

Evaluation of Temporomandibular Joint in patients with Rheumatoid Arthritis

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ABSTRACT

Objective: The objective of our study was to evaluate the temporomandibular disorders (TMD) among a group of patients with rheumatoid arthritis (RA).

Patients and methods: This is a cross sectional and descriptive study including 47 patients with diagnosed RA, consulting in the Rheumatology Department, from November 2014 to August 2015. The temporomandibular joint (TMJ) examination was lead using the Research Diagnostic Criteria for TMD (RDC/TMD; axis I). The following key parameters were evaluated: the pain on the TMJs by bilateral palpation; the TMJ sounds (clicking or crepitus) during opening-closing of the mandible; the range of motion of mandible measured after the maximum unassisted mandibular opening and the opening trajectory. A panoramic radiography was performed for every patient to look for condylar abnormalities: the TMJ pinching, the erosions and the geodes.

Results: The mean age of RA patients was 51.36 ± 10.9 years [30-76 years], with a sex ratio (male/female) of 0.064. The mean duration of RA disease was 12.2 ± 7.85 years [1-35]. The mean value of DAS 28 was 5.31 ± 1.3 [2.1-7.5]. The RF (Waller Rose/LateX) was positive in 72.3% of cases. The ACPA were positives in 44.7% of cases. The TMJ examination showed that 34% of patients had TMJ pain in palpation. 23.4% of patients had crepitus in TMJ mobilization. 19.1% of patients had clicking in TMJ mobilization. A limitation of the opening of the mouth was detected in 7 patients (14.9%). A non-rectilinear trajectory of the mouth opening was detected in only 4 patients (8.5%). The analysis of the panoramic radiography showed condylar abnormalities in 51% of patients. 6.3 % of them (3 patients) had joint space narrowing, 29.7% (14 patients) had erosions and 42.5% (20 patients) had geodes. A significant correlation was found between the value of RF and the TMJ clicking in mobilization ($p < 0.05$), between the duration of the RA and the alteration of the trajectory of mouth opening ($p < 0.05$). The influencing factors in the TMD were the positivity of the RF ($p < 0.05$) and the duration of RA ($p = 0.01$).

Conclusion: Our study showed that the TMD is a frequent manifestation of RA. It should be always suspected by rheumatologist to prevent complications.

Key Words: Temporomandibular Joint Disorders, Arthritis, Rheumatoid, Panoramic Radiography

INTRODUCTION

Rheumatoid arthritis (RA) is a chronic, systemic, autoimmune inflammatory disease, characterized by joint inflammation, erosive properties and symmetric multiple joint involvement [1]. It may cause progressive and irreversible joint changes [2].

Involvement of the temporomandibular joint (TMJ) varied greatly from 2 to 88% [3-5]. This is due on one hand to the very different selection of the patient populations and to age distribution and the duration or the severity of the RA, respectively. On the other hand, the study criteria and methods differ with regard to collecting the anamnestic data, the definition of diagnostic criteria, and the imaging techniques used. However, the majority of studies showed that approximately 50% of RA patients develop a clinical involvement of the TMJ [6-8].

TMJ is usually among the last joint to be involved and is associated with many clinical signs and symptoms of which pain is a major problem later leading to inflammation, limited movements, swelling (joint stiffness), and muscle spasm [9]. If it occurs in early age, it may result in mandibu-

lar growth disturbance, facial deformity, and ankylosis and in adult, these can vary from mild joint stiffness to total joint disruption with occlusal facial deformity [10]. Often, patients do not realize the association between these complaints and the RA [5, 11]. The diagnosis of TMJ involvement in RA is exclusionary based on history, physical findings, radiographic study, and lab testing. Hence a multidisciplinary approach is necessary [12].

The objective of our study is to evaluate the temporomandibular disorders (TMD) among a group of patients with RA.

PATIENTS AND METHODS

This is a cross sectional and descriptive study including 47 patients with diagnosed RA, consulting in the Rheumatology Department, from November 2014 to August 2015.

