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Research Article

Evaluation of The Prevalence of Furcation Involvement in Adult Patients with Etiological and Demographic Factors

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Abstract

Introduction: Molar teeth are the most frequently affected and most frequently lost teeth as a result of periodontal attachment and bone loss due to periodontal diseases. It is important to determine the prevalence of involvement and clinical factors affecting Furcation Involvement (FI), since FI resulting from periodontal diseases adversely affects the prognosis of molar teeth. From this point of view, the aim of our study is to determine the frequency of FI in the molar teeth region; to evaluate together with clinical, etiological and demographic factors.

Materials and Methods: This study was performed on 300 patients and 1931 teeth meeting the inclusion criteria. According to the Glickmann classification, class 0-I teeth were considered healthy, class II-III-IV teeth were considered to have FI and lost teeth were recorded.

Results: When all molars were evaluated, FI was observed in 18.12% and 19.54% of the teeth were lost. More FI was observed in maxillary molars (21.58%) than in mandibular molars (14.66%). First molars (22.66%) showed a higher prevalence of involvement than second molars (13.58). When the first and second molars in the maxilla and mandible were compared in terms of furcation defect, the highest FI was observed in the maxillary 1st molar with 28.5%, while the lowest FI was observed in the mandibular second molars with 12.5%.

Conclusion: It was found that advancing age and smoking increase the risk of furcation involvement. In addition, more FI was found in male patients than in females and in individuals with low education level compared to individuals with higher education levels. It was observed that higher gingival index and plaque index values were associated with FI. More attachment loss and pocket depth were measured in teeth with FI. Higher furcation involvement was found in teeth with proximal restoration or endodontically treated compared to healthy teeth. Higher values were found in terms of both furcation involvement and tooth loss in patients with poor oral hygiene habits.

Keywords: Furcation Defect; Periodontitis; Etiology; Smoking; Gender Identity

Introduction

Periodontitis is a chronic inflammatory disease characterized by the destruction of the periodontium, which includes the Periodontal Ligament (PDL), cementum, alveolar bone and gingiva, caused by specific microorganisms or groups of microorganisms that accumulate on tooth surfaces [1]. Periodontitis can cause pathological resorption of bone between the roots of multi-rooted teeth. The resulting bone defects are defined as furcation defects [2]. The shape of the destruction occurring in the furcation area and the identification and classification of the defect that arises after this destruction, especially in the early stages, is important both for determining the clinical condition and for selecting the treatment method [3]. For this reason, different classification systems have been developed. Among these, Glickman's classification system and its modifications are

the most commonly used in clinical practice [4]. The prognosis for multi-rooted teeth with FI has been found to be less favorable compared to multi-rooted teeth without FI. In areas with probing depths of 4 mm or more, the response to treatment of molar furcation defects has been seen to yield more unfavorable results compared to flat surfaces or teeth other than molars [5]. A retrospective study conducted at a clinic specializing in periodontal treatment showed that molar teeth with Class II and III FI had approximately 3 and 7 times higher risk of periodontitis and tooth loss, respectively [6]. Another study showed that molar teeth with FI had a higher risk of tooth loss compared to molars without FI [7].

The aim of this study is to evaluate the prevalence of FI in maxillary and mandibular molars and lost molar teeth in an Turkish adult population. Teeth with FI in our clinic examined in terms of etiological and local factors and their demographic distribution analyzed. A second objective of this study was to investigate the relationship between the presence of FI and different variables (gingivitis, smoking, plaque, educational level, presence of periodontal pockets, attachment loss, gender and age).

Materials and Methods

Study Design and Participants

This study included 100 patients aged 30-80 (mean 45.03) who attempt to our clinic.

Inclusion Criteria

- Patients with at least 4 molar teeth in the posterior molar region, excluding 3rd molars, who had not undergone periodontal treatment in the last 6 months and had not used any medication known to have potential effects on periodontal tissues were included

Exclusion Criteria

- 3rd molars and molars in which the furcation area has disappeared for any reason (crown root fracture, residual roots after extraction, etc.) were not included in the study. Lost teeth were recorded as missing.
- Incomplete survey responses

Ethical Statement

The study protocol was prepared in accordance with the principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the Non-Interventional Clinical Research Ethics Committee of Zonguldak Bülent Ecevit University, under approval number 2020/14. Consent forms detailing the procedures to be performed prior to the operation were provided and patients were informed about the procedures to be performed.

Data Collection

Demographic data (age, gender, educational status) were recorded from patients participating in the study. In addition, smoking status and toothbrushing frequency were inquired.

