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Comparison of Clinical Findings in Temporomandibular Disorders and Bruxism: An Observational Study

Temporomandibular Bozukluklar ve Bruksizmde Klinik Bulguların Karşılaştırılması: Gözlemsel Bir Çalışma

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Abstract

Aim Temporomandibular joint disorders (TMD) are complex disorders affecting the temporomandibu-lar joint (TMJ), masticatory muscles and related structures, often causing severe pain and functional limitations. This study aimed to compare clinical findings among three TMD subtypes (osteoarthritis [OA], disc displacement with reduction [DDWR], and disc displacement without reduction [DDWoR]) and bruxism, and to evaluate the prevalence and characteristics of tinnitus in these groups.

Materials and Methods A retrospective cross-sectional study was conducted on 97 patients with primary diagnoses of OA, DDWR, DDWoR or Bruxism. Clinical parameters evaluated included impairment in daily activities, masticatory pain and efficiency, joint sounds, muscle palpation scores, maximal mouth opening and presence of tinnitus. Data were statistically analyzed by accepting the significance level as $p<0.05$.

Results DDWoR patients showed the highest levels of impairment in daily activities, chewing pain, and decreased maximal mouth opening. Bruxism patients had the highest masseter palpation scores and tinnitus prevalence. Joint sounds were most prominent in the DDWR group. OA patients exhibited intermediate scores, higher than those of the DDWoR and bruxism groups, but significantly lower than those of the DDWR group. No significant difference was found between the groups in temporal palpation scores.

Conclusions This study evaluates the effects of different TMD subtypes and bruxism on clinical findings, revealing the unique symptom profiles and common features of these diseases. The findings emphasize the importance of individualized approaches in TMD diagnosis and treatment processes. In particular, the relationship between bruxism and tinnitus and the significant effect of DDWoR on daily life activities may contribute to the development of more targeted treatment strategies. The development of such studies will help clinicians provide more appropriate and effective solutions to the needs of patients.

Keywords Bruxism, clinical findings, TMJ

Öz

Amaç *Temporomandibular eklem bozuklukları (TMB), temporomandibular eklemi (TME), çiğneme kaslarını ve ilişkili yapıları etkileyen, sıklıkla şiddetli ağrı ve fonksiyonel kısıtlılıklara yol açan karmaşık hastalıklardır. Bu çalışma, üç TMB alt grubu (osteoartrit [OA], redüksiyonlu disk deplasmanı [DDRlu] ve redüksiyonsuz disk deplasmanı [DDRsuz]) ile bruksizmin klinik bulgularını karşılaştırmayı ve bu gruplarda tinnitusun prevalansını ve karakteristik özelliklerini değerlendirmeyi amaçladı.*

Gereç ve Yöntem *Primer tanısı OA, DDRlu, DDRsuz veya Bruksizm olan toplam 97 hasta üzerinde retrospektif kesitsel bir çalışma gerçekleştirildi. Değerlendirilen klinik parametreler arasında günlük aktivitelerde bozulma, çiğneme sırasında ağrı ve çiğneme etkinliği, eklem sesleri, kas palpasyon skorları, maksimum ağız açıklığı ve tinnitus varlığı yer aldı. Veriler istatistiksel olarak analiz edildi ve anlamlılık düzeyi $p<0,05$ olarak kabul edildi.*

Bulgular *DDRsuz hastalarında günlük aktivitede bozulma, çiğneme ağrısı ve azalmış maksimum ağız açıklığı en yüksek seviyede bulundu. Bruksizm hastaları ise en yüksek masseter palpasyon skorları ve tinnitus prevalansına sahipti. Eklem sesleri en belirgin olarak DDWR grubunda gözlenmiştir. OA hastaları ise orta düzeyde skorlar sergilemiş olup, DDWoR ve Bruksizm gruplarından daha yüksek, fakat DDWR grubundan anlamlı derecede daha düşük değerler göstermiştir.. Gruplar arasında temporal kas palpasyon skorları açısından anlamlı bir fark bulunmadı.*

Sonuç *Bu çalışma, farklı TMB alt tipleri ile bruksizmin klinik bulgular üzerindeki etkilerini değerlendirmekte ve bu hastalıkların kendine özgü semptom profillerini ve ortak özelliklerini ortaya koymaktadır. Bulgular, TMB tanı ve tedavi süreçlerinde bireyselleştirilmiş yaklaşımların önemini vurgulamaktadır. Özellikle Bruksizm ve tinnitus arasındaki ilişki ile DDRsuz'un günlük yaşam aktiviteleri üzerindeki belirgin etkisi, daha hedeflenmiş tedavi stratejilerinin geliştirilmesine katkı sağlayabilir. Bu tür çalışmaların geliştirilmesi, klinisyenlerin hastaların ihtiyaçlarına daha uygun ve etkili çözümler sunmasına yardımcı olacaktır.*