We included all patients aged between 30 and 80 years, which diagnosed RA. The diagnosis of the RA was secured by the ACR 1987/EULAR 2010, Rheumatoid Arthritis Classification Criteria [13]. The consent of the patient is necessary. Different RA parameters were collected: the duration of rheumatoid arthritis course, the presence of joint defor-

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mities and the Disease activity score (DAS28) [14], using the number of tender joints, swollen joints and the ESR. We practiced for every patient the following tests:

Temporomandibular joint examination:

The TMJ examination was lead using the Research Diagnostic Criteria for TMD (RDC/TMD; axis I) [15] to assess the prevalence of TMD, and was performed by a dentist.

The following key parameters were evaluated:

The pain on the TMJs by bilateral palpation; the TMJ sounds (clicking or crepitus) during opening-closing of the mandible; the range of motion of mandible measured after the maximum unassisted mandibular opening and the opening trajectory.

Panoramic radiography:

A panoramic radiography was performed for every patient to look for condylar abnormalities: the TMJ pinching, the erosions and the geodes.

Statistical Analysis:

All data were stored and analyzed using the SPSS Statistical Package (version 18.0). The significant threshold value was set to $p \leq 0.05$.

RESULTS

General characteristics of the population:

The mean age of RA patients was 51.3 ± 10.9 years [30-76 years]. Our population was characterized by a clear predominance of female with a sex-ratio of 0.06. ninety three point six percent of our patients were female. The majority of our patients were non-smoking with a percentage of 91.5%, and also non-alcoholic with a percentage of 97.9%. Type 2 diabetes was present in 8 patients (17%), hypertension in 7 patients (14.9%) and dyslipidemia was observed in 5 patients (10.6%).

Parameters of rheumatoid arthritis:

The mean duration of the disease was 12.2 ± 7.8 years, with extremes ranging from one year to 35 years. Joint deformities were present in 21 patients (44.7% of the cases). The mean value of DAS 28 was 5.31 ± 1.3 with extremes ranging from 2.1 to 7.5.

More than half of our patients (59.6%) had a very active disease (DAS 28 greater than 5.1). The dosage of the rheumatoid factor (RF) was performed for all our patients, it was positive in 34 patients (72.3% of the cases). The average Latex value was $156 \text{ UI/ml} \pm 109$, the Waller Rose value was $119 \text{ UI/ml} \pm 184$. The Anti-Citrullinated Protein Antibody (ACPA) was performed in 66% of cases, positive in 21 patients (44.7% of cases). The mean value was $324.8 \text{ UI/ml} \pm 503$, with extremes between 36 and 2000 UI/ml. The Anti-Nuclear Antibodies (AAN) were performed in 83% of cases, positive in only 9 patients (19.1% of cases). 41 patients had RA specific radiological findings (87.2% of the cases). More than half (53.2% of the cases) presented radiologic destruction on both hands. Most joint involve-

ments were erosions, geodes and joint pinching in 36.2% and 31.9% respectively. Only one patient had coxofemoral abnormalities, which were bilateral. Of our patients, 28 had extra-articular manifestations (59.6% of the cases). The most frequent extra-articular manifestations were the Sjogren syndrome, the rheumatoid nodule and the pulmonary fibrosis in 48.9%, 10.6% and 4.3% respectively. The average value of ESR in our patients was 52.57 mm/h with extremes between 9 and 125 mm. The median value was 50 mm/h. The mean value of CRP in our patients was $27 \text{ mg/l} \pm 44.6$ with extremes between 0.4 and 260 mg/l. The median value was 13.2 mg/l. All TMJ data are detailed in Table I. 18 patients (38.3%) presented clinical findings in the examination.

Table I : TMJ examination data

Temporomandibular joint examination data:

TMJ examination		Number of patients	Percentage (%)
TMJ pain in palpation		16	34
Crepitus sound in mobilization		11	23.4
Clicking sound in mobilization		9	19.1
Amplitude of the mouth opening	Normal	40	85.1
	limited	7	14.9
Trajectory of the mouth opening	rectilinear	43	91.5
	Non-rectilinear	4	8.5

Panoramic radiography:

The analysis of the panoramic radiography showed condylar abnormalities in 51% of cases (24 patients). Thirty four percent of them (16 patients) had joint narrowing, 29.7% (14 patients) had erosions and 42.5% (20 patients) had geodes. 49% (23 patients) didn't have any radiologic condylar involvement.



