incisal contact were found. The patient most severely affected (a man, 52 years old at the examination) showed an anterior bite opening of 6 mm and contact on the second molars only (Fig. 1). This patient had an active, destructive RA with onset only 6 years previously. His speech and chewing ability were severely affected by the present malocclusion.

Radiographic abnormalities of the TMJ were observed in 20 (83%) of the patients (Tables 2 and 3), 16 of whom had experienced pain in the TMJ region. The radiographic abnormalities varied greatly (Fig. 2) but were mainly destructive with productive signs (Table 3). Four patients had complete mandibular head destruction.

All six patients with occlusal changes had evident radiographic abnormality. Three showed complete mandibular head destruction.

Restricted translatory motion of the mandibular head at maximum mouth opening

Table 2. Radiographic abnormalities of the temporomandibular joint (TMJ) related to type of dentition (for definition of groups, see Table 1) in 57 patients with rheumatoid arthritis or severe primary arthrosis

Type of disease	No. of patients with TMJ abnormalities out of total no. in each group					
	Dentate				Edentulous	
	Group I	Group II	Group III	Total	Group IV	Total
Rheumatoid arthritis (no. = 49)	7/9	3/4	10/11	20/24 (83%)	21/25	41/49 (84%)
Primary arthrosis (no. = 8)	0/1	1/1	1/3	2/5	1/3	3/8

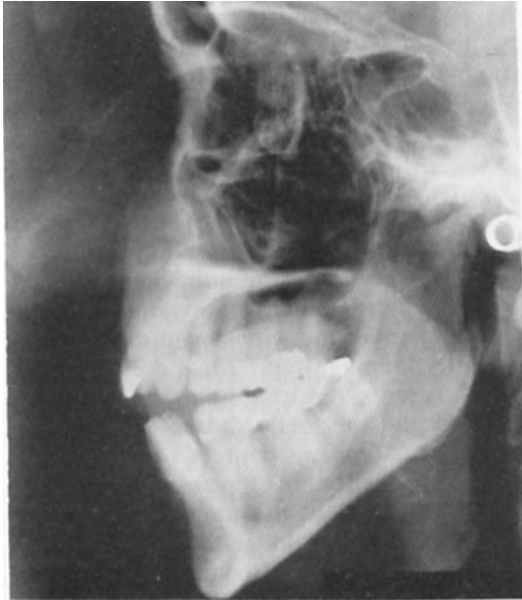


Fig. 1. Part of a lateral cephalogram of a 52-year-old man with RA of 6 years' duration, showing posteriorly rotated mandible with anterior bite opening and contact on the second molars only. Well-developed mandible, but complete destruction of the mandibular head and neck.

was found in 15 patients, of whom 7 had a maximum mouth opening that exceeded 40 mm. The translatory motion was almost completely restricted in four patients, bilaterally in two of these, with a maximum mouth opening of 15 and 25 mm only. The other two had a mouth opening (with deviation) of 30 and 40 mm.

Corticosteroids had been taken by 7 of the

20 patients with radiographic TMJ abnormality, including 2 of the 4 with complete mandibular head destruction.

With regard to the frequency of TMJ abnormality, very little difference was found between the subgroups of dentate patients (Table 2).

The radiographic examination of the four patients with evident anterior bite opening referred directly to the Department of Oral Radiology showed complete or almost complete mandibular head destruction and restricted translatory motion (Fig. 3). Maximum mouth opening varied from 28 to 34 mm.

*Complete denture wearers.* Previous or present pain in the TMJ region was reported by 19 of the 25 edentulous patients. Crepitus was found in seven. Ten patients had a mouth opening of 35–40 mm, and one patient had only 20 mm. Seven patients reported changes of the occlusion with loss of contact between the front teeth.

Radiographic TMJ abnormalities were found in 21 (84%) of the patients (Tables 2 and 3), 15 of whom had experienced pain in this region. The radiographic abnormalities varied greatly, as in the dentate group of patients (Fig. 2, Table 3). Irregular, hollowing-out destruction was the most characteristic finding (Fig. 4). Two patients had complete mandibular head destruction.

All seven patients who reported occlusal changes demonstrated radiographic TMJ abnormality, including the two with complete mandibular head destruction. In four patients the bone erosions were rather small.

Table 3. Radiographic temporomandibular joint (TMJ) abnormalities related to type of dentition (for definition of groups, see Table 1) in 49 patients with rheumatoid arthritis

Type of dentition	No. of patients with TMJ abnormalities (unilateral in parentheses)			Total
	Bone erosion	Erosions with productive (reparative) changes	Mainly productive changes	
Dentate patients (no. = 24)				
Group I	1	6 (2)	—	7 (2)
Group II	1 (1)	1	1	3 (1)
Group III	3 (1)	7 (1)	—	10 (2)
Total	5 (2)	14 (3)	1	20 (5)
Complete denture wearers (no. = 25)				
Group IV	8 (6)	11 (1)	2 (2)	21 (9)

