

Maintenance of Dental Hygiene in Various Brushing Practices Among Orthodontic Patients with Multi-Bracket Fixed Appliances

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ABSTRACT

Objectives: To determine the plaque index of orthodontic patients with multibracket fixed appliances in various brushing practices.

Materials and Methods: This cross-sectional study was conducted at the orthodontic department of a tertiary care hospital. The inclusion criteria were patients, aged 15-30 years, of both genders who receive at least six months of treatment with multi-bracket fixed appliances. The patients with restored teeth, mental incompatibility and craniofacial syndromes/anomalies were placed in exclusion criteria. Silness and Loe index for plaque were recorded for each patient. Independent sample t-test and One-way ANOVA were applied to determine the difference in plaque scores for various brushing practices. The level of significance was set at less than or equal to 0.05.

Results: The gender distribution of the study sample came out to be 36.9% males and 63.1% females. Statistically significant differences in plaque scores for the variables like the method of brushing ($p = 0.02$), practice of brushing ($p = 0.009$) and timing of brushing ($p = 0.001$) were seen. Post hoc Bonferroni test showed a statistically significant difference between the variables like once per day and twice per day ($p = 0.018$), once per day and more than twice per day ($p = 0.040$) and before breakfast and after breakfast ($p = 0.001$).

Conclusions: The use of interdental brushing in addition to normal brushing and mouthwash produces minimal improvement in plaque reduction. The male and female subjects comply equally with oral hygiene measures. Brushing twice a day after breakfast and before going to bed significantly reduces plaque in orthodontic patients.

Keywords: Brushing practice, Oral Hygiene, Multibracket appliances

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INTRODUCTION

Dental plaque accumulation is associated with many diseases of the tooth and surrounding periodontium. These diseases range from white spot lesions of teeth to more advanced tooth decay which ultimately results in loss of teeth.¹ The periodontium also suffers from the hostile environment produced by the microorganism embedded in dental plaque with sequential development of gingivitis, periodontitis and finally loss of the attachment apparatus of the tooth.² To prevent the accumulation and hazards of dental plaque brushing has been advised for every individual at least twice a day.³ Various types of brushes have been devised for brushing purposes like manual, electric and interdental.⁴ Despite brushing frequency and techniques plaque accumulates on the teeth due to the complexity of morphology of the dental and peridental tissues. The presence of orthodontic appliances especially the multibracket fixed appliance further complicates the situation and makes the cleaning of teeth much difficult.^{5,6}

The efficacy of various methods and practices in preventing dental plaque formation and improving oral hygiene has been evaluated in various ways by investigators.⁷⁻⁹ Some have evaluated the efficacy of manual and electric tooth brushes.^{10,11} Others have evaluated the difference between written instruction and verbal instructions for oral hygiene maintenance.^{12,13} The use of interdental tooth brushes and high-pressure water jet cleaning of the teeth has been also investigated. These studies show variable results regarding the use of different types of brushing methods and brushes.^{13,14} Some have shown electric brushes to be superior to manual brushes for maintaining dental hygiene while others have shown no difference. Ariane et al¹³ have shown an improved efficacy of the interdental brush in patients with lingual brackets. They further concluded that both verbal and written instructions play a major role in oral hygiene improvement.

After the placement of multi-bracket fixed appliances in orthodontic patients, the regular instructions are brushing twice daily, one after breakfast and the other before going to bed at night. The use of interdental brushing is also advised in patients who find it difficult to clean with regular brushing. Verbal instructions are the usual mode; however, some centres also give written instructions to their patients. The compliance of the patients with all the instructions may vary and therefore,

the oral hygiene maintenance may be different. The research done about white spot lesions, dental caries and periodontal disease consequently to orthodontic treatment shows that oral hygiene measures do not suffice to prevent them.¹⁶ Therefore, we have designed this study to determine the plaque levels in our orthodontic patients with multi-bracket fixed appliances following the oral hygiene maintenance instructions. This will provide the necessary information to further modify the oral hygiene instructions and evaluate them for their efficacy.