Figure 1 : A panoramic radiography which shows the joint narrowing in the right TMJ.

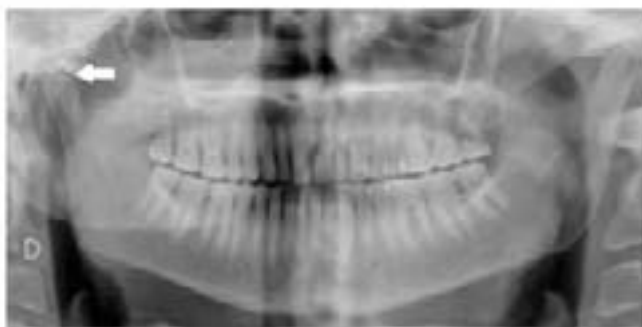


Figure 2 : A panoramic radiography which shows the joint narrowing and the erosions in the right TMJ.



Figure 3 : A panoramic radiography which shows the geodes and the joint narrowing in the right TMJ.



Figure 4 : A panoramic radiography which shows the joint narrowing, the erosions and the geodes in the right TMJ.

The influencing factors in temporomandibular disorders (TMD):

Our study didn't show any correlation between clinical and biological parameters and TMJ pain in palpation, crepitus sound in mobilization and limitation of mouth opening. We found a significant correlation between the value of RF (Waller Rose/Latex) and the TMJ clicking in mobilization (p value<0.05). Also between the duration of the RA and the alteration of the trajectory of mouth opening (p<0.05) (Table II).

Table II : Correlation between clinical, biological parameters and TMD (P* value)

	TMJ pain in palpation	Crepitus in mobilization	Clicking in mobilization	Limitation of mouth opening	trajectory of mouth opening
Age (years)	0.2	0.8	0.7	0.6	0.1
BMI (Kg/m ²)	0.9	0.8	0.2	0.1	0.8
Duration of RA (years)	0.6	0.8	0.5	0.5	0.02
DAS 28	0.6	0.7	0.7	0.8	0.8
ESR (mm/h)	0.4	0.3	0.6	0.6	0.4
CRP (mg/l)	0.9	0.6	0.4	0.6	0.6
RF (UI/ml)	Waller	0.4	0.3	0.04	0.7
	Rose				
	Latex	0.7	0.1	0.01	0.9
ACPA (UI/ml)	0.8	0.8	0.6	0.1	-
Sex	0.5	1.0	1.0	1.0	1.0
Diabetes	0.6	0.5	0.3	0.3	0.4

*Comparison between 2 groups with Khi2 test; TMD = temporomandibular joint disorder; TMJ = temporomandibular joint; BMI = body mass index; RA = rheumatoid arthritis; DAS 28 = disease activity score; ESR = erythrocyte sedimentation rate; CRP = C-reactive protein; RF = rheumatoid factor; ACPA = anti-citrullinated protein antibodies.

We considered a significant p value if p < 0.05.

In conclusion, the influencing factors in the TMD were: the RF positivity (WR: p=0,04; Latex: p=0.01) and the duration of RA (p=0.02). Our study didn't found a significant association between clinical and radiographic findings in TMJ (p=0.07).

DISCUSSION

RA is a chronic auto-immune disease which is characterized by bilateral and symmetric arthritis [16], resulting in an inflammation of the synovial membrane. It's the most frequent chronic inflammatory rheumatism [16]. Its prevalence is meanly 0.19% in Tunisia basing on LITAR (Tunisian League Against Rheumatism) statistics [17]. Franks in 1969 [18], reported that women are approximately three times more likely to be affected than men with RA. Abhijeet and Shirish in 2010 also concluded the same findings [19]. This fact was confirmed by our study, we had a sex-ratio of 0.064 in favor of women. The clinical course of RA may vary from mild joint discomfort of short duration to chronic polyarthritis, pain, and deformity of joints with swelling [20]. Helenius et al [21], in 2005 reported that in RA, multiple joints of the body are commonly affected, TMJ being the last joint to be involved. In the study by Abhijeet and Shirish



[19], done in patients with, 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 et al [22]. In our study, the mean duration of general disease was 12.2 ± 7.85 years, with extremes ranging from one year to 35 years.

