RESEARCH

Is There a Relation Between Post-Canine Tooth Loss and Clinical Manifestations Of Temporomandibular Disorder?

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ABSTRACT

Is There a Relation Between Post-Canine Tooth Loss and Clinical Manifestations Of Temporomandibular Disorder?

Background: To investigate the association between the clinical symptoms of temporomandibular disorders (TMDs) and the loss of post-canine teeth.

Methods: This retrospective study was conducted on the patients who had admitted with the complaints of limitation in mouth opening, pain, locking, joint sound and disability in chewing related with the temporomandibular joint (TMJ).

Results: 212 patients (187 females and 25 males; mean age 32.35±13.40 years), who fulfilled the inclusion criteria, were enrolled in this clinical study. The difference between the patients without tooth loss, with 1-5 missing teeth, and with ≥ 6 missing teeth, in terms of the symptoms were significant except locking. Regarding the number of quadrants with missing teeth significant differences were observed in terms of pain, TMJ sound and disability in chewing. Also, a significant correlation observed between the number of missing teeth with pain and disability in chewing.

Conclusion: The result of this study suggests that an increasing number of missing teeth and the quadrants with missing teeth seem to increase the clinical symptoms of TMDs. However, to draw clear conclusions more prospective clinical studies which include distribution of tooth loss, the duration of reduced molar support, radiographical evaluation of TMJ and socio-economic factors should be conducted.

KEYWORDS

Molar support, Shortened dental arch, Pathologic loading

ÖZ

Kanin Sonrası Diş Kaybı İle Temporomandibular Eklem Disfonksiyonunun Klinik Bulguları Arasında Bir İlişki Var Mı?

Amaç: Temporomandibular Eklem Disfonksiyonlarının (TED) klinik semptomları ve kanin sonrası diş kaybı arasındaki ilişkiyi araştırmaktır.

Gereç ve Yöntemler: Bu retrospektif çalışma, temporomandibular eklem (TME) ile ilgili çiğnemede zorluk, ağrı, kilitleme, eklem sesi ve ağız açıklığında kısıtlılık şikâyeti ile başvuran hastalar üzerinde yürütülmüştür.

Bulgular: Bu klinik çalışmaya dahil edilme kriterlerini sağlayan 212 hasta (187 kadın ve 25 erkek; ort. yaş 32,35 ± 13,40 yıl) dahil edildi. Diş kaybı olmayan, 1-5 eksik dişi olan ve ≥ 6 eksik dişi bulunan hastalar arasında semptomlar açısından farklılık kilitlenme dışında anlamlıydı. Eksik diş olan kadranların sayısı açısından ağrı, TME sesi ve çiğnemede zorluk açısından anlamlı farklılıklar gözlendi. Ayrıca, eksik diş sayısı ile çiğnemede zorluk ve ağrı arasında da anlamlı bir ilişki olduğu gözlendi.

Sonuç: Bu çalışmanın sonucu, eksik dişlerin ve eksik dişli kadranların sayısındaki artışın TED'in klinik semptomlarını arttırdığını göstermektedir. Bununla birlikte, net sonuçlara varmak için, diş kaybının dağılımını, azalmış molar desteğinin süresini, TME'nin radyografik değerlendirmesini ve sosyo-ekonomik faktörleri içeren daha ileri prospektif klinik çalışmalar yapılmalıdır.

ANAHTAR KELİMELER

Molar destek, Kısa dental ark, Patolojik yükleme

The term Temporomandibular Disorders (TMDs) is representing a wide range of functional disabilities and the pathological conditions that can affect all components of the masticatory system.[1,2] Although the etiology of TMDs is not clearly understood, studies have shown that the etiology is multifactorial and may include changes in occlusion, incompatible and incorrect prosthesis, trauma, parafunctional activities, degenerative diseases, psychological, emotional factors, and missing teeth.[3-6]

Controversies exist regarding the association between missing teeth and TMDs in the literature. While some studies have suggested the presence of a link between missing teeth and TMDs[3,7,8], others claimed that clinically no significant differences exist between patients with and without missing teeth in terms of symptoms of TMDs.[9,10] Therefore, the aim of this study is to investigate the association between missing post-canine teeth and clinical symptoms of TMDs.

