ORIGINAL ARTICLE

Temporomandibular disorders in patients with rheumatoid arthritis: A clinical study

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Abstract

Objectives: The aim of this study is to evaluate the prevalence and type of temporomandibular disorders (TMD) in patients with rheumatoid arthritis (RA).

Materials and Methods: Fifty-four patients having RA treatment at Cukurova University in Rheumatology Clinic were enrolled to the study. Demographic and rheumatologic data were recorded. The patients were examined in Dental Faculty by using Research Diagnostic Criteria/TMD (RDC/TMD) axis I and answered RDC/TMD axis II Biobehavioral Questionnaire. Data were evaluated according instructions for scoring and assessment of RDC/TMD. Mann–Whitney test was performed to compare continuous variables between two groups and Kruskal–Wallis test was performed to compare continuous variables for more than two groups.

Results: Although their activity situations were 55.6% active and 44.4% inactive, the distribution of treatment modality was 31.5% for anti-tumor necrosis factor-α (TNF-α) and 68.5% for disease-modifying antirheumatic drugs (DMARD). The distribution of temporomandibular joint (TMJ) involvement was; 9.3% with no involvement, 7.4% with joint involvement, 64.8% with muscular involvement, 18.5% with both muscular and joint involvement. Rheumatologic functional scores were (0) 3.7%, (1) 50%, (2) 38.9%, (3) 7.4%. Patients' chronic pain was graded from 0 to 4 and the distribution was 3.7%, 24.1%, 20.4%, 31.5% and 20.4%, respectively. The mean duration of RA for anti-TNF-α (11.47 ± 7.67) was significantly higher compared with DMARD (7.09 ± 5.21) $P = 0.040$.

Conclusion: There was a high prevalence of TMD in RA patients, and muscular involvement was the highest among the TMJ involvements. Thus, this study supports TMJ examination should be encouraged in the rheumatology settings.

Key words: Research Diagnostic Criteria, rheumatoid arthritis, rheumatologic functional score, temporomandibular joints, temporomandibular disorders

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Introduction

Rheumatoid arthritis (RA) is a systemic autoimmune disorder, characterized by synovial hyperplasia and chronic inflammation. Numerous joints in the body are usually affected and the function is limited. Symmetric polyarticular joint pain and swelling, morning stiffness, malaise, and fatigue can also be seen. The inflammation may be reversible over months, and patients may experience spontaneous remission. However, most patients whose symptoms have persisted for longer than 90 days experience a progressive

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disease, in which the reversible inflammatory activity leads to irreversible joint damage.[1]

Temporomandibular disorders (TMD) are a collective term that includes a number of clinical problems involving the masticatory muscles and/or temporomandibular joint (TMJ). TMD are subgroups of musculoskeletal and rheumatologic disorders and are considered to be the major causes of nondental pain in the orofacial region.[2] Some common clinical symptoms of TMD include TMJ sounds/noises, TMJ pain, facial pain, headaches, limited range of mandibular movement, change in occlusion, masticatory difficulty, earaches, tinnitus, vertigo, and neck, shoulder, and back pain. Some patients with pathological internal derangement of the TMJ, however, are asymptomatic or have relatively innocuous clinical symptoms.[3-5]

It is well known that TMJ can be involved in patients with rheumatic disease. Reported frequencies of TMD vary between 2% and 88% in RA patients.[6-14] Although the temporomandibular joint is often affected by RA, symptoms can be seen in only a minority of the patients. Joint tenderness and stiffness are the most frequent symptoms. In severe disease, there is the destruction of the joint surface, with pain, stiffness, crepitations and anterior open bite. Management is principally nonsurgical, but rarely joint replacement is required. The temporomandibular joint is affected in approximately 50% of cases of juvenile idiopathic arthritis.[1]

Early and aggressive RA treatments may slow joint damage and help reduce the risk of disability. Treatment typically involves medications, though surgery may be necessary in cases of severe joint. Disease-modifying antirheumatic drugs (DMARD) are common treatment modalities in RA patients and anti-tumor necrosis factor (TNF) drugs are used in DMARD resistant patients.