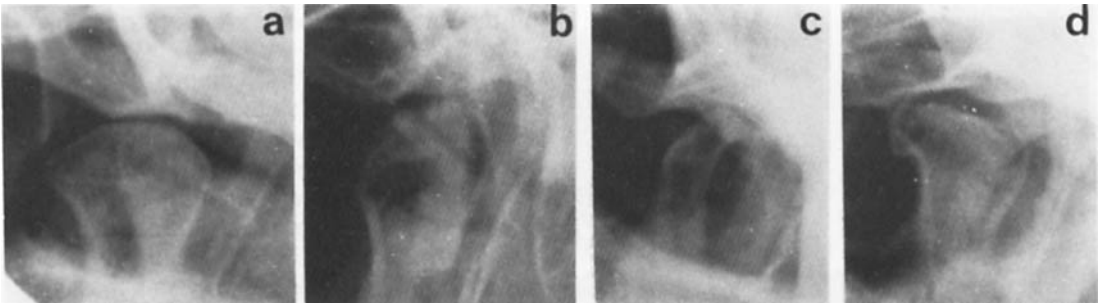


Fig. 2. Transantral (or transmaxillary) examination of the right temporomandibular joint in patients with RA and various types of dentition (for definition of groups, see Table 1). 2a. 53-year-old woman with disease duration of 13 years and group III dentition, showing normal mandibular head; 2b. 51-year-old woman with disease duration of 33 years and group I dentition, showing bone erosion (also anterior bite opening); 2c. 59-year-old woman with disease duration of 39 years and group III dentition, showing a complete destruction of the mandibular head (also anterior bite opening); 2d. 74-year-old woman with disease duration of 25 years and group IV dentition, showing productive changes only (osteophytes).



Fig. 3. Photographs of anterior bite opening (A) in a 45-year-old woman with 16 years' duration of RA and group I dentition. Lateral transcranial radiography (B) of right and left temporomandibular joint showed severe destruction of the mandibular head, flattened fossa, and restricted translatory motion at maximum mouth opening. R = right; L = left. Upper radiographs: teeth in intercuspation position; lower radiographs: maximum mouth opening.



Fig. 4. Lateral tomograms (three different sections) of the left temporomandibular joint of a 61-year-old woman with 20 years' duration of RA. Tomography of the right joint showed no abnormality. Complete denture wearer; group IV dentition. Irregular, hollowing-out destruction, particularly on the posterior margin of mandibular head.

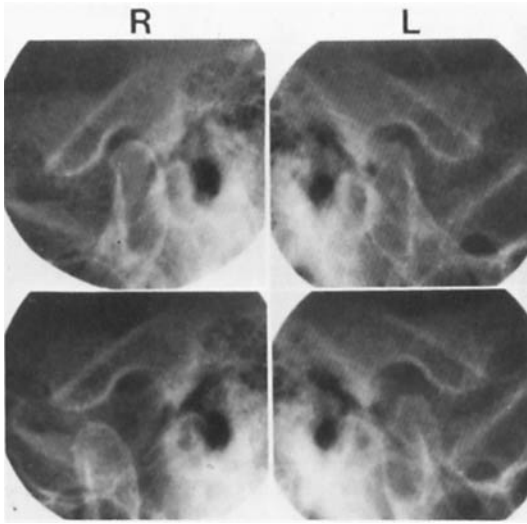


Fig. 5. Lateral transcranial radiography of both temporomandibular joints showing bone erosion on the left side (same patient as in Fig. 4). Restricted translatory motion of the mandibular head, particularly on the left side. A maximum mouth opening  $>40$  mm (with deviation to the left), because of good condylar rotation, was recorded. R = right; L = left. Upper radiographs: teeth in intercuspal position; lower radiographs: maximum mouth opening.

In 8 of the 12 patients with restricted condylar translation, the maximum mouth opening exceeded 40 mm. Almost complete restriction of such motion was found bilaterally in one patient with a mouth opening of 20 mm, while the motion was almost completely restricted unilaterally in two patients with a mouth opening (with deviation) exceeding 40 mm (Fig. 5).

Corticosteroids had been taken by 4 of the 21 patients with radiographic TMJ abnormality, including 1 of the 2 patients with complete mandibular head destruction.

With regard to the frequency of TMJ abnormality, no difference was found between the edentulous and the dentate group of patients (Table 2). Concerning the type of TMJ lesion, the ratio between joints with bone erosion and joints with erosion *and* secondary productive changes was greater in the edentulous group (8 of 11) than in the dentate group (5 of 14) (Table 3). Asymmetrical TMJ lesion was also more

frequent in the former group (9 of 21) than in the latter group of patients (5 of 20).

## Discussion

In the present RA series, TMJ abnormality was observed in more than 80% of the patients. This is in agreement with previous studies (8, 12). Comparing different radiographic methods, Larheim et al. (19) concluded that TMJ abnormality was most frequently found when using supplementary methods. This may explain the higher figure in the present series than in most others during the past 15 years (15, 18 (cited in Ref. 26), 28). Clinical TMJ symptoms, mostly pain with periodical occurrence, were also frequent, and the concordance (70–80%) between clinical and radiographic findings supports previous observations (8, 28). Several patients reported that symptoms from other joints had overshadowed pain in the TMJ region, as suggested by Mayne & Hatch (26).