MATERIAL AND METHODS

This single-center, retrospective clinical study was conducted at the Department of Oral and Maxillofacial Surgery of Ordu University, between April 2017 and August 2019 with the approval of Institutional Review Board of Ordu University (protocol number: 2019-123). Data of the patients who had admitted to the clinic with TMJ complaint were retrieved from the archival records. From the chart review systemically healthy patients who had at least one of the clinical symptoms

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among pain, joint sound, locking, limited mouth opening and disability in chewing that detected during first clinical examination, were included in the present study. Patients who had a history of oral facial trauma or degenerative injury of TMJ, had a parafunctional habit, had a psychiatric illness or receive medication, had incomplete demographic data and radiographs, or incomplete data of symptoms which explored, and had fixture or removable denture, were excluded from the study.

The age and gender of the patients, the number of missing post-canine teeth, joint sounds, pain, disability in chewing, locking and maximum mouth opening (MMO) were retrieved from the clinical and radiological records of the patients. Missing teeth calculated as the total number of the absent teeth except the third molars. Dental quadrants with missing posterior teeth were also recorded and categorized 0 to 4. The pain levels of the patients and disability of chewing, were evaluated by Visual Analog Scale (VAS). The MMO had measured as the distance between the upper and lower central incisors by the electronic caliper. The joint sound had examined with stethoscope, and locking had determined during clinical examination and recorded as present or not.

A priori sample size calculation was performed with G*Power 3.1. software based on a significance level of 0.05 and a power of 0.80 to detect a clinically meaningful difference in missing teeth in terms of TMDs symptoms with an effect size of 0.37. This yielded that a minimum sample of 174 individuals would be needed.

STATISTICAL ANALYSIS

Statistical analyses were performed with the IBM SPSS Statistics for Windows software (version 23.0, IBM Corp, Armonk, NY). Kolmogorov-Smirnov test was used to assess the normality of the data. The number of missing teeth was categorized into three groups as: 0, 1-5, and ≥6 missing teeth. The difference between the patients without missing teeth, with 1-5 missing teeth, and with ≥ 6 missing teeth, among the quadrants with missing teeth and also between genders regarding pain, MMO, disability in chewing were analyzed using One-Way ANOVA, Kruskal-Wallis and Mann Whitney U tests. The difference between the patients without missing teeth, with 1-5 missing teeth, and with ≥ 6 missing teeh, among the quadrants with missing teeth and also between genders regarding TMJ sound, and locking were analyzed using Chi-Square test. The correlation between the number of missing teeth and pain, MMO, disability in chewing and were analyzed with Spearman correlation. Demographic characteristics were analyzed with Kruskal-Wallis test for continuous data and Chi-Square test for categorical variables. All tests were two-tailed, and was based on a 0.05 significance level.

RESULTS

212 patients (187 females and 25 males; mean age 32.35 ± 13.40 years) who fulfilled the inclusion criteria were enrolled in this clinical study. Demographic characteristics presented in Table 1.

Table 1.

Demographic characteristics of the patients

	Total	Among missing teeth category			p value
		No missing teeth	1–5 missing teeth	≥6 missing teeth	
Age Mean (SD)	32.35 (13.40)	24.81 (9.23)	33.41 (10.19)	50.57 (11.28)	<0.001*
Gender					0.368**
Female (%)	187 (88.2)	82 (43.9)	72 (38.5)	33 (17.6)	
Male (%)	25 (11.2)	14 (56)	9 (36)	2 (8)	

*:Kruskal-Wallis, **:Chi-Square, **SD**: Standard Deviation

The difference between the patients without missing teeth, with 1-5 missing teeth, and with ≥ 6 missing teeth regarding pain, MMO, disability in chewing and TMJ sound were significant. However, differences between the patients without missing teeth, with 1-5 missing teeth, and with ≥ 6 missing teeth regarding locking were not significant (Table 2, Figure 1).