Research Diagnostic Criteria/TMD (RDC/TMD) is a two axis-based statement, which is used primarily for research purposes and includes demographics of the study population, patient characteristics, axis I diagnosis and axis II profile. Axis II assesses and classifies the pain condition as pain intensity, pain-related disability, depression (DEP) and nonspecific physical symptoms (NPS).[3,15]

The purpose of this study is to evaluate the prevalence of TMD in patients with RA using RDC/TMD. Also, masticatory muscle involvement, inflammatory involvement of TMJ and psychological status in patients with RA were evaluated.

Materials and Methods

This study was performed by two examiners in the Medical Faculty of Cukurova University, Department of Rheumatology and Faculty of Dentistry, Department of Prosthodontics using RDC/TMD. The study protocol had been approved by the Local Ethics Committee.

Patients having RA treatment in the Department of Rheumatology were assigned to the study. Demographic and rheumatologic data as age, gender, duration of RA, functional score of RA, disease activity (due to number of swelling and tender joints, erytrhosit sedimentation rate, duration of morning stiffness) of RA and treatment of RA were recorded. All patients had given written informed consent to their participation in the study. The patients were examined in the Department of Prosthodontics using RDC/TMD axis I. A panoramic X-ray and lateral panoramic images were taken for all patients. Exclusion criteria were: Being younger than 18 years old, being edentulous.

During the study period of 8 months, the first two work hours of 1 day in a week was chosen for the study. A total of 60 patients accepted to be involved in the study. Due to the exclusion criteria 6 patients were out of the study. Each patient answered RDC/TMD axis II Biobehavioral Questionnaire. The RDC/TMD was translated into Turkish and the author approved its back-translation. It is available on the website of the RDC/TMD international consortium whose web address is: http://www.rdc-tmdinternational.org.

The first examiner was from the Department of Rheumatology, who was treating the patients. Second examiner experienced in RDC/TMD was from the Department of Prosthodontics and enrolled the patients, according to the study criteria. Data from the questionnaire was evaluated according to the instructions for scoring and assessment of RDC/TMD. Characteristic pain intensity (CPI), disability score (DS), DEP items, NPS-pain items included (NPS-included), NPS-pain items excluded (NPS-excluded), chronic pain grade (CPG) were calculated and recorded.

Statistical analysis was performed using IBM SPSS version 20.0 (IBM SPSS statistics for windows, IBM corp, 2011, Armonk, NY, USA). Mann–Whitney test was performed to compare continuous variables between two groups and Kruskal–Wallis test was performed to compare continuous variables for more than 2 groups. The Chi-square test was performed to analyze the association between two categorical variables. Categorical variables were summarized as count and percentages. Continuous variables were summarized as mean ± standard deviation (SD),

median (minimum, maximum). $P < 0.05$ were accepted as significant.

Results

Rheumatoid arthritis patients ($n = 54$) were generally evaluated using categorical and continuous variables [Table 1a and b]. Most of the patients were female 79.6%. Although their activity situations were quite similar (55.6% active and 44.4% inactive), the distribution of treatment modality was different (31.5% for anti-TNF-α and 68.5% for DMARD). The distribution of TMJ involvement was as follows; 9.3% with no involvement, 7.4% with joint involvement, 64.8% with muscular involvement, 18.5% with muscular + joint involvement. Patients were categorized according to rheumatologic functional scores and the scores were (0) 3.7%, (1) 50%, (2) 38.9%, (3) 7.4%. According to RDC/TMD axis II scoring protocol, patients'