Anahtar Kelimeler *Bruksizm, klinik bulgular, TME*

INTRODUCTION

The teomporomandibular joint (TMJ) is a diarthrodial joint located between the mandibular fossa and the mandibular condyle and just in front of the external auditory canal. The masticatory muscles are responsible for the movement of this joint and diseases of this joint are characterized by joint, masticatory muscle and craniofacial pain.[1]

Temporomandibular disorders (TMDs) are a leading cause of non-dental pain in the maxillofacial region. These disorders involve the TMJ and surrounding anatomical structures, encompassing conditions such as joint space irregularities, myofascial pain, and degenerative changes. Symptoms of TMDs are of variable character. These symptoms include limited maximum mouth opening , headache, clicking, ear pain and muscle tenderness. TMJ imaging along with clinical examination are commonly used methods for diagnosis.[2]

The prevalence of TMDs in adults ranges from 5% to 12% and clinical symptoms vary. Due to the variability of these clinical manifestations, it would be valuable to identify specific diagnostic criteria to guide to dealing with TMDs from begin-ning to end. The Diagnostic Criteria for Temporomandibular Disorders (DC/TMD), remains the most widely used diagnostic guideline for TMDs to this day. Nevertheless, research on the subject has continued to expand, with advances being made in areas such as etiology.[3]

The diagnosis of TMD is usually based on history, physical examination and different imaging modalities, but is difficult even for the most experienced practitioner due to the combination of symptoms between different disorders. The DC/TMD, published in 2014, is a reliable tool for the diagnosis of TMD that includes two axes. Axis-I includes clinical and radiographic diagnostic criteria, while Axis-II focuses on the assessment of psy-chosocial status and pain-related disabilities.[4]

Temporomandibular joint disorders include not only internal irregularities but also myofascial functional problems. TMJ internal derangements are characterized by abnormal disc-chondyle relationships, while degenerative changes have been reported to result from abnormal remodeling due to overload. Myofascial pain is defined as a myogenous pain condition characterized by trigger points.[5]

The American Academy of Orofacial Pain describes TMDs as a broad category of conditions affecting the masticatory muscles, TMJ, and related structures. Key clinical characteristics include pain localized to the TMJ and adjacent tissues, impaired mandibular function, restricted or painful jaw movement, joint sounds, and jaw locking. Tinnitus, on the other hand, refers to the perception of sound in the absence of an external source, and this condition exhibits variability in its sensory features, underlying causes, and associated health conditions.[6-8]

As with many diseases, early diagnosis and treatment of TMDs provides a favorable prognosis. Therefore, recognizing signs or symptoms associated with TMD during rou-tine examination is of great importance for early detection and improving the patient's prognosis.[9]

In addition to the well-known clinical features of TMDs, these condi-tions present a wide range of symptoms that can complicate the clinical picture. The aim of this study was to compare the clinical features of three temporomandibular joint (TMJ) subtypes osteoarthritis, disc displacement with reduction, and disc displacement without reductionand bruxism, by evaluating various clinical parameters across these groups. With this comparative approach, we aim to gain a deeper understanding of the unique characteristics of each TMD subgroup and contribute to the development of more targeted diagnostic and treatment strategies.

MATERIALS and METHODS

This retrospective cross-sectional study was conducted at Harran University Hospital, Turkey, and included a total of 97 patients. Among these, osteoarthritis (OA), disc displacement with reduction (DDWR), and disc displacement without reduction (DDWoR) were diagnosed in accordance with the DC/TMD protocol. In addition, bruxism was diagnosed based on patient self-reports and/or clinical findings, as determined from the primary complaint recorded during the initial clinical evaluation. None of the patients had undergone any invasive interventions within the six months preceding the assessment. Initially, a total of 122 patients were evaluated in this study; however, 12 patients were excluded due to the absence of informed consent, and 13 patients were excluded due to missing data and measurements in their records, resulting in a final analysis conducted on 97 patients. The research was designed retrospectively by examining patient records maintained in the Oral and Maxillofacial Surgery Department. Participants were notified about the potential use of their data in future research and provided written consent for inclusion in the study. The study population included all individuals seeking evaluation and management for the aforementioned three types of TMD and Bruxism.