Table 2.

Differences in terms of symptoms among patients without, with 1-5, and with ≥ 6 missing teeth

Symptoms		Missing teeth category			p value
		No missing teeth	1–5 missing teeth	≥6 missing teeth	
Pain					0.001*
Mean (SD)		34.58 (24.69)	40.74 (25.15)	53.29 (27.35)	
Median (min-max)		30 (0-100)	40 (0-100)	30 (0-100)	
Disability in chewing					<0.001*
Mean (SD)		29.48 (21.40)	46.54 (28.51)	56 (33.18)	
Median (min-max)		30 (0-100)	50 (0-100)	60 (0-100)	
MMO					0.003**
Mean (SD)		37.07 (9.21)	38.26 (9,79)	31.77 (9.66)	
Median (min-max)		37.5 (16-64)	37 (8-61)	32 (10-51)	
Joint sound (%)	+	73 (49)	59 (39.6)	17 (11.4)	0.008***
	-	23 (36.5)	22 (34.9)	18 (28.6)	
Locking (%)	+	36 (45)	34 (42.5)	10 (12.5)	0.392***
	-	60 (45.5)	47 (35.6)	25 (18.9)	

*:Kruskal-Wallis, **: One-Way ANOVA, ***: Chi-Square, **SD**: Standard Deviation, **MMO**: Maximum mouth opening

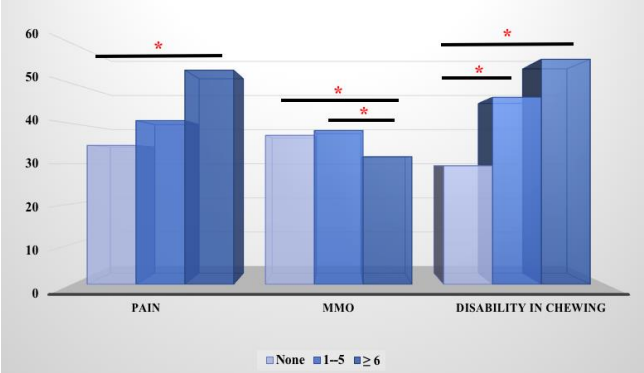

Figure 1

Pain, MMO, disability in chewing among missing teeth category

Regarding the number of quadrants with missing teeth, significant differences were observed in terms of age ($p<0.001$), pain, TMJ sound and disability in chewing. However, no significant differences were observed between the number of quadrants with missing teeth, and gender (0.577), MMO, and locking (Table 3, Figure 2).

Table 3.

Differences in terms of symptoms among the number of quadrants with missing teeth

Symptoms		Number of quadrants with missing teeth 0	1	2	3	4	p value
Pain							
Mean (SD)		34.58 (24.69)	37.86 (20.69)	41.13 (27.86)	51.76 (25.55)	51.06 (29.25)	0.009*
Median (min-max)		30 (0-100)	40 (0-80)	30 (0-100)	50 (0-100)	50 (0-100)	
Disability in chewing							
Mean (SD)		29.48 (21.40)	42 (23.23)	44.84 (32.13)	51.76 (26.27)	60.30 (34.32)	<0.001*
Median (min-max)		30 (0-100)	50 (0-80)	40 (0-100)	50 (0-100)	70 (0-100)	
MMO							
Mean (SD)		37.07 (9.21)	39.34 (10.04)	37.13 (8.19)	34 (8.90)	33.48 (11.81)	0.102**
Median (min-max)		37.5 (16-64)	37 (17-61)	37 (19-53)	33 (20-51)	34 (8-55)	
Joint sound (%)	+	73 (49)	23 (15.4)	24 (16.1)	13 (8.7)	16 (10.7)	0.034***
	-	23 (36.5)	12 (19)	7 (11.1)	4 (6.3)	17 (27)	
Locking (%)	+	36 (45)	16 (20)	13 (16.2)	6 (7.5)	9 (11.2)	0.598***
	-	60 (45.5)	19 (14.4)	18 (13.6)	11 (8.3)	24 (18.2)	