Table 1a: General evaluation of categorical variables in RA subjects

	C	(%)
G		
M	11	20.4
F	43	79.4
T M		
A-TNF	17	31.5
DMARD	37	68.5
Act		
A	30	55.6
Ia	24	44.4
TMD		
No TMD	5	9.3
J	4	7.4
M	35	64.8
J+M	10	18.5
RFS		
0	2	3.7
1	27	50.0
2	21	38.9
3	4	7.4
CPG		
0	2	3.7
I	13	24.1
II	11	20.4
III	17	31.5
IV	11	20.5

G=Gender; C=Count; %=Percentage; M=Male; F=Female; TM=Treatment modality; A-TNF: Anti-TNF-α; DMARD=Disease-modifying antirheumatic drugs; Act=Activity; A=Active; Ia=Inactive; TMD=Temporomandibular disorder; J=Joint involvement; M=muscular involvement; J+M=Joint and muscular involvement; RFS=rheumatologic functional score; CPG=chronic pain grade

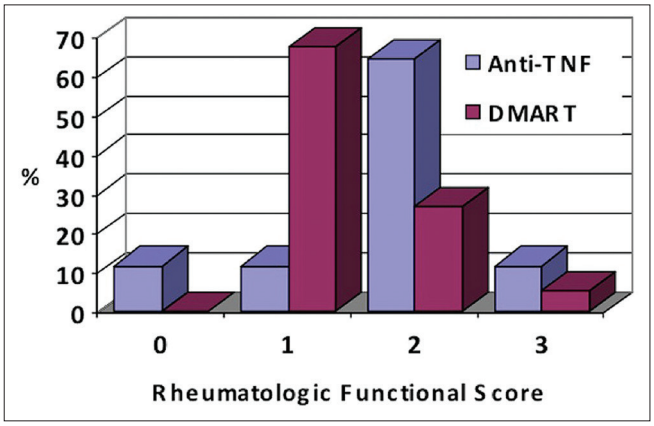

Figure 1: Percentage of treatment by rheumatologic functional score

Table 2: Age, duration of RA, CPI, DS, DEP, NPS-included, NPS-excluded characterized by sex

	Mean±SD Median (minimum, maximum)		
	Male	Female	*P*
Age	51±6.52	45.6±11.06	0.146
	54 (38, 56)	45 (20, 65)	
Duration of RA	6.89±6.11	8.86±6.47	0.394
	4 (2, 22)	7 (1, 25)	
CPI	49.6±35.6	54.7±26.07	0.952
	60 (0, 93)	56.7 (0, 100)	
DS	45.9±42.9	46.82±25.2	0.401
	56.7 (0, 100)	53.3 (0, 100)	
DEP	1.44±1.02	1.62±0.85	0.313
	1 (0.4, 3.4)	1.5 (0, 3.3)	
NPS-included	1.91±1.07	1.80±0.79	0.979
	1.75 (0.42, 3.33)	1.75 (0, 3.25)	
NPS-excluded	1.76±0.95	1.73±0.84	0.957
	1.43 (0.43, 3.14)	1.86 (0, 3.29)	

RA=Rheumatoid arthritis; CPI=Characteristic pain intensity; DS=Disability score; DEP=Depression; NPS (included)=Nonspecific physical symptoms (pain items included); NPS (excluded)=Nonspecific physical symptoms (pain items excluded); SD=Standard deviation

Table 1b: General evaluation of continuous variables in RA subjects

	Duration of RA	Age	CPI	DS	DEP	NPS (included)	NPS (excluded)
Mean	8.50	46.56	53.85	44.94	1.57	1.81	1.74
Median	7.00	48.00	58.33	50.00	1.48	1.75	1.71
SD	6.28	10.36	27.60	29.31	0.87	0.83	0.84
Minimum	1	20	0	0	0	0	0
Maximum	25	65	100	100	3.4	3.3	3.3

RA=Rheumatoid arthritis; CPI=Characteristic pain intensity; DS=Disability score; DEP=Depression; NPS (included)=Nonspecific physical symptoms (pain items included); NPS (excluded)=Nonspecific physical symptoms (pain items excluded); SD=Standard deviation