Yi-Chun Lin et al [5], sequentially recruited 56 adult RA patients. TMD and RA were surveyed, clinically by questionnaires and physical examinations, and radiologically by tomography in TMD and conventional radiography in RA. As results, RA patients were found to have a very high prevalence of TMD (92.9%). This rather high prevalence, exceeding those of previous studies (4.7–88%) [8, 23–26], might be attributed to their hospital being a tertiary medical center. (Table IX) Hence, most of the referred patients were much more complicated. Nevertheless, only 51.8% of them had experienced TMJ-related problems, while others had remained clinically silent. Moreover, most of these patients (91.1%) had subjective TMD.

There are several possible explanations for this discrepancy. First, subjective TMJ discomfort or complaints are likely to be overshadowed by joint problems elsewhere in the body [24, 27]. Compared with other joints like the hands and knees where frequent motion and weight-bearing is unavoidable in daily life, the joints of the stomatognathic system are less of a problem for RA patients. They can subjectively reduce its motion by talking less or by avoiding ingestion of hard food [28].

Second, the TMJ is structurally different from other joints. It has special retrodiscal tissue that is rich in blood vessels, which may act as a highly efficient drainage system for joint exudates. In this manner, joint swelling and pain may be alleviated or even prevented [29].

Third, previous studies, [5, 27, 30, 31] found that mandibular function was not significantly restricted, for example, in the study of Yi-Chun Lin et al [5], only 13 (23.2%) patients had maximal mouth opening < 40 mm, despite severe TMJ destruction. This constatation was consistent with our study which showed a limited opening mouth in only 14.9% of cases. This might be due to the presence of a specialized articular disc structure, which divides the TMJ into 2 distinct cavities, the upper and lower one [32]. This may also constitute an important cause for reduced self-awareness of TMJ problems among RA patients [5].

Furthermore, in the majority cases of RA patients who had TMD, it was still ascertain that all of the TMDs were due to the underlying RA [5]. Previously, Marbach stated that the most common disease of the TMJ is osteoarthritis (OA) [28]. Similarly, Gynther et al [33], reported that there is no radiographic criterion that is pathognomonic for generalized OA or RA, although condyle erosion is more common in RA.

In a later study by Gynther et al, arthroscopic, histologic and immunohistochemical studies revealed that TMD related to generalized OA was similar to those related to RA [8].

On the other hand, data from McNeill showed that a large percentage of the normal population had abnormal findings in the clinical examination of TMJ [8, 34].

Therefore, in some patients with TMD but with normal or mild tomographic findings, their TMD might not be due to

RA per se. Further studies with computed tomography or magnetic resonance imaging may help in differential diagnosis.

Table III : The prevalence of temporomandibular disorder in different studies

Studies [References]	Clinical findings (%)	Radiographic findings (%)	Clinical and Radiographic findings (%)
Yi-Chun Lin et al [5]	85.7	74.5	92.9
Gynther et al [8]	59	-	-
Helenius et al [21]	58	17	-
Voog et al [22]	-	75	-
Ogus H [23]	61	68	40
Goupille et al [24]	61	69	-
Yoshida et al [25]	12.8	-	-
Yamakawa M et al [26]	67.6	-	-
Our study	38.3	51	14.9

Many studies reported that the radiological changes of TMJ include cortical erosion, decreased joint space, deossification, sharpen pencil head or spiked deformity of the condylar head or mouth piece of flute deformity of condylar head, and subcortical cysts [35, 36].

Abhijeet and Shirish in 2010 reported that in patients with RA, the predominant finding was erosion of condyle (85%) followed by condylar sclerosis similar to study by Gynther and Tronje [37], Goupille et al [38], and Voog et al [39]. Sclerosis is a sign of healing of joint in contrast to erosion, which indicated active bone disease [38].

In our study, 24 patients (51%) had radiographic findings; 6.3% had joint narrowing, 29.7% had erosions and 42.5% had geodes.