: Kruskal-Wallis, **: One-Way ANOVA, *: Chi-Square, **SD**: Standard Deviation, **MMO**: Maximum mouth opening*

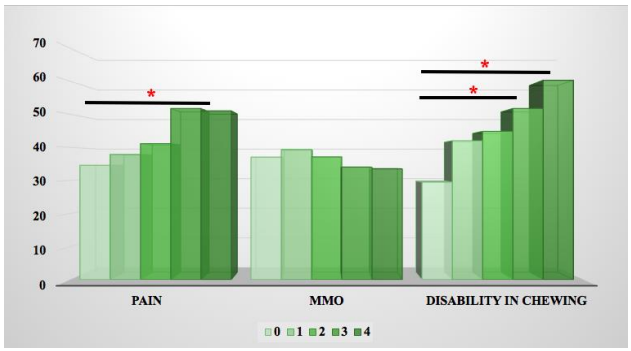

Figure 2

Pain, MMO, disability in chewing among quadrants with missing teeth

Distribution of the symptoms among gender is shown in Figure 3 and 4. A significant correlation observed between number of missing teeth, and pain and disability in chewing while no significant correlation found between MMO and the number of missing teeth (Table 4).

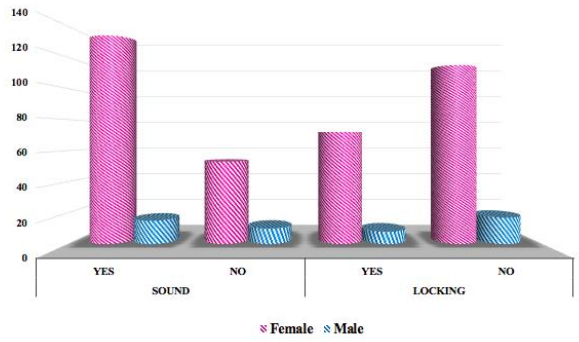

Figure 3

Joint sound (p=0.167) and locking (p=0.345) regarding gender

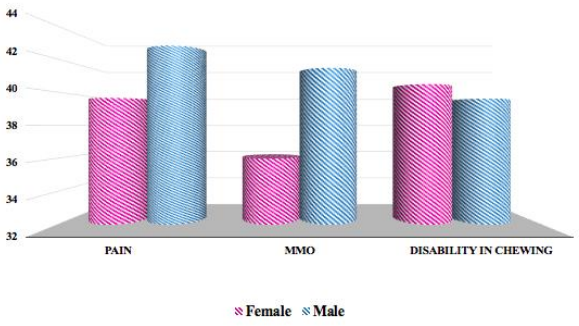

Figure 4

Pain (p=0.520), MMO (p=0.002), disability in chewing (p=0.896) among gender

Table 4.

Correlation between missing teeth and clinical symptoms

	Missing teeth	
Symptoms	r	P value
Pain	0.224	0.001*
Disability in chewing	0.352	<0.001*
MMO	-0.130	0.60*

: Spearman correlation, **r: correlation coefficient, **MMO**: Maximum mouth opening*

DISCUSSION

Tooth loss, especially the loss of post-canine teeth considered among the factors that contribute the TMDs.[11-13] In clinical point of view, it has been thought that TMDs are caused by pathological loading to the joint structures associated with the loss of molar support which deteriorate nutrition and the homeostasis.[8,14,15] However, some researchers suggest that rather than causing pathological loads, tooth loss affect the balance between joint structures.[14, 16, 17] In this retrospective study, it was aimed to investigate that if a positive relation is present between the post-canine tooth loss and the clinical symptoms of TMDs. To accomplish this goal 212 patients who have clinical symptoms in TMJ were evaluated in terms of the loss of post-canine teeth.

