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Does Temporomandibular Joint Pain have a Predictive Value for Temporomandibular Joint Internal Derangement in Fibromyalgia Patients? Magnetic Resonance Imaging Role in Diagnosis

Fibromyaljili Hastalarda Temporomandibular Eklem Ağrısı, Temporomandibular Eklem iç Düzensizlikleri için bir Belirteç Olabilir mi? Manyetik Rezonans Görüntülemenin Tanıdaki Rolü

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Abstract

Objective: The purpose of this study was to evaluate magnetic resonance imaging (MRI) findings of the temporomandibular joint (TMJ) in patients with temporomandibular disorders (TMDs) with and without fibromyalgia syndrome (FMS).

Materials and Methods: There 3 groups of TMJ included in this study: 1) patients diagnosed with FMS, 2) healthy patients with pain, and 3) healthy patients without pain. The MRI variables were disc/condyle relation (normal, anterior disc displacement with reduction, and anterior disc displacement without reduction) and joint effusion (absent, moderate, and severe). Pain was assessed using the visual analog scale (VAS). Significance was evaluated at the level of $p<0.05$.

Results: There was a significant relationship between disc/condyle relation and the prevalence of effusion in all groups ($p<0.05$). There was also a significant relationship between pain and the disk/condyle relationship and the grade of the effusion ($p<0.05$). The incidence of more severe effusion and anterior disc displacement without reduction in painful joints was significantly higher than in painless joints ($p<0.05$). In terms of VAS values, there was no significant difference between groups 1 and 2 ($p>0.05$). The MRI findings in group 2 were more dramatic than in the other groups.

Conclusion: This study demonstrated that based on the MRI findings of patients presenting with fibromyalgia, effusion severity increased as disc/condyle compatibility deteriorated, which is similar to patients presenting without fibromyalgia. In addition, it was found that the severity of pain did not indicate a more dramatic internal derangement and effusion.

Keywords: Fibromyalgia, temporomandibular disorders, magnetic resonance imaging

Öz

Amaç: Bu çalışmanın amacı, ağrı şikayeti bulunan ve temporomandibular eklem (TME) bozukluğu görülen fibromyalji teşhisi konmuş ve sağlıklı bireylerdeki manyetik rezonans görüntülüme (MRG) bulgularını değerlendirmektir.

Gereç ve Yöntemler: Bu çalışmaya 3 grup TME dahil edilmiş olup; 1) fibromyalji teşhisi konmuş hastalar, 2) ağrı şikayeti olan sağlıklı bireyler ve 3) ağrı olmayan sağlıklı bireylerde olarak belirlenmiştir. Disk/kondil ilişkisi (normal, redüksiyonlu ve redüksiyonsuz disk deplasmanı) ve efüzyon (yok, orta ve ciddi) MRG ile değerlendirilmiş olup ağrı bulgusu ise vizual analog skala (VAS) ile skorlanmıştır. İstatistiksel olarak anlamlılık değeri $p<0,05$ olarak belirlenmiştir.

Bulgular: Tüm gruplarda disk/kondil ilişkisi ile efüzyon prevalansı arasında anlamlı bir ilişki olduğu görülmüştür ($p<0,05$). Bunun yanı sıra ağrı ile disk/kondil ilişkisi ve efüzyon seviyesi arasında anlamlı bir ilişki bulunmaktadır ($p<0,05$). Ağrı görülen eklemlerde redüksiyonsuz disk deplasmanı ile şiddetli efüzyon görülme sıklığının ağrı görülmeyen bireylere göre anlamlı derecede fazla olduğu

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belirlenmiştir (p<0,05). Grup 1 ile grup 2 VAS değerleri arasında anlamlı bir farklılık görülmemektedir (p>0,05). Grup 2 MRG bulguları diğer gruplara göre daha dramatiktir.

Sonuç: Fibromyalji teşhisi konmuş bireylerin MRG bulgularına göre disk/kondil uyumu bozuldukça efüzyon şiddetinin de arttığı görülmüş olup bu durum, sağlıklı bireylerin TME MRG bulguları ile benzerlik göstermektedir. Bu çalışma ile fibromyalji görülen bireylerde ağrı şiddetinin; eklem içi bozukluk ve efüzyon şiddeti hakkında bir belirleyici olmadığı sonucuna varılmıştır.