MATERIALS AND METHODS

This cross-sectional study was conducted after ethical approval from the institutional review board of prime foundation Pakistan (Prime/IRB/2021-377) at the orthodontic department of a tertiary care hospital from January to June 2022. The inclusion criteria were patients, aged 15-30 years, of both genders who receive at least six months of treatment with multi-bracket fixed appliances. The patients with restored teeth, mental incompatibility and craniofacial syndromes/anomalies were placed in exclusion criteria. A total of 130 patients during the 6 months gave written consent before inclusion in the study. Silness and Loe index⁵ for the plaque were recorded for each patient. Six teeth (21, 26, 15, 31, 46 and 35) from all the quadrants were selected for recording plaque index. The plaque scores were recorded as the absence of plaque (grade 1), mild plaque revealed with dental explorer (grade 2), moderate plaque accumulation along the gingival margin visible to the eye (grade 3) and substantial soft debris with gingival margin and braces (grade 4). The final plaque score for subjects was obtained by dividing the summed-up plaque score of all six teeth by six. The measurement errors were ruled out by inter-examiner assessment of plaque scores of randomly selected twenty subjects.

The data were analyzed by SPSS for Windows (version 20, Chicago Inc.). The plaque scores for gender, use of mouth wash and method of brushing having two variables were assessed with an Independent sample t-test. The difference in plaque levels for practice and timing of brushing having three variables were assessed with One-way ANOVA and Post Hoc Bonferroni tests. The intra-examiner reliability was assessed by Kappa statistics. The level of significance was set at less than or equal to 0.05.

RESULTS

The gender distribution of the study sample came out to be 36.9% males and 63.1% females. The difference in plaque index between variables like method of brushing, use of mouth wash and gender of subjects is shown in Table 1. The variable of the brushing method ($p = 0.02$)

showed a statistically significant difference while the variables like the use of mouthwash and gender were insignificant.

The difference in plaque scores for variables like practice and timing of brushing is shown in Table 2. A statistically significant difference was seen for the

Table 1: Comparison of plaque index regarding method of brushing, use of mouthwash and gender

Variable		N	Plaque Index Mean \pm SD	p-value
Method of brushing	Normal brushing	91	1.53 \pm .62	0.020*
	Interdental brushing	39	1.26 \pm .53	
Use of mouthwash	Yes	31	1.28 \pm .52	0.076
	No	99	1.51 \pm .63	
Gender	Male	48	1.53 \pm .62	0.374
	Female	82	1.42 \pm .61	

$N = 130$

Independent sample t-test

Level of significance ≤ 0.05 *

variables like practice of brushing ($p = 0.009$) and timing of brushing ($p = 0.001$). The Post hoc Bonferroni test showed a statistically significant difference between the variables like once per day and twice per day ($p = 0.018$), once per day and more than twice per day ($p = 0.040$) and before breakfast and after breakfast ($p = 0.001$). The agreement of the first and second

examinations at 70.3% for plaque scores gives a Kappa value of 0.68 which is indicative of good inter-examiner reliability.

DISCUSSION

Esthetics, functional occlusion and stability are the prime objectives of orthodontic treatment. However, to

Table 2: Comparison of plaque index regarding practice and timing of brushing

Variable		N	Plaque Index Mean \pm SD	p-value
Practice of brushing	Once per day	38	1.71 .53	0.009*
	Twice per day	75	1.37 .63	
	>Twice per day	17	1.27 .54	
Timing of brushing	Before breakfast	76	1.62 .60	0.001*
	After breakfast	50	1.22 .56	
	Before bed	4	1.31 .34	

One-Way ANOVA

Level of significance ≤ 0.05 *

guard these objectives before, during and after orthodontic treatment the importance of oral hygiene maintenance cannot be overlooked. If compromised, bad oral hygiene can leave the teeth and supporting structures in miserable conditions which subsequently will jeopardize the prime objectives of esthetics, functional occlusion and stability. There are several

factors which are responsible for maintaining oral health in optimal condition. Among these, the most important are the brushing practices, eating habits, use of mouthwash and scheduled ultrasonic scaling. In this present study, we have placed our focus on the brushing practices of orthodontic patients to evaluate how well the various factors contribute to maintaining oral

hygiene at an optimal level.