All participants met the following inclusion criteria: (1) OA, DDWR and DDWoR diagnosed on the basis of clinical and/or imaging evaluations in accordance with the DC/TMD protocol and diagnosis of bruxism based on patient selfreport and/or clinical findings (2) no interventional treatment within the last 6 months; and (3) complete patient file information. Exclusion criteria were (1) history of interventional procedures such as joint surgery, arthrocentesis; (2) conservative treatment within 6 months of the arthrocentesis procedure; (3) prior or current malignant disease in the head and neck region; (4) and (5) insufficient medical and demographic data. Clinical findings evaluated were Disruption in daily activities, Chewing pain, Chewing efficiency, Joint sounds, Masseter palpation scores, Temporal palpation scores, Current pain score, Maximal mouth opening and presence of tinnitus.

This study aims to assess the impact of various TMJ conditions on patients and to compare clinical parameters across these disorders. Age and gender distributions were recorded and evaluated for standardization of disease groups. Disruption in daily activities was measured with the VAS-1 scale as whether the patient could not perform his/her daily routine activities or whether this situation was impaired. Chewing pain and efficiency; was recorded with the VAS-1 scale by asking the degree of pain during chewing and the hardness of the chewed food (0 represented a liquid diet and 100 represented the ability to eat everything).Joint sounds; joint sounds were evaluated with the VAS-1 scale as 0 no sound and 100 continuous sound with movement. Current pain score; was measured using the VAS-1 scale ranging from 0 (no pain) to 100 (severe pain). Masseter and temporal palpation scores were measured using the VAS-2 scale, which is graded from 0 to 10, by applying light pressure to the relevant muscles and recording the patient's pain level. The masseter palpation score was created by adding the right and left scores, and statistics were made on this score. Maximal mouth opening was recorded in millimeters as the value measured with the help of a caliper at the maximum mouth opening between the reference points of the patients' incisal teeth. This mouth opening was the maximum mouth opening that the patient could open without assistance, even if he felt pain. The presence of tinnitus was recorded based on the patients' declaration of presence or absence, regardless of whether it was unilateral or bilateral.

RESULTS

In this retrospective crosssectional study of 97 patients diagnosed with OA, DDWR, DDWoR and Bruxism, gender and age distribution did not show a statistically significant difference between the groups, as shown in Table 1 (p=0.949, p=0.714).

Disruption in daily activities: DDWoR patients showed

the highest levels of disruption (48.14 ± 5.55), significantly higher than the OA and bruxism groups (p=0.001), while the DDWR group also had higher scores than OA and bruxism but did not differ from the DDWoR group.

Chewing pain: Patients in the DDWoR group reported the most chewing pain (73.29 ± 4.42), significantly higher than other groups (p=0.001), followed by the DDWR group. Bruxism patients had the least chewing pain.

Chewing efficiency: Bruxism patients had lower chewing efficiency (27.50 ± 6.48) without any statitically significancy compared to the other groups (p=0.195).

Joint sounds: DDWR patients had the highest joint sound scores (80.40 ± 5.72), significantly greater than DDWoR and bruxism groups (p=0.000). OA patients (49.29 ± 8.12) showed intermediate values, without significant difference compared to the other groups.

Masseter palpation scores: Bruxism patients had significantly higher masseter palpa-tion scores (12.56 ± 1.24) compared to other groups (p=0.008), indicating more tenderness in the masseter muscles. In contrast to masseter palpation scores, no statistically significant difference was observed between the groups in temporal muscle palpation scores (p=0.719).

Current pain score: While the DDWoR group reported higher current pain scores, no statistically significant differences were found between the groups (p=0.126).

Maximal mouth opening: DDWoR patients had significantly lower maximal mouth opening (27.74 ± 1.03 mm) compared to the other groups (p=0.000).

Tinnitus: Bruxism patients reported the highest incidence of tinnitus (68.75%), signifi-cantly higher than in the other groups (p=0.004).

Statistical analyses were performed using SPSS version 20.0 (IBM Corp., Armonk, NY, USA). The normality of continuous variables was assessed with the Shapiro–Wilk and Kolmogorov–Smirnov tests, which indicated that the data were not normally distributed. Therefore, continuous variables were compared among groups using the Kruskal–Wallis test, and Bonferroni-adjusted pairwise comparisons were applied when significant differences were detected. Categorical variables, such as sex distribution and tinnitus prevalence, were analyzed using the chi-square test. A p-value of less than 0.05 was considered statistically significant.