A clinical periodontal examination was performed on the patients and the following measurements were taken from the first and second molars included in the study, using the Plaque Index (PI) (Silness and Löe 1964), Gingival Index (GI) (Löe and Silness 1963), Periodontal Probing Depths (PPD) (distance between the gingival margin and the periodontal pocket base,) and Clinical Attachment Level (CAL) (distance between the enamel-cementum junction and the gingival sulcus base) were measured from the first and second molar teeth included in the study using a special millimeter-calibrated probe (Williams Probe) from the midfacial surfaces of the relevant teeth at each of the 6 regions of the tooth (mesio-mid-disto vestibular and mesio-mid-disto palatal/lingual) [8,9].

To examine FI, the degree of involvement was recorded using Glickman classification (class I-II-III-IV) for horizontal assessment with the aid of Naber's probe, specially designed for use in these cases. The presence of restorations (proximal filling-crown restoration), occlusal trauma and endodontic treatment in the first and second molars included in the study were recorded. All periodontal measurements and evaluations were performed by the same dentist.

Data Analysis

In our study, the SPSS application was used for statistical analyses. The normality test for continuous variables was performed

using the Kolmogorov-Smirnov test. Since not all data were normally distributed, the Mann-Whitney U test was used to assess differences between groups for continuous variables. Comparisons between categorical variables were performed using the chi-square test. Binary logistic regression tests were used in regression analyses. Descriptive statistics were specified by providing the mean, standard deviation, minimum and maximum values of the variables. The significance level was set at 0.05.

Results

Demographic Characteristics

Our study included a total of 300 patients with 1931 first and second molar teeth, 164 of whom were female and 136 of whom were male, ranging in age from 30 to 70. The average age of the patients is 44.65 and 45.48 respectively. Among 1931 molar teeth, 1496 were healthy (62.3%), 435 (18.1%) had some degree of FI and 469 (19.5%) teeth that should have been present in the natural dentition were missing. These results show us nearly one in five molars shows FI and similar number are already lost. When maxillary molar teeth and mandibular molar teeth were compared in terms of furcation defects, a statistically significant difference was observed between them (p=0.000). The prevalence of FI in maxillary molars was 21.58% (259 teeth), which was higher than that in mandibular molars (14.66%, 176 teeth). We believe that this situation is related to the anatomical position of the interproximal furcation entrances in maxillary molars. When examined in terms of tooth loss, the prevalence of mandibular molar loss was found to be higher at 22.5% (270 teeth) compared to maxillary molars at 16.58% (199 teeth). When we compare the first molar teeth and second molar teeth in the maxilla and mandible in terms of furcation defects, a statistically significant difference was observed between them (p=0.000). The prevalence of FI in maxillary first molars was 28.50% (171 teeth), which was higher than in all other molars. In terms of tooth loss, the prevalence of loss in mandibular first molars were 33% (198 teeth), which was higher than in all other molars. When evaluating furcation defects in all molar teeth according to age groups, a statistically significant difference was observed between age groups (p=0.000). When we evaluate the age groups with the highest prevalence of FI were 50-60 years old in the first place and 40-50 years old in the second place. Fig. 1 shows that the age groups with the highest prevalence of FI were 50-60 years old in the first place and 40-50 years old in the second place. We believe that the lower prevalence of FI in the 60-70 age group compared to these groups is due to the higher number of teeth lost in this group compared to all other groups (Fig. 1).

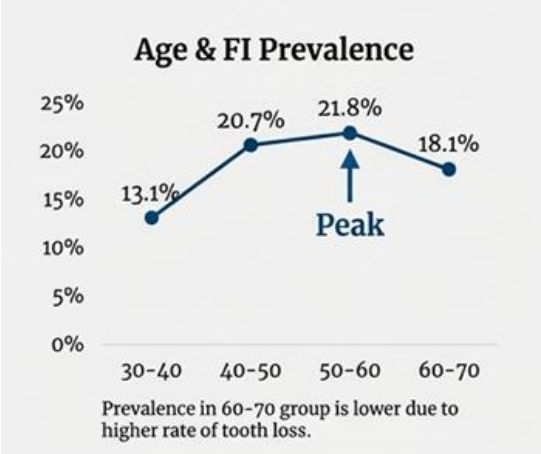

Figure 1: Age groups with the highest prevalence of FI were 50-60 years old in the first place and 40-50 years old in the second place. We believe that the lower prevalence of FI.

Other demographic data and periodontal status such as gender, educational status, toothbrushing frequency, smoking, periodontal treatment history, endodontic and prosthetic treatment history were examined in our study, a statistically significant relationship was found (p<0.005). No statistically significant relationship was found between bruxism and FI (p=0.482) (Table. 1).