Most of the radiographic TMJ abnormalities in the present series of RA patients were destructive with secondary reparative changes. Destructive changes with an irregular, hollowing-out appearance was rather characteristic of RA in this joint (Fig. 4) (23). The predominance of destructive lesions also supports observations by Ericsson & Lundberg (12, 13) and Ogus (28). In general, bone erosion is the most reliable radiographic manifestation for the assessment of severity of RA, in addition to narrowing of the joint space (20). In long-standing cases, secondary arthrosis may occur (25, 30).

Since most of the patients in the present series were older than 50 years, some of the radiographic TMJ abnormalities were probably unrelated to RA. Ericsson & Lundberg (13) found radiographic abnormalities, although most often osteophytes, in about 44% of individuals without joint disease in this age group. Comparing radiographically the TMJs in patients with primary arthrosis and controls, Chalmers & Blair (9) found TMJ abnormalities in about 35% in both groups. Unlike RA, arthrosis of the TMJ in the present series was asymptomatic, sub-

stantiating previous observations (26). Such changes may even represent remodelling (3, 22, 27).

The maximum mouth opening, compared with values in dentate and edentulous subjects without joint disease (1, 4, 10, 21, 33), was severely restricted in a few patients only. This agrees with previous observations on RA patients (15, 28). Maximum mouth opening of even less than 40 mm may be regarded as physiological both in dentate patients (21) and in complete denture wearers (1, 10). However, in spite of a rather satisfactory mouth opening (>40 mm), impaired joint motion of various degrees occurred in several patients in the present series (Fig. 5). Even in patients with complete destruction of the mandibular head and almost complete restriction of the translatory motion, probably because of fibrous adhesions within the joint, an evident condylar rotation was present. In such patients the maximum mouth opening may give false impression of the joint motion. This may explain why Franks (15) and Ogus (28) found no difference of joint motion (on the basis of maximum mouth opening as the only measure) between RA patients and controls. The present finding supports the observation of Carlsson et al. (7) that 'fibrous adhesions probably seriously limited joint mobility' in autopsy specimens from patients with RA of long duration.

The frequency of occlusal changes with anterior bite opening in the present series was rather high and most often associated with severe radiographic TMJ abnormalities. Five of the 13 patients with such bite opening had complete mandibular head destruction. This observation was supported by the finding in the patients with evident bite opening referred directly to the Department of Oral Radiology. Only one patient with complete mandibular head destruction in the present series had no anterior bite opening. This patient may possibly have juvenile RA, with receding chin and a rather small mandible. The lack of vertical open bite may be explained by the mandibular overdevelopment that occurs in such patients to compensate for the posterior rotation of the lower jaw (11). However, in the four patients

with only small bone erosions in the present series, the reported occlusal changes were possibly due to synovitis of the TMJ. A few patients with advanced occlusal changes felt seriously disabled in their oral functions, including affection of speech, also reported previously (24). In some earlier studies, attention was not paid to occlusal changes (8, 12), whereas in others such changes have not been verified (18, 28). Hatch (18, cited in Ref. 26) found no objective evidence of malocclusion in his series, although one patient thought that his mandible had receded since the onset of symptoms, and another believed that the teeth did not occlude properly. None of his nine edentulous patients reported any problem with their dentures. In the present series severe anterior bite opening was found in one (dentate) patient only (Fig. 1). An anterior open bite of 5 mm has previously been reported in a complete denture wearer with RA (17). Observations in the present series indicated that the occlusion should be carefully examined whenever the patient reports 'changes of the bite' during the course of the disease.

The frequency of TMJ abnormality in this series was not associated with the type of dentition, although the number of patients in the different subgroups was rather small and the duration of the recorded dental condition most uncertain. This supports observations by Franks (15) and Ogus (28). To our knowledge, they are the only investigators who have taken this aspect into consideration in large series of RA patients. On the basis of the difference in reported frequency of unilateral chewing habit between RA patients and controls, Franks (15) suggested that the TMJ abnormality in RA might be related to an uneven distribution of function between the right and left side. This finding and the more frequent occurrence of destructive and asymmetrical TMJ lesions in edentulous patients than in the dentate group in the present series need further investigation.

The use of corticosteroids has been discussed as a cause of severe joint destruction (14). As can be seen in the present study, severe joint destruction and anterior bite opening may occur in RA patients irrespec-

tive of whether they have been taking such medication.

### Conclusions

In the present patient group it was found that radiographic TMJ abnormality, frequently with symptoms of pain (periodical) and impaired/altered mandibular function, occurred in about four of five patients with RA, mostly of long duration. Even in patients with satisfactory mouth opening, severe TMJ abnormality and impaired joint motion could be present. Occlusal changes with anterior bite opening were recorded in about one third of both the dentate and the edentulous RA patients with radiographic TMJ abnormality. Such changes were most frequently associated with severe TMJ destruction. Radiographic TMJ abnormality occurred with similar frequency in dentate and edentulous RA patients; however, a destructive and asymmetrical TMJ abnormality was more often found in the edentulous group.

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