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Original Article

Impact of Duration of Orthodontic Treatment on Periodontal Health and Treatment Needs of Patients

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ABSTRACT

Malocclusion is highly prevalent and can also affect the general health of patients. Orthodontic treatment is required to treat malocclusion. This treatment often leads to a deterioration in periodontal and general oral health of patients. **Objective:** To assess the impact of duration of orthodontic treatment on periodontal health and treatment needs of patients. **Methods:** A comparative cross-sectional study was done on a total of 51 individuals undergoing orthodontic treatment. The data were collected from July 2021 to June 2023 after obtaining ethical clearance. All participants above the age of 12 years irrespective of their gender were included in the study. Participants who had mixed dentition or other systemic illness were not included. Data were collected using the Community Periodontal index for treatment needs (CPITN). **Results:** The difference in CPITN scores across orthodontic treatment groups with respect to duration (p=0.382) was not significant. All groups irrespective of their treatment duration required Basic oral hygiene instructions (TN1) while Complex treatment (TN3) was only required by patients undergoing treatment for more than a year. **Conclusions:** Basic oral hygiene instructions (TN1) were the treatment need of all patients from all groups irrespective of their treatment duration. An equal percentage of patients from all three treatment groups required (TN2) while (TN3) was only required by patients undergoing treatment for more than a year.

INTRODUCTION

Malocclusion is a disruption of the normal occlusal relationships that enable individuals to perform the function of mastication and phonation in addition to being critical for facial esthetics [1]. It severely impacts the Quality of life of the affected person [2]. Treatment using orthodontic appliances that are fixed is preferred method which is most commonly used for treating the malocclusion [3]. These appliances can complicate oral hygiene maintenance which may cause accumulation of deterioration of oral health [4]. In adults, tooth loss, impaired function, and poor cosmetics may be the result of decreased periodontal integrity. The early stage of disease in the periodontium is gingivitis and it can lead to periodontitis, if left ignored [5]. The patients with severe occlusion or corrective problems are often treated with traditional metal stents [6]. People may feel uncomfortable and conventional cleaning may become difficult for them by wearing traditional braces [7]. To remove all deposits of plaque, patients should meticulously clean all oral appliances that have been placed for treatment to minimize the risk of demineralization [8]. In general, conditions associated with poorer periodontal health among orthodontic patients include those that favor and lead to plaque stagnation and in addition to that those

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resulting in difficulty to perform common oral hygiene measures [9]. Nevertheless, according to some studies, during the use of fixed orthodontic appliances, gingival changes may not result in permanent aggression to periodontal support tissue while few studies have suggested that gingival enlargement can occur during orthodontic treatment [10]. Brackets placed for orthodontic treatment affects oral health-related quality of life of the patients by hampering the process of mastication [11]. Facial esthetics and mastication can be improved through the teeth alignment by orthodontic treatment [12]. However, complications of this treatment like dental caries and discoloration of tooth are seen13. Accumulation of plaque and changes oral microbiota can be a result of inadequate oral hygiene practices [13]. During and after the orthodontic treatment, the relationship between the oral microbial status and orthodontic treatment procedures is considered to be a challenge [14]. The deposition of plaque that forms around the gingival margin includes anaerobic as well as aerobic bacteria that can result in periodontal diseases and its destruction [15]. In general, by using chemical solutions known as Mouth Rinse, the bacterial loads can be reduced [16]. Orthodontic treatment can lead to a correction of malocclusion with a resultant improve in the masticatory function of individuals [17].

There are innumerable studies that shed light upon the periodontal health of patients undergoing orthodontic treatment. The current study attempted to unravel the unexplored domain of impact of duration of orthodontic treatment on the periodontal treatment needs of patients in addition to assessing the impact of duration on the periodontal health itself. The aim of this study was to assess the impact of duration of orthodontic treatment on periodontal health and treatment needs of patients.