	Healthy Molar n (%)	FI Molars n (%)	Loss Molars n (%)	P-value
Gender				0,001
Woman	892(%68)	185(%14,1)	235(%17,9)	
Man	604(%55,5)	250(%23)	234(%21,5)	

Edducational levels				0,001
Primary School	424(%46,9)	242(%26,80)	238(%26,3)	
High School	704(%67,7)	140(%13,5)	196(%18,8)	
University	368(%80,7)	53(%11,6)	35(%7,7)	
Tooth Brushing Frequency				0,001
none	50(%27,2)	87(%47,3)	47(%25,5)	
regular	1171(%73,9)	148(%9,3)	265(%16,7)	
irregular	275(%43,5)	200(%31,6)	157(%24,8)	
smoking				0,001
yes	478(%51)	258(%27,6)	200(%21,4)	
no	1018(%69,5)	177(%12,10)	269(%18,4)	
History of Periodontal treatment				0,001
yes	725(%74,9)	80(%8,3)	163(%16,8)	
no	771(%53,8)	355(%24,8)	306(%21,4)	
History of Endodontic treatment				0,001
yes	80(%61,5)	50(%38,5)	0(%0)	
no	1416(%62,30)	365(%17)	469(%20,7)	
Presence of a prosthehtic rehabilitation				0,001
Yes	254(%23,6)	88(%25,5)	3(%0,9)	
No	1242(%60,4)	342(%16,9)	466(%22,7)	
CAL (average rate)	0,65 ± 1,13	3,29 ±1,64	-	0,001
PPD (average rate)	3,54 ± 0,89	5,26 ± 1,23	-	0,001
GI				0,001
Healthy	1,%100	0, %0	-	
Mild Inflammation	745,%98	15, %2	-	
Moderate Inflammation	358, %83,6	70, %16,4	-	
Severe Inflammation	391, %52,8	350, %47,2	-	
Plaque Index (PI)				0,001
0	1(%100)	0(%0)	-	
1	737(%98)	15(%2)	-	
2	359(%83,3)	72(%16,7)	-	
3	398(%53,4)	348(%46,6)	-	
Bruxism History				0,482
Yes	390(%60,9)	126(%19,7)	124(%19,4)	
No	1106(%62,8)	309(%17,6)	395(%19,6)	

Table 1: Correlation between Gender, Education, smoking habit, History of Periodontal and Endodontic Treatments, presence of the Prosthetic Rehabilitation, periodontal levels (PI, GI, PPD, CAL) and FI.

According to the results we can say males are more likely to have FI than female (23%, 14.1% respectively p=0,001). And lower educational levels are strongly associated with FI. older males between 50-60 years had a peak prevelance of FI. Smoking doubled the risk of FI (27.6%, 12.1%, respectively p=0,001). While not a direct cause, a history of restorative and endodontic treatments is strongly associated with a higher FI (restorated/non-restorated molars with FI: 25.5% versus 16.9% respectively, endodontic/non endodontic molars with FI: 38,5% versus 17% respectively p=0,001).

Discussion

The aim of this study is to evaluate the prevalence of furcation involvement in molar teeth in a population with varying levels of periodontal health and disease, i.e., a population that generally represents the Turkish community. Another reason for this study is to understand how furcation involvement affects the prognosis of molar teeth in a Turkish population [6,7]. Therefore, it is important to determine the actual prevalence. Upon reviewing the Turkish literature, despite the importance of furcation involvement on the prognosis of molars, we could not find any epidemiological studies focusing on furcation involvement and clinical variables (smoking, education level, plaque, gingival index and attachment loss). We believe that this study may demonstrate the importance of including the diagnosis of furcation defects in future epidemiological studies.

Najim, et al., reported a total furcation defect prevalence of 8.3% in their 2016 study, which evaluated furcation defects in molar teeth using periapical and bitewing radiographs on 329 patients [10]. In our study, furcation defects were detected in 18.12% of molar teeth. We believe that this difference stems from the fact that the aforementioned study was conducted in a country with a high socioeconomic level, such as Sweden and that the evaluations were made solely on the basis of radiographs, unlike our study. Unlike other studies, we believe that conducting our study on a group of patients who visited the periodontology clinic due to periodontal problems influenced the proportionally high prevalence of furcation involvement. Similarly, in our study, higher rates of furcation defects were detected in maxillary molars (21.58%) compared to mandibular molars (14.66%). We believe that this difference arises because the positions of the interproximal furcation entrances in maxillary molars make them more difficult to clean with oral hygiene practices compared to mandibular molars. They found that the percentage of lost maxillary molars (21.7%) was higher than that of mandibular molars (23.6%) and did not find this difference to be statistically significant. Similarly, in our study, lost mandibular molars (22.5%) were more common than maxillary molars (16.58%) and this difference was statistically significant (p=0,001). In the study mentioned above, maxillary first molar teeth were found to be the teeth most frequently affected by furcation defects (11.3%), while mandibular second molar teeth were found to be the teeth least affected by furcation defects (4.1%). Similarly, in our study, maxillary first molars had the highest rate at 28.50%, while mandibular second molars had the lowest rate of furcation defects at 12.50%.