Anahtar Kelimeler: Fibromyalji, temporomandibular eklem bozuklukları, manyetik rezonans görüntüleme

Introduction

Fibromyalgia syndrome (FMS) is a chronic musculoskeletal disorder characterized by generalized fatigue, pain, morning stiffness, sleep disturbances, psychological distress, a low pain threshold, and tender points (1,2). The prevalence of FMS ranges from 2 to 8%, and it is seen more frequently with advanced age (3,4). Pain in the craniofacial area has not traditionally been considered in the diagnosis of FMS. Nevertheless, FMS patients often have orofacial pain, including temporomandibular disorders (TMDs) (5).

TMD is defined as "an umbrella'' term that embraces a number of clinical problems that involve the masticatory muscles, the temporomandibular joints (TMJ) internal structures, and the associated structures" (6). Symptoms in patients with TMD can include pain, joint clicking, and limited mouth opening, or there may be no complaints.

Evaluation of TMD symptoms in patients with and without FMS has been discussed in previous studies (7,8), but the correlating magnetic resonance imaging (MRI) findings of TMJ in patients with and without FMS have not been fully examined. The aims of this study were: 1) evaluating the MRI findings of TMJ in TMD patients with and without FMS, and 2) comparing MRI findings of TMJ between the painful and nonpainful sides of each individual in the two groups.

Materials and Methods

This study was approved by the Clinical Research Ethics Committee of Uşak University (decision number: 173-01, date: 15.05.019). A total of 590 patients' data records were evaluated retrospectively. As a result, 295 of the patients with information from completed Diagnostic Criteria (DC) for TMD questionnaires and MRIs were available bilaterally (reference number: 173-01).

The inclusion criteria consisted of unilateral or bilateral painful TMD based on DC/TMD, patients aged 18 and over, and a diagnosis of FMS by the same physiatrist.

Clinical assessment of the patients was carried out according to the DC/TMD guidelines. The visual analog scale (VAS 0-10) was used to quantify pain. There were three groups:

Group 1: TMJ among patients diagnosed with FMS

Group 2: Painful TMJ among otherwise healthy patients

Group 3: Pain-free TMJ among otherwise healthy patients

The study by Koca et al. (9) guided the MRI application and evaluation protocol of this study (Figures 1, 2).

Statistical Analysis

The Number Cruncher Statistical System 2007 (Kaysville, Utah, USA) program was used for statistical analysis. The Mann-Whitney U test was used for two-group comparisons. The chi-square test was used to identify the relationships among qualitative data. Significance was evaluated at levels of p<0.05.

Cohen's kappa tests were used to determine the agreement between each analysis.

Results

Evaluation of the Relationship Between the Intragroup Disc Position and Effusion

There was a significant relationship between the disc/condylar relation and the prevalence of effusion in the patients in group 1, group 2 and group 3 (Table 1). In group 1, in cases presenting with severe effusion, a normal disc/condylar relationship was observed in four (2.3%) joints, anterior disc displacement with reduction (ADDwR) in 17 (10%) joints, and anterior disc displacement without reduction (ADDwoR) in 33 (19.5%) joints. A significant difference was found between those with a normal disc/condylar relationship with ADDwR and those with ADDwoR (p<0.05) (Table 1).

In group 2, in cases presenting without effusion, a normal disc/condylar relationship was observed in 18 (6.7%) joints, ADDwR in 20 (7.4%) joints, and ADDwoR in 16 (5.9%) joints. In cases presenting with severe effusion, a normal disc/condylar relationship was observed in five (1.9%) joints, ADDwR in 25 (9.3%) joints, and ADDwoR in 73 (27%) joints. While there was no statistically significant difference between the normal disc/condyle relationship and ADDwR (p>0.05), a significant difference was observed between the normal disc/condyle relationship and ADDwoR (p<0.05) (Table 1).

In group 3, in cases presenting without effusion, a normal disc/condylar relation was observed in 60 (40%) joints, ADDwR in 17 (11.3%) joints, and ADDwoR in three (2%) joints. In joints presenting with severe effusion, a normal disc/condylar relationship was observed in seven (4.7%) joints, ADDwR in 10 (6.7%) joints, and ADDwoR in 12 (8%) joints, and there were significant differences among the groups (p<0.05) (Table 1).