Table 3: Age, duration of RA, CPI, DS, DEP, NPS-included, NPS-excluded characterized by treatment modality

	Mean±SD Median (minimum, maximum)		
	Anti-TNF-α	DMARD	*P*
Age	43.1±10.8	48.2±10.18	0.146
	45 (20, 58)	50 (34, 65)	
Duration of RA	11.47±7.67	7.09±5.21	0.040
	10 (2, 25)	6 (1, 22)	
CPI	54.9±26.7	53.3±28.4	0.972
	56.7 (0, 97)	60 (0, 100)	
DS	47.5±27.0	46.3±29.5	0.681
	53.3 (0, 100)	53.3 (0, 100)	
DEP	1.55±0.886	1.60±0.883	0.963
	1.5 (0.4, 3.3)	1.45 (0, 3.4)	
NPS-included	1.72±0.768	1.87±0.876	0.589
	1.5 (0.42, 3.17)	1.92 (0, 3.33)	
NPS-excluded	1.66±0.821	1.78±0.878	0.621
	1.43 (0.43, 3.14)	2 (0, 3.29)	

DMARD=Disease-modifying antirheumatic drugs; Anti-TNF-α=Anti-tumor necrosis factor alpha; RA=Rheumatoid arthritis; CPI=Characteristic pain intensity; DS=Disability score; DEP=Depression; NPS (included)=Nonspecific physical symptoms (pain items included); NPS (excluded)=Nonspecific physical symptoms (pain items excluded); SD=Standard deviation

Table 4: Chronic pain grade characterized by temporomandibular joint involvement

	Count (%)				
	Grade 0	Grade 1	Grade 2	Grade 3	Grade 4
No TMD	0 (0)	1 (20.0)	3 (60.0)	1 (20.0)	0 (0)
J	0 (0)	1 (25.0)	1 (25.0)	1 (25.0)	1 (25.0)
M	2 (5.7)	8 (22.9)	5 (14.3)	12 (34.3)	8 (22.9)
J+M	0 (0)	3 (30.0)	2 (20.0)	3 (30.0)	2 (20.0)

TMD=Temporomandibular disorder; J=Joint involvement; M=Muscular involvement; J+M=Joint and muscular involvement

chronic pain was graded from 0 to 4 and the distribution was 3.7%, 24.1%, 20.4%, 31.5% and 20.4%, respectively [Table 1a].

The mean and SD for duration of RA, age, CPI, DS, DEP, NPS-included, NPS-excluded, which were determined as continuous variables in this study were 8.50 ± 6.28, 46.56 ± 10.36, 53.85 ± 27.60, 44.94 ± 29.31, 1.57 ± 1.87, 1.81 ± 0.83, 1.74 ± 0.84, respectively [Table 1b].

Age, duration of RA, CPI, DS, DEP, NPS-included, NPS-excluded were characterized by gender in Table 2. There were no statistically significant differences among the characteristics.

In Table 3, age, duration of RA, CPI, DS, DEP, NPS-included, NPS-excluded were characterized by treatment modalities of RA. Statistically significant difference was observed only for the duration of RA ($P = 0.04$) [Figure 1]. The mean and SD for the duration of RA characterized by treatment modalities, which are anti-TNF and DMARD, were 11.47 ± 7.67 and 7.09 ± 5.21 respectively.

When CPG of 54 RA patients were characterized by TMJ involvement, 35 patients had muscular involvement out of 54 RA patients, and 34.3% ($n = 12$) were graded as 3. RA patients with joint involvement ($n = 4$) were evenly distributed from grade 1 to grade 4 [Table 4]. Muscular and joint involvements were diagnosed in 10 RA patients.

In Table 5, TMJ involvement was characterized by age, CPI, DS, DEP, NPS-excluded, NPS-included and duration of RA no statistical difference was observed.