Karşıyaka, et al., evaluated the prevalence of furcation involvement in different age groups in 2008 [11]. In their study of 97 patients aged 30-75, they found that furcation involvement was more common in mandibular molars than in maxillary molars, but this difference was not statistically significant. In our study, furcation defects were more common in maxillary molars than in mandibular molars and this difference was statistically significant. We believe this difference may be due to the small number of patients included in the aforementioned study. Karşıyaka, et al., found that the severity and prevalence of furcation defects, as well as the likelihood of tooth loss, increased with age. When comparing male and female patients, they found that male patients showed more furcation involvement and a higher rate of missing teeth than female patients. These results are similar to those of our study. According to the results of both studies, first molar teeth show more furcation involvement than second molar teeth. This situation may be due to the fact that the furcation entrance of second molar teeth is located more apically compared to first molar teeth anatomically [12]. In our study, similarly, more attachment loss was observed in older age groups and this was more prevalent in the maxillary teeth region compared to the mandibular teeth. Considering the results of our study, attachment loss and associated furcation defects were highest in patients aged 50-60 years. We believe that the higher prevalence of furcation defects (21.79%) observed in patients aged 50-60, compared to the 18.05% prevalence in the 60-70 age group, is due to the higher tooth loss rate in patients over 60 (34.02%) compared to the 50-60 age group (27.53%). higher than in the 50-60 age group (27.53%). Paulander, et al., found that individuals with low education levels had higher average attachment loss values compared to those with higher education [13]. Individuals with lower education levels may be more likely to have deeper periodontal pockets and these pockets that may form in furcation areas can affect the risk of furcation involvement. This assumption is supported by the findings of the present study. In studies investigating the effect of smoking on molar teeth in individuals with periodontal disease, it has been shown that smokers have greater molar tooth loss and furcation involvement compared to non-smokers [14,15]. Similarly, in our study, furcation involvement was more frequent in smokers (27.60%) compared to non-smokers (12.10%). When evaluating tooth loss, the rate was 21.4% in the smoking group, compared to 18.40% in the non-smoking group. Our study yielded results that are consistent with the aforementioned studies. Wang, et al., in a study conducted on 134 maintenance patients, reported that molar teeth with crowns or proximal restorations had a significantly higher percentage of furcation involvement compared to unrestored teeth. 52 While only 39.1% of unrestored molars had furcation involvement, 52.8% of molars with class II restorations and 63.3% of crowned molars were found to have furcation involvement [16]. Similarly, in our study, when evaluating furcation defects in all molar teeth in terms of the presence of proximal restorations, a statistically significant difference was observed between the groups (p=0.000). The prevalence of furcation involvement was

25.50% in teeth with proximal restorations, while it was 16.90% in teeth without restorations.

Although the role of pulp pathology in the etiology of furcation involvement is still unclear, the high incidence of molars with accessory canals supports such a relationship [17]. In our study, teeth that had undergone endodontic treatment were compared to healthy teeth in terms of furcation involvement; while the prevalence of furcation defects in healthy teeth was 17%, endodontically treated teeth were found to have a 38.5% prevalence of furcation defects. Our study yielded results similar to those mentioned in the referenced study. On the other hand, rather than being a sole etiological factor, we believe this could also be due to the overall poorer dental health of patients who have undergone endodontic treatment compared to those who have not.

Although some debate still exists, occlusal trauma is considered a questionable etiological/contributing factor in isolated furcation defects [17]. In a 1974 study by Lindhe and Svanberg with experimental animals, they concluded that traumatic occlusion associated with gingival inflammation led to greater alveolar bone loss in the animals, suggesting that excessive occlusal forces applied to molars could make furcation areas more susceptible to bone loss in the presence of inflammation [18]. When we compared patients in our study who had complaints of teeth clenching or were diagnosed by us with healthy patients; despite a furcation defect prevalence of 19.7% compared to 17.6%, no statistically significant difference was found between the groups.

Conclusion

This study confirms that FI is a multifactorial problem with clear anatomical, demographic and behaviour predictors. For effective management and early diagnosis of FI a proactive approach informed by this risk profile is essential

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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None.

Data Availability Statement

Not applicable.

Ethical Statement

The study was approved by the Zonguldak Bülent Ecevit University's Ethics Committee (approval number 2020/14).

Informed Consent Statement

All participants provided written informed consent prior to participation.

Authors' Contributions

ÖÜ and MIC conceived the study, designed the methodology, performed data analysis and drafted the manuscript. All authors reviewed and approved the final manuscript.

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