Effusion Comparison Among the Groups

No effusion was observed in 65 (11%) joints in group 1, in 54 (9.2%) joints in group 2, and in 80 (13.5%) joints in group 3. There was a statistically significant difference among the groups ($p<0.05$) (Table 2).

Moderate effusion was observed in 51 (8.6%) joints in group 1, 113 (19.1%) joints in group 2, and 41 (6.9%) joints in group 3. There was a statistically significant difference between group 2 and the other groups ($p<0.05$) (Table 2).

Severe effusion was observed in 54 (9.1%) joints in group 1, in 103 (17.4%) joints in group 2, and in 29 (4.9%) joints in group 3. There was a statistically significant difference between group 3 and the other groups ($p<0.05$) (Table 2).

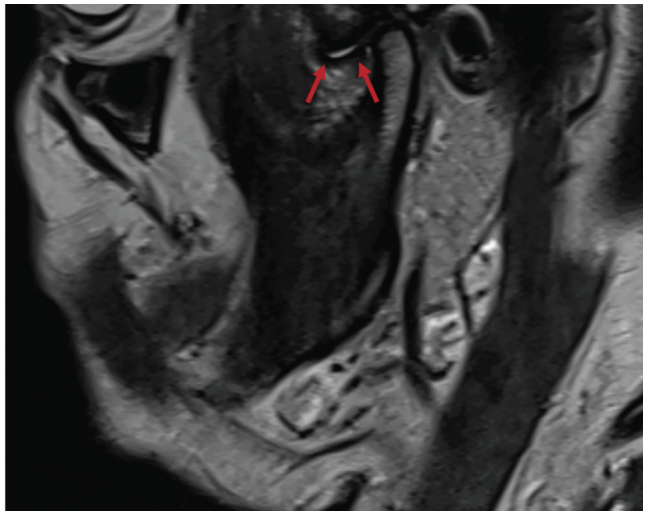

Figure 1. Moderate effusion image in the anterior joint space, it was taken with the mouth closed and T2 weighted. Indicated by a red arrow

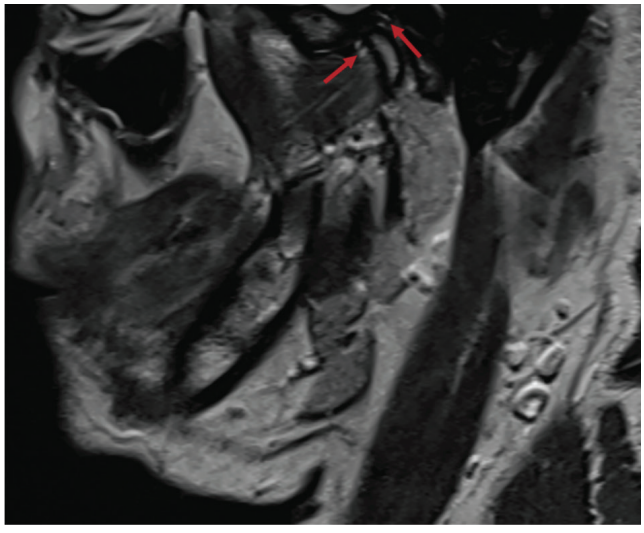

Figure 2. Severe effusion image in the lower and upper joint space, it was taken with the mouth closed and T2 weighted. Indicated by a red arrow

Comparison of the Disc/condyle Relationship among the Groups

A normal disc/condylar relation was observed in 35 (5.9%) joints in group 1, in 40 (6.8%) joints in group 2, and in 90 (15.2%) joints in group 3. There was a statistically significant difference between group 3 and the other groups ($p<0.05$) (Table 2).

VAS Comparisons among the Groups

No statistically significant difference was observed in terms of VAS scores between group 1 and group 2 ($p>0.05$) (Table 3).