The investigation of the brushing practices has produced promising results to comprehend their use. The present study shows that the use of an interdental brush, when used in addition to normal brushing, results in a significant reduction of plaque levels and achieves optimal cleanliness in patients with multi-bracket fixed appliances. Dissimilar findings were shown by other studies in which the interdental cleaning devices were investigated.¹³⁻¹⁵ Their results have shown that interdental cleaning devices although can reduce plaque levels, do not produce significant differences. The use of mouthwash to keep the level of plaque as low as possible during orthodontic treatment has been also investigated. In the present study, we have found a decreased level of plaque accumulations in subjects who have used mouthwash during the orthodontic treatment. However, the difference was not significant from those subjects who had not used mouthwash. Similar results have been reported by another study carried out to see the effect of mouthwashes in reducing the risk of white spot lesion formation in orthodontic patients.^{19,17} Although mouthwashes do not produce a significant difference in the reduction of plaque levels, their role in subjects with poor and compromised patients will become much more significant. The plaque levels were also seen for the gender of the subjects in the present study. Both were equally compliant with oral hygiene instructions as there was no significant difference in plaque levels between male and female subjects. On the contrary, other studies showed better compliance with instructions from female subjects on improving oral hygiene as compared to the male subjects.¹⁸⁻²⁰

The timing of brushing is very important in keeping oral hygiene at an optimal level. The timing and frequency of brushing have been investigated by other researchers^{21,22} in terms of the percentage of the subjects however, the difference in plaque level based on these various brushing practices has not been determined by any researcher. In the present study, we have found a significant reduction in plaque development in subjects who brush their teeth after breakfast as compared to those who brush before breakfast. The subjects who brush their teeth before going to bed at night are very few which is why this finding does not produce a

significant difference. The frequency of brushing was also determined in the present study. The subjects who brush their teeth twice a day were shown to have significantly reduced plaque levels as compared to those who brush once a day. However, no significant difference was seen for the subjects who brush their teeth more than twice a day. So, brushing more than twice a day may be harmful to the supporting gingiva of the dentition rather than having some beneficial impact.

The orthodontic patients need careful monitoring for oral hygiene during treatment with the appliances in the mouth for a long time. For this reason, apart from setting the objectives of esthetics, stability and functional occlusion, the factors for better oral hygiene of the patients must be carefully considered. Ignoring these factors may lead to a complete failure of all the treatment objectives as poor health of teeth and supporting structures may call for halting the process altogether. Limitations of the study are the confounding factors like socioeconomic status and dietary habits of the patient which are not addressed. The results of this study showed that verbal instructions and measures to maintain oral hygiene are not sufficient. Therefore, additional measures like dietary advice, frequent scaling and extra sessions for oral hygiene counseling etc. are needed to be incorporated and evaluated with the help of research to improve oral hygiene and prevent the dental and periodontal disease process during and after orthodontic treatment.

CONCLUSIONS

The use of interdental brushing in addition to normal brushing and mouthwash produced minimal improvement in plaque reduction. The male and female subjects comply equally with oral hygiene measures. Brushing twice a day i.e. after breakfast and before going to bed significantly reduces plaque in orthodontic patients.

DISCLAIMER

None to declare.

CONFLICT OF INTEREST

There is no conflict of interest among the authors.

ETHICAL STATEMENT

The ethical approval is provided by the Institutional Review Board of Prime Foundation Pakistan

(Prime/IRB/2021-377).

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