DISCUSSION

TMD is an umbrella term for different types of disorders and symptoms of the stoma-tognathic system, including various diagnoses with different backgrounds and patho-physiology. In epidemiologic evaluations of loss of function and pain symptoms in the affected area, approximately 10% of the population, with a female predominance, has been reported to exhibit these symptoms.[10] The primary aim of this study was to evaluate the clinical impact of different TMDs and to compare various clinical parameters between these disorders. Inclusion criteria required a confirmed diagnosis of TMD based on clinical and imaging evaluations, complete patient files, and no interventional treatment within the last six months. Clinical parameters such as disruption in daily activities, chewing pain, chewing efficiency, joint sounds, masseter and temporal palpation scores, current pain levels, maximal mouth opening, and the presence of tinnitus were evaluated.

In our study, when the gender and mean age distributions between the disease groups were evaluated, it was noted that there was no difference between the groups in these variables (p>0.05). It can be said that this result provides sufficient criteria in terms of subject homogenization and increases the reliability of the study results.

The findings of our study include the evaluation of TMD

Table 1. Statistical Analysis for Whole Study

Tmd Types									
	Osteoarthritis (n 21)		DDWR (n 25)		DDWoR (n 35)		Bruxism (n 16)		P value
Sex distrubution	Male	Female	Male	Female	Male	Female	Male	Female	.949 a
	3	18	4	21	7	28	3	13	
Age distribution	32.29±14.91		30.24±11.08		29.89±9.46		35.00±13.20		.714 b
Disruption in daily activities	19.05±27.36 x		29.64±27.58 x y		48.14±32.87 y		18.13±22.27 x		**.001 c**
Chewing pain	52.86±35.65 x y		62.60±30.41 y		73.29±26.20 y		34.06±27.88 x		**.001 c**
Chewing efficiency	48.05±29.12		41.20±26.19		42.29±33.63		27.50±25.94		.195 b
Joint sounds	49.29±37.22 x y		80.40±28.64 y		24.86±33.63 x		17.81±28.10 x		**.000 c**
Masseter palpation scores	5.66±5.78 x		6.84 ±7.12 x		6.94±6.69 x		12.56±4.99 y		**.008 c**
Temporal palpation scores	3.66±6.83		3.88±6.72		4.74±7.07		5.62±6.58		.719 b
Current pain score	33.33±36.24		41.40±32.35		43.86±35.45		22.50±22.94		.126 b
Maximal mouth opening	32.92±8.27 x		34.29±11.94 x		27.74±6.10 y		39.50±7.97 x		**.000 c**
Tinnitus presence	%19,05 x		%28 x		%22.86 x		%68.75 y		0.004 a

a Chi square test
b Kruskal Wallis test
c Kruskal Wallis test with pairwise comparison including Bonferroni correction

subtypes and bruxism, as well as detailed analysis of quality of life and various clinical parameters. Our study results showed that patients with DDWoR experienced the most masticatory pain and the highest level of impairment in daily activities. This result is consistent with previous studies that have identified DDWoR as one of the most debilitating forms of TMD due to its progressive nature and associated limited mandibular range of motion.[2,11,12]

As previously stated in the literature[13] the DDWoR patient group has negative effects on daily function and quality of life due to limited jaw movement, discomfort and pain. Our study results are also parallel to this information. The DDWoR disease group caused the most impairment in daily activities. While the difference between the DDWoR and OA and Bruxism groups in daily activity impairment values was significant, the difference was not significant, although the impairment was greater in the DDWR and DDWoR groups. We believe that these results indicate that disc displacements cause more problems in the patient's daily activities.

In the clinical study conducted by Kraus et al.[14] on DDWoR patients, the top three questions that received the most responses in patient feedback were whether physio-therapy helped with jaw pain/tension, limited mouth opening, and pain during chewing. We believe that these responses are the ways in which this type of disease affects impairments in daily activities.

According to our research, it was determined that the patients in the DDWR group exhibited the highest scores in terms of joint sounds. This finding, which indicates the presence of disc movement and structural instability in the joint; confirms the idea that audible clicks occurring during the reduction of the disc position in patients with DDWR are quite common and may be perceived as dis-turbing by the patients. On the other hand, the lower frequency of joint sounds in bruxism patients suggests that disc displacement or movement is less common in this group, whereas OA patients showed intermediate levels, higher than DDWoR and bruxism but lower than DDWR.

Mainieri et al.[15] reported in a clinical study on bruxism patients that masseter muscle activity did not show any correlation with the signs and symptoms of TMD's, and that

they detected very high rates of masseter palpation scores in bruxism patients, either unilaterally or bilaterally, in line with our study.