Discussion

TMD is one of the major causes of nondental pain in the orofacial area (6). Pain involving the masticatory muscles in particular is considered a common symptom in FMS patients (5). Although the craniofacial area is not taken into consideration in the diagnosis of FMS, it has been shown that pain in the orofacial area usually originates from TMD (7,8). There are studies in the literature that have investigated the prevalence of FMS among TMD patients and reported different rates in this regard (5,7). A study by Leblebici et al. (7) reported that FMS was observed in 52% of patients diagnosed with TMD. Velly et al. (10) on the other hand, reported that 11% of patients with TMD had a diagnosis of FMS. The present study found that 28.8% of 295 patients with TMD had a diagnosis of FMS.

Numerous studies have reported that FMS is more prevalent in women (11,12). The present study revealed that all patients diagnosed with FMS were women, which is consistent with the literature (1,8). In addition, to eliminate the differences between sexes, the other groups only included women, because all individuals in group 1 were women.

Many studies in the literature have evaluated the connection between the disc/condylar relationship and effusion in cases with TMD and have offered different views on this subject. A relationship between disc position and effusion is hypothesized since the TMD etiopathogenesis remains unclear (13). The cause of an effusion may be a response to trauma or an inflammatory reaction (14). Many studies have argued that there is a significant relationship between anterior disc displacement and the prevalence of effusion (15,16). Regarding the relationship between effusion and disc position, Larheim et al. (17), Manfredini et al. (18), and Orlando et al. (19) reported that the mechanical pressure occurring due to disc position causes the release of inflammatory mediators, which in turn may result in effusion. In the present study, when an internal assessment independent of pain was made in all groups, it was found that as the effusion severity increased, the normal disc/condylar relationship deteriorated, and the prevalence of ADDwoR increased. A significant relationship was observed between ADDwoR and the prevalence of severe effusion. The study conducted by Hoşgör showed an increase in the

prevalence of ADDwoR with increasing effusion severity, and it is safe to say that the findings of the present study are compatible with the previous literature (16). In other words, the relationship between effusion and the disc/condyle relationship has symptoms in joints with fibromyalgia that are similar to joints without fibromyalgia.

In TMD studies, the relationship between disc position and effusion has promoted the argument that pain may be a clinical symptom. In the present study, group 1 and group 2 was significantly less common than that in group 3, while the prevalence of ADDwoR was significantly higher. The absence of effusion was significantly less common than in group 1 and group 2 than in group 3, while the prevalence of severe effusion was significantly higher. A study conducted by Pinto et al. (20) evaluated the relationship between pain factors and disc position and effusion. It was found that an excessive mechanical load caused by disc displacement can result in the release of inflammatory mediators into the articular disc and retrodiscal spaces and form effusions in the synovial membrane, which in turn can cause pain. Many studies have evaluated the disc position, effusion, and pain, and they suggested that the presence or severity of effusion has a clinically significant relationship with pain (16,21). Conversely, many studies in the literature argue

Table 1. Relationship between disc/condyle relation and effusion values in group 1, group 2 and group 3

Effusion in groups	Disc/condyle relation				p-value
		Normal	ADDwR	ADDwoR	
Group 1	No	20[a] (11.7%)	39[a] (22.9%)	6[b] (3.5%)	0.001**
	Moderate	11[a] (6.5%)	23[a] (13.6%)	17[a] (10.1%)	
	Severe	4[a] (2.4%)	17[a] (10.1%)	33[b] (19.5%)	
Group 2	No	18[a] (6.7%)	20[b] (7.4%)	16[b] (5.9%)	0.001**
	Moderate	17[a] (6.3%)	45[a] (16.7%)	51[a] (18.9%)	
	Severe	5[a] (1.9%)	25[a] (9.3%)	73[b] (27%)	
Group 3	No	60[a] (40%)	17[b] (11.3%)	3[b] (2%)	0.001**
	Moderate	23[a] (15.3%)	13[a] (8.7%)	5[a] (3.3%)	
	Severe	7[a] (4.7%)	10[b] (6.7%)	12[c] (8%)	

[a,b,c]Lettering of post-hoc tests, Chi-square **p<0.01, Normal: Normal disc/condyle relation, ADDwR: Anterior disc displacement with reduction, ADDwoR: Anterior disc displacement without reduction