Loss of five or more posterior teeth reported increasing the risk to present TMDs significantly.[18] In a study conducted by Dulcic et al.[19] it is suggested that the prevalence and severity of TMDs are higher in patients with more tooth loss in the posterior regions. A strong correlation between the tooth loss and TMDs symptoms found by Bagıs et al.[7] in another study. However, rather than the number of posterior tooth loss the number of quadrants or the distribution of the missing post-canine teeth considered to be more important than the number of missing post-canine teeth as Wang et al.[3] mentioned. On the other hand, in a study exploring the effect of the loss of post-canine teeth on the TMJ osteoarthrosis with 60 patients, it has shown that no differences have existed between dentate patients and patients with reduced molar support.[20] Also, it is suggested that a short dental arch provide adequate function and occlusal stability, therefore, the incidence of TMDs does not increase.[8,12,14,21] Beside the results of the studies that have considerable variations due to differences in samples, design and evaluation methods association between tooth loss and TMDs remains controversial. In the present study, it has been observed that symptoms in TMJ increase within the patients with more missing post-canine teeth and the number of quadrants with missing teeth.

One of the most common symptoms of TMDs is pain.[11] Wang et al.[3] and Reissmann et al.[10] reported that shortened dental arch associated with tooth loss is not a major risk factor for TMJ pain. In our study it was observed that with increase in the number of missing teeth and missing teeth with quadrants pain increases. In addition to the pain, patients frequently have a symptoms like restricted interincisal opening, locking, TMJ sounds, and disability in chewing.[11] TMJ sounds reported to significantly increased with the increasing tooth loss.[3, 22] It is reported that the loss of the occlusive support cause displacement of the joint disc and leads joint sounds.[14] A correlation observed among posterior occlusion and crepitation by Kopp.[23] We found that nearly 50% of the patients who have joint sounds have no missing teeth.

Regarding mouth opening, in general, less than 30 mm is considered limited.[7] In our study although the patients with ≥ 6 missing teeth have significantly lower mouth opening than the patients without missing teeth and with 1-5 missing teeth, nearly in all patients in both categories the interincisal distances measured more than 30mm. It is widely accepted that people without post-canine teeth have a reduced chewing capacity.[12] In the study of Chatzopoulos et al.[24] individuals who have greater number of missing teeth, especially the patients with ≥9 missing teeth, showed a statistically significant difficulty in chewing. In another study conducted with 725 adults by Sarita et al.[25] it is reported that shortened dental arches and long asymmetric arches result in chewing disability. In the present study participants who have more missing teeth and quadrants with missing teeth showed disability in chewing similarly.

The studies which explore the association between age/gender and tooth loss with TMDs have conflicting results. Wang et al.[3] conducted a study on 741 patients aged between 21 and 60 years, and reported that loss of posterior teeth increases the prevalence of TMDs, especially in young women. Also, they reported that because of the decrease in tightly locked occlusion with aging the risk of TMDs decreases with the increasing age. In another study which the participants aged between 35 and 74 years, it is reported that men with missing posterior teeth, showed an increased TMDs symptoms, while, no significant association was found in the females.[26] On the other hand, results of the study of Dulcic et al.[19] on 196 patients aged between 36 to 71 years suggested that TMDs are higher in people who have higher teeth loss in the supporting areas without gender differences. In our study 212 individuals aged between 18 and 75 years and the majority of TMJ symptoms that evaluated were higher in the older participants, regardless of gender.

The present study have some limitations. Because of the retrospective design distribution of tooth loss, and the duration of reduced molar support could not be taken into consideration. Second, the majority of the

participants were female as a common limitation of studies related with TMJ disorders. When interpreting the results of this study these factors should be kept in mind.

CONCLUSION

As a conclusion, within the limitations the result of this study suggests that increasing number of and the quadrants with missing teeth seems to trigger the TMJ symptoms. However, to draw clear conclusions more prospective clinical studies which include periods and distribution of tooth loss, the duration of reduced molar support, radiographic evaluation of the TMJ and socio-economic factors should be conducted.

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