Kurita et al [40], reported that functional and parafunctional loading elicit adaptive and degenerative changes in load bearing joints including TMJ. In TMJ, the anterosuperior part of the mandibular condyle and the posterior slope and inferior part of the articular eminence are assumed to bear the greatest load.

Consistent with previous findings [41], in the study of Yi-Chun Lin et al [5], the majority of RA patients (29.6%) developed TMJ symptoms shortly (within 1 year) after the onset of the generalized disease. Aside from this, 18.5% noted TMJ symptoms before the generalized disease. The early onset of TMD in RA patients implies that early diagnosis and prompt treatment may be beneficial.

On the other hand, a large proportion of these patients (51.8%) developed TMJ symptoms more than 1 year after the onset of RA, with up to 22.2% of cases developing their symptoms after 5 years or more. Therefore, continuous and close monitoring of the TMJ during the course of RA is necessary [5].

Yi-Chun Lin et al [5], defined severe TMD as the presence of at least 3 of 4 items (TMJ tenderness, TMJ sounds, functional disturbance, evidence of moderate or severe TMJ abnormalities on tomography). Half of their RA patients



belonged to the severe TMD group. They had more debilitating symptoms and functional disabilities, and thus need to be referred to TMJ clinics promptly and managed more actively.

Because most of the RA patients received treatment from rheumatologists rather than dentists, we attempted to analyze the link between the parameters of RA severity and TMD in order to provide a useful guide for rheumatologists in predicting the probability of severe TMJ involvement in their patients. Previous studies have revealed inconsistent relationships between RA severity and TMJ involvement [22, 23, 25, 26, 30, 42-45].

Bivariate correlation analysis in the study of Yi-Chun Lin et al [5], showed significant correlations between TMD severity and joint destruction and peak ESR and RF values, but not the CRP value. After further analysis by stepwise logistic regression, the score of hand-joint space narrowing proved to be the single most relevant factor in the prediction of severe TMD. A plausible explanation is that, unlike other factors such as joint tenderness or erosion that represent initial or transient phenomenon of the disease, joint space narrowing usually appears later in the course of RA, at a stage when the involvement of the TMJ is likely to be more prominent. The finding for peak RF corresponds to those of previous studies [24, 30, 43]. But contrary to previous reports [25, 30, 43, 44], peak CRP was not correlated with TMD severity in the study of Yi-Chun Lin et al[5]. One possible explanation is that ESR tends to be an indicator of chronic persistent inflammation while CRP is an acute phase protein that usually elevates in less than 24 hours during an episode of acute inflammation and declines rapidly after the inflammation is controlled. The peak CRP value only points out the transient activity of joint inflammatory processes, which cannot signify the extent of joint

destruction. However, statistical analysis of an average of repetitive laboratory marker values will lead to different results, and further studies are necessary to clarify this[5].

The duration of RA was noted to correspond to TMD severity in the aforementioned series [23, 43]. By the way, our study showed a significant association ($p<0.05$) between the duration of the disease and the limitation of mouth opening in our patients. However, it was not comparable to the integrated TMD severity in the study of Yi-Chun Lin et al[5]. They speculate that the articular damage in RA, including TMD, is proportional to the duration of active inflammation rather than the total duration of arthritis [46]. Our study has some limits such the restrict number of patients.

CONCLUSION

In RA, the TMJ is usually among the last joint to be involved and is associated with many clinical signs and symptoms. The diagnosis of TMD is exclusionary based on history, physical findings, and radiographic study. Hence a multidisciplinary approach is necessary.

In our study, 18 patients (38.3%) presented clinical findings in examination. The statistic analysis showed a significant correlation between the value of RF (Waller Rose/Latex) and the TMJ clicking in mobilization (p value <0.05). We also proved a significant correlation between the duration of the RA and the alteration of the trajectory of mouth opening ($p<0.05$). So, the influencing factors in the TMD in our patients were the positivity of the RF ($p<0.05$) and the duration of RA ($p=0.01$). But we didn't found a significant association between clinical and radiographic findings in TMJ ($p=0.07$).

Conflicts of interest: Authors have declared that no competing interests exist.

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