Table 2. Comparison of effusion value and disc/condyle relation among groups

	Groups				p-value
		Group 1	Group 2	Group 3	
Effusion	No	65[c] (11%)	54[a] (9.2%)	80[b] (13.5%)	0.001*
	Moderate	51[b] (8.6%)	113[a] (19.1%)	41[b] (6.9%)	
	Severe	54[a] (9.1%)	103[a] (17.4%)	29[b] (4.9%)	
Disc/condyle relation		Group 1	Group 2	Group 3	0.001*
	Normal	35[a] (5.9%)	40[a] (6.8%)	90[b] (15.2%)	
	ADDwR	79[a] (13.3%)	90[a] (15.2%)	40[b] (6.8%)	
	ADDwoR	56[c] (9.4%)	140[a] (23.7%)	20[b] (3.4%)	

[a,b,c]Lettering of post-hoc tests, Chi-square **p<0.01, Normal: Normal disc/condyle relation, ADDwR: Anterior disc displacement with reduction, ADDwoR: Anterior disc displacement without reduction

Table 3. Comparison of VAS values between group 1 and group 2

Groups	n	mean ± SD	min-max (median)
Group 1	170	6.84±0.59	6-8 (7)
Group 2	270	6.84±1.28	4-9 (7)

Mann-Whitney U test, *p<0.05, **p<0.01, SD: Standard deviation, min-max: Minimum-maximum

that there is no significant relationship between effusion, the disc/condyle relationship, and pain (22,23). The findings of the present study found significant relationships among the disc/condyle relation, effusion, and, pain which is compatible with some of the literature.

Although there was no significant difference in VAS scores between groups, a more dramatic picture was seen in joints presenting with pain in group 2. In other words, in group 2, the MRI findings were more dramatic than group 1. Among the possible causes of this condition are the lower pain thresholds of FMS patients, which may result in higher pain expression on the VAS. In addition, since the patients presenting with FMS did not have ample joint movement due to sensitive points in their masticatory muscles, the fact that a destructive effect on the joint does not occur as frequently in non-FMS patients can also be listed among the possible causes (24).

There are numerous studies in the literature evaluating the relationship between FMS and TMD. They reported a substantial prevalence of TMD in FMS patients, and the most relevant reason for this was muscular factors (25). However, these studies used only RDC/TMD for the diagnosis and evaluation of TMD. The use of MRI in the present study allowed for observations of changes in the disc/condyle relation and synovial fluid. This also allowed the present study to observe the effusion and internal derangement in cases that were asymptomatic in terms of pain. For that reason, identifying the cause of TMD as being of muscular origin in individuals presenting with FMS in previous studies that did not use MRI may have resulted in a failure to detect the presence of intra-articular internal derangements and effusion. As a result, asymptomatic cases may have gone undetected. In the literature, there is only one study conducted by Leblebici et al. (7) in which cases of TMD presenting with FMS were evaluated with MRI. They concluded that among the causes of TMD in FMS patients, those of muscle and arthrogenic origin were significantly more relevant than those of arthrogenic origin only. However, they only evaluated 52 patients and, unlike the present study, did not address the disc position and effusion or evaluate any cause and effect relationships.

Conclusion

The present study has shown that based on the MRI findings of patients presenting with FMS, the effusion severity increased as the disc/condyle compatibility deteriorated, which is similar to patients presenting without fibromyalgia. Additionally, it can be said that the severity of pain did not indicate more dramatic internal derangement and effusion in FMS individuals. The fact that the prognosis of intra-articular findings in patients presenting with fibromyalgia was better than that of healthy patients is another important finding of this study.

The authors of this study believe that future studies evaluating synovial fluid in terms of inflammatory mediators and proteins and discussing it along with the clinical symptoms in cases presenting with and without fibromyalgia will light the way for other studies to be conducted on this subject.

Ethics

Ethics Committee Approval: This study was approved by the Clinical Research Ethics Committee of Uşak University (decision number: 173-01, date: 15.05.019).

Informed Consent: Retrospective study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: C.G.K., G.P., Concept: C.G.K., G.P., Design: C.G.K., G.P., Data Collection or Processing: C.G.K., M.K., Analysis or Interpretation: C.G.K., M.K., Literature Search: C.G.K., M.K., Writing: C.G.K., M.K.

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