Table 5: Age, duration of RA, CPI, DS, DEP, NPS-included, NPS-excluded characterized by temporomandibular joint involvement

	Mean±SD Median (minimum, maximum)				*P*
	No TMD	J	M	J+M	
Age	46.80±16.04	49±10.68	45.06±10.39	50.4±8.26	0.486
	50 (24, 64)	54 (33, 55)	45 (20, 65) s	51 (38, 64)	
Duration of RA	8.60±4.45	9.75±10.37	9.75±10.37	9.10±7.32	0.976
	10 (4, 14)	6 (2, 25)	6 (2, 25)	6.5 (1, 22)	
CPI	60.67±26.92	50±33.78	54.85±29.98	48.67±18.80	0.718
	53.33 (2, 100)	63.33 (0, 73)	60 (0, 97)	51.67 (20, 80)	
DS	38.67±17.26	44.17±31.43	44.17±31.43	45.33±27.41	0.945
	40 (13, 60)	51.67 (0, 73)	51.67 (0, 73)	48.33 (10, 90)	
DEP	1.63±0.983	1.23±0.661	1.23±0.661	1.85±0.746	0.568
	53.3 (0, 100)	1.33 (0.5, 1.8)	1.33 (0.5, 1.8)	1.95 (1, 2.8)	
NPS-included	1.87±0.761	1.52±0.559	1.52±0.559	1.88±0.970	0.920
	1.5 (1.33, 3.17)	1.46 (0.92, 2.25)	1.46 (0.92, 2.25)	1.54 (0.83, 3.25	
NPS-excluded	1.6±0.724	1.25±0.214	1.25±0.214	1.8±0.916	0.658
	1.43 (0.86, 2.71)	1.29 (1, 1.43)	1.29 (1, 1.43)	1.71 (0.43, 3.0)	

TMD=Temporomandibular disorder; J=Joint involvement; M=Muscular involvement; J+M=Joint and muscular involvement; RA=Rheumatoid arthritis; CPI=Characteristic pain intensity; DS=Disability score; DEP=Depression; NPS (included)=Nonspecific physical symptoms (pain items included); NPS (excluded)=Nonspecific physical symptoms (pain items excluded); SD=Standard deviation

Table 6: Functional rheumatologic score characterized by gender, treatment modality, temporomandibular joint involvement and CPG

	Count (%)				*P*
	0	1	2	3	
Gender					
Male	2 (18.2)	2 (18.2)	5 (45.5)	2 (18.2)	0.008
Female	0 (0)	25 (58.1)	16 (37.2)	2 (4.7)	
Treatment modality					
A-TNF	2 (11.8)	2 (11.8)	11 (64.7)	2 (11.8)	<0.001
DMARD	0 (0)	25 (67.6)	10 (27.0)	2 (5.4)	
TMD					
No TMD	0 (0)	2 (40.0)	3 (60.0)	0 (0)	0.603
J	0 (0)	1 (25.0)	2 (50.0)	1 (25.00	
M	2 (5.7)	19 (54.3)	11 (31.4)	3 (8.6)	
J+M	0 (0)	5 (50.0)	5 (50.0)	0 (0)	
CPG					
0	0 (0)	1 (50.0)	1 (50.0)	0 (0)	0.502
I	1 (7.7)	6 (46.2)	6 (46.2)	0 (0)	
II	0 (0)	5 (45.0)	6 (54.5)	0 (0)	
III	0 (0)	10 (58.8)	4 (23.5)	3 (17.6)	
IV	1 (9.1)	5 (45.5)	4 (36.4)	1 (9.1)	

TMD=Temporomandibular disorder; J=Joint involvement; M=Muscular involvement; J+M=Joint and muscular involvement; Anti-TNF=Anti-tumour necrosis factor; DMARD=Disease-modifying antirheumatic drugs; CPG=Chronic pain grade

When functional rheumatologic scores and muscular and/or joint involvement were considered, muscular involvement had the highest number of patients (n = 35) and distribution of these patients among the scores "0" to "3" were %5.7 (n = 2), %54.3 (n = 19), %31.4 (n = 11), %8.6 (n = 3), respectively [Table 6].