The highest masseter palpation scores recorded in the bruxism group indicate that overuse of the jaw muscles and muscle fatigue are frequently seen in these patients. This situation can be directly associated with muscle-related pain and fatigue symptoms clinically. On the other hand, the fact that temporal muscle palpation scores did not show a statistically significant difference between the groups suggests that brux-ism mainly affects the masseter muscles and the temporal muscles are less affected by this process.

A cross-sectional clinical study conducted by Mejersjö et al.[10] examined the frequency of ear symptoms in patients with TMDs and the relationship of these symptoms with TMD in 132 patients diagnosed with TMD. The findings showed that 72% of TMD patients reported ear symptoms and Ear symptoms were significantly associated with muscle pain, TMJ pain, decreased mouth opening capacity, parafunctions and some occlusal factors. In addition, muscle pain on palpation was found to be more pronounced on the same side as ear symptoms. In conclusion, ear symptoms are common in TMD patients and are closely related to parafunctions and muscle pain.

An additional noteworthy aspect of our study is the evaluation of tinnitus. In the broader context of temporomandibular disorders (TMD), otologic symptoms are commonly observed, and these manifestations have been linked to oral parafunctional habits as well as to tenderness of masticatory muscles on the symptomatic side. [10] Our observations are consistent with this relationship and suggest that TMD-related neuromuscular alterations may play a role in ear complaints. Although the prevalence of tinnitus appears to differ among clinical subgroups, our data do not permit causal inferences for specific TMD categories; instead, they highlight heterogeneity in the underlying mechanisms and the importance of subgroup-focused analyses.

Fernandes et al.[16] in their study investigating the relationship between painful TMDs, bruxism and tinnitus, noted that there was a strong relationship between painful TMD and tinnitus (OR=7.3) and that this relationship was lower in bruxism. However, our study showed that the prevalence of tinnitus was higher in the bruxism group (68.75%, p=0.000) and that bruxism may be a more significant risk factor for tinnitus. In addition, while Fernandes' study classified TMD only as painful and painless, our study examined TMD in four subgroups as OA, DDWR, DDWoR and bruxism, revealing more specific clinical effects of the diseases. On the other hand, Fernandes et al. stated that the risk of tinnitus increases even more in cases where bruxism is present together with painful TMDs. This finding is consistent with the high tinnitus rates in the bruxism group in our study, suggesting that these two conditions may have a common neurological or mechanical basis. However, the fact that tinnitus and bruxism assessments in both studies were based on selfreporting and clinical criteria stands out as a factor limiting the objectivity of the results obtained. The high prevalence of tinnitus in bruxism indicates that this symptom should be evaluated more carefully during the diagnosis and treatment process.

Due to the complex structure of TMD's, our clinical evaluation based on primary diagnoses is extremely important in terms of evaluating the clinical symptoms that patients show in addition to their primary diagnoses based on the complaint that brought the patient to the clinic.

Certain limitations should be acknowledged in this study. Firstly, the retrospective and cross-sectional design inherently restricts the ability to establish causal relationships among TMDs and bruxism, and associated clinical symptoms. Symptom assessments relying on medical records and patient self-reports might introduce recall bias, particularly affecting subjective measurements such as pain

intensity and tinnitus. Although the sample size was sufficient for preliminary observations, it may limit the generalizability of the findings to broader populations. Additionally, several potentially confounding factors known to influence TMD and bruxism, such as psychological stress and other parafunctional habits, were not evaluated in this study. Future research involving larger, diverse populations and utilizing prospective longitudinal designs would be valuable to clarify the intricate relationships between TMD, bruxism, and related clinical outcomes.

CONCLUSIONS

In conclusion, this study provides data that can enable the development of more targeted and specific treatment strategies in the management of these disorders by con-sidering the effects of different TMD subtypes and Bruxism, which is very closely related to TMD, on certain clinical parameters with a comparative approach. We believe that such findings can help clinicians adopt more comprehensive and personalized approaches when creating treatment plans and contribute to the provision of more effective solutions in patient management.

List of Abbreviations

TMJ: Temporomandibular Joint
TMD: Temporomandibular Disorders
OA: Osteoarthritis
DDWR: Disc Displacement with Reduction
DDWoR: Disc Displacement without Reduction
VAS: Visual Analog Scale
DC/TMD: Diagnostic Criteria for Temporomandibular Disorders

Informed Consent Statement:"Informed consent was obtained from all subjects involved in the study."

Ethics Approval

The study was conducted in accordance with the Declaration of Helsinki and approved by the Clinical Research Ethics Committee of Harran University with a protocol code HRU/24.19.23

Peer-review

Externally and internally peer-reviewed.

Authorship Contributions

MEP contributed to all controbution roles.

Conflicts of Interest

None declared.

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