METHODS

A comparative cross-sectional study was carried out on 51 patients undergoing orthodontic treatment. The study participants were recruited using the convenient sampling technique. Keeping the precision at 5%, confidence level 95% and prevalence of periodontitis in orthodontic patients to be 3%, the sample size was calculated to be 51 [18]. It was conducted in the Sharif Medical and Dental College, Lahore. After receiving permission from the ethics committee (No. SMDC/SMRC/195-21)(received on 08.06.21) the data were collected from July 2021 to June 2023. All participants above the age of 12 years irrespective of their gender were included in the study. Participants who had mixed dentition or systemic illness were excluded from the study. Patients undergoing orthodontic treatment were divided in three categories based on the treatment duration (less than 6 months, 6 to 12 months and more than 12 months. Data were collected using the Community Periodontal index for treatment needs (CPITN). The marking on the CPITN probe are as follows: The tip of the probe is 0.5mm. Then there is a black band between 3.5 and 5.5 mm. At 8.5 and 11.5 mm from the ball tip are the rings. This probe is used to for clinical assessment of periodontium while scoring the index teeth using CPITN index [19]. Each index tooth was probed at three points mesiobuccal, distobuccal and mid-buccal. The highest recorded score was assigned to the tooth. The scoring system in CPITN index is healthy periodontium (score 0), bleeding gums with or without instrumentation (score 1), deposition of calculus with visible black band on CPITN probe (score 2), pocket depth 4-5mm with gingival margin within black band on CPITN probe (score 3), pocket depth 6mm or more and an invisible black band of the CPITN probe (score4), sextant excluded (X), not recorded (9).The periodontal treatment needs were classified as follows: 1. If the patient needed no treatment (TN0) 2. If the patient required instructions pertaining to oral hygiene (TN1) 3. If the patient required scaling in addition to oral hygiene instructions (TN2) 4. If in addition to instructions on oral hygiene and scaling the patient needed extensive root planning and procedures of surgical intervention (TN3).

The formulae for calculation of treatment needs are as follows:

- **%TN1**= % Codes B (bleeding)+C (calculus) +P1 (pocket depth 4-5mm)+P2 (pocket depth 6mm or above)
- **%TN2**= % Codes C (calculus)+ (pocket depth 4-5mm) +P2 (pocket depth 6mm or above)
- **% TN3**=% Code P2 (pocket depth 6mm or above)

SPSS veraion-24 was used for analysis. Numeric data were presented as mean and standard deviation. Nominal data were recorded as frequency and percentage. Kruskal Wallis test was used to find the difference in the CPITN scores of patients undergoing orthodontic treatment with respect to duration. P value ≤0.05 was considered significant.

RESULTS

The mean age of the participants was 15.30 ± 2.339 years with 50.5% males and 49.5% females. Table 1 shows that difference in CPITN scores across orthodontic treatment groups with respect to duration was not significant. The CPITN scores of patients undergoing orthodontic treatment less than 6 and from 6 to 12 months were lower than those undergoing treatment for over a year indicating a deterioration of periodontal health with progression in treatment duration as shown in table 1.

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Table 1: CPITN scores across patients undergoing orthodontic treatment for various durations

	Duration of orthodontic treatment	N	Mean Rank	Chi-square	df	P-value
CPITN score	Less than 6 months	17	24.18	1.925	2	0.382
	6 to 12 months	17	24.18			
	>12 months	17	29.65			

Table 2 shows that irrespective of the treatment duration none of the patients had a healthy periodontium. It was seen that the highest percentage of bleeding gums, periodontal pocket depth of 4-5mm and 6mm and above were found in patients under treatment for more than a year. Calculus deposition in group of patients undergoing treatment less than 6 months and from 6 to 12 months was equal and higher than those undergoing treatment for over a year as shown in table 2.