Discussion

The prevalence of TMJ involvement in patients with the rheumatic disease varies between 2% and 88%.[4-9,14] This value has been found to vary greatly depending on diagnostic criteria, and the population studied.[16] According to our study, the prevalence of TMD in RA patients was %90.7.

Pain, clicking and decreased movement of TMJ were frequent clinical findings of TMD.[4,16] In our study, %9.25 of patients had pain in joints, %40.7 had a deviation in mandibular movements and %29.6 had joint sounds as clicking (%22.2) and crepitation (%7.41). According to the radiographic evaluation, condylar resorptions were determined in 4 patients. Even TMJ is not affected directly by RA, due to psychological aspect of the chronic disease; masticatory muscles can be affected by clenching and grinding teeth. The results of this study support this statement.

Pain, disability and DEP have unique causes and consequences in addition to pathophysiologic bases of the pain condition. For this reason, the proposed RDC/TMD employs axis II to assess and classify the global severity of the pain condition in terms of pain intensity, pain-related disability, DEP, NPS.[3,17] These factors were evaluated in this study and there was no statistical difference between the patients. Thus, the effects of pain conditions for the patients enrolled to this study were similar.

When TMJ involvement considered, bilateral TMJ tenderness and swelling are seen. In early stages, there are few radiographic changes, but as the disease advances, the joint space becomes progressively narrower. In the end stage RA of the TMJ, due to joint space obliteration, an anterior open bite is seen.[4,7,9] Although four patients in this study had condylar resorption, their maximal mouth openings were not restricted. Also, none of the patients was in the end stage of RA of TMJ. This finding indicates that the clinical examination would, therefore, seem to be a suitable method in addition to screening of TMJ in suspecting TMD.

Rheumatoid arthritis is a generalized chronic inflammatory polyarticular connective tissue disease. Treatment for RA aims to reduce inflammation in the joints in order to relieve pain and prevent or slow the damage in joints.[18] DMARDs are typically used in all stages of RA in an effort to slow the disease, save the joints and other tissues from permanent damage. TNF-α are used in DMARD resistant patients.[18] Due to our study anti-TNF-α treatment modality was used in patients who had higher CPGs as shown in Figure 1.

Treatment of RA of the TMJ is similar to other joints. Nonsteroidal anti-inflammatory medications are used during the acute phase along with jaw exercises till the pain subsides. Trieger *et al*. reported the effect of arthrocentesis in the treatment of TMD in RA patients and concluded that this method is useful for short-term management of TMD symptoms.[19] Stabilization splint has an important role in the management of TMD patients. In future, the effect of stabilization splints on RA patients should be researched and should be aimed to show the change at TMD symptoms.

Pain is a subjective symptom and the declarations of the patients are related with socio-economical, cultural and psychological situations. Thus, a clinician who is interested in patients with chronic pain should evaluate the patient from a psychosocial perspective. Conti *et al*. compared the validity and reliability of Visual Analog Scale, numeric scale, and Behavior Rating Scale and reported that numeric scale was the best way in scoring the reproducible pain.[20] In this present study, questions scoring pain in the biobehavioral questionnaire (RDC/TMD) were in numeric scale.

Rheumatoid arthritis is usually seen in other joints prior to TMJ involvement. Thus both patient's complaint and

clinician's interest on TMJ involvement is subsequent than other joints. Because patient's complaint is always on the joint, which is affected commonly by RA, clinician can ignore TMJ evaluation. Authors recommend to the clinicians that signs and symptoms of TMD should be in the overall evaluation of RA patients.

Conclusion

Within the limits of this study, high prevalence of TMD in RA patients can be seen and tenderness of masticatory muscles was seen in almost all patients. Thus, clinicians should consider TMJ examination within the clinical evaluation.

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Conflicts of interest
There are no conflicts of interest.

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