Table 2: Prevalence of orthodontic patients affected with respect to the duration of treatment

Duration of orthodontic treatment	Prevalence of persons affected in patients undergoing treatment							
				% Persons coded				
	Age (yrs)	No. examined	No. Of dentate persons	H (Healthy perio-dontium)	B (Blee-ding gums)	C (Cal-culus)	P1 (Pocket depth 4-5mm)	P2 (Pocket depth 6mm or more)
Less than 6 months	12-23	17	17	0%	5.9%	64.7%	29.4%	0%
6 to 12 months	12-18	17	17	0%	5.9%	64.7%	29.4%	0%
More than 12 months	12-18	17	17	0%	11.8%	35.3%	41.2%	11.8%

Table 3 shows that basic oral hygiene instructions (TN1) were the treatment need of all patients from all groups irrespective of their treatment duration. An equal percentage of patients from all three treatment groups required (TN2) while (TN3) was only required by patients undergoing treatment for more than a year as shown in table 3.

Table 3: Periodontal treatment needs of patients undergoing treatment with respect to duration

Duration of orthodontic treatment	Periodontal treatment needs of patients undergoing orthodontic treatment			
	$\%TN_0$	$\%TN_1$	$\%TN_2$	$\%TN_3$
Less than 6 months	0%	100%	94.1%	0%
6-12 months	0%	100%	94.1%	0%
More than 12 months	0%	100%	94.1%	11.8%

DISCUSSION

Our study reported that CPITN scores of patients undergoing orthodontic treatment less than 6 were lower than those undergoing treatment for over a year indicating a deterioration of periodontal health with progression in treatment duration. While according to another study Plaque and gingival Index from two groups of subjects were measured in one study. There was a significant increase in these parameters after first 3 months of appliance wear. After the removal of appliances, a decrease in the scores of these parameters was seen from 3 to 6 months [4]. Our study showed that irrespective of the treatment duration none of the patients had a healthy periodontium. It was seen that the highest percentage of bleeding gums, periodontal pocket depth of 4-5mm and 6mm and above were found in patients under treatment for more than a year. Our study, also showed that calculus deposition in group of patients undergoing treatment less than 6 months and from 6 to 12 months was equal and higher than those undergoing treatment for over a year. According to another study, there was considerable difference between pre and post orthodontic treatment plaque levels($p<0.01$). The study showed that at baseline overall gingival index scores were 0.56 ± 0.11 and improved to 0.48 ± 0.12 after orthodontic treatment ($p<0.01$). The study also reported a drop on probing depths after completion of treatment($p<0.01$). In FA group, the probing depth was 3.01± 0.77 mm and 2.53 ± 0.78mm at baseline and after treatment, respectively. 5.01 ± 2.20 months was the total duration of orthodontic treatment. FA group had the treatment duration of the (4.16 ± 1.71 months) [20]. Our study shows that basic oral hygiene instructions (TN1) was the treatment need of all patients from all groups irrespective of their treatment duration. An equal percentage of patients from all three treatment groups required (TN2) while Complex treatment (TN3) was only required by patients undergoing treatment for more than a year. Another study showed that on the duration of less than ≤ 12 months of use, most of the sample requiring TN1 were 53.3%. Among patients undergoing treatment for > 12 months most of the sample in TN2 were 55.0%. A significant relationship between periodontal treatment needs and length of treatment ($p=0.004$) was seen [21]. It is extremely essential for clinicians to understand the periodontal treatment needs of patients undergoing orthodontic treatment specially as the duration increases. This will help them cater to the needs of these patients and their overall well-being. Addressing the periodontal treatment needs generated as a result of the orthodontic treatment in these patients will also help in a better patient compliance with the treatment. Our study has unraveled both the impact of orthodontic treatment on the periodontal health and treatment needs of these patients in association with the duration.

CONCLUSIONS

Bleeding gums, periodontal pocket depth of 4-5mm and 6mm and above were found to be most prevalent in patients undergoing treatment for more than a year. Calculus deposition in group of patients undergoing treatment less than 6 months and from 6 to 12 months was equal and higher than those undergoing treatment for over a year. TN1

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was the treatment need of all patients from all groups irrespective of their treatment duration. An equal percentage of patients from all three treatment groups required TN2 while TN3 was only required by patients undergoing treatment for more than a year.

Authors Contribution

Conceptualization: AA1, AQ, SMF, AN, HB,
Methodology: AA1, AQ, SMF, AN, HB
Formal analysis: HB
Writing-review and editing: AA1, AQ, SMF, AN, HB, AA2
All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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