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RESEARCH ARTICLE

EFFECTIVE PLAQUE CONTROL DURING ORTHODONTIC TREATMENT: EVALUATION OF THREE TOOTH BRUSHES

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ABSTRACT

Maintaining good oral hygiene is a must for the successful outcome of orthodontic treatment with tooth brush as a main aide of cleaning. This study was planned to check plaque controlling and cleaning effectiveness of brushing with conventional tooth brush, orthodontic tooth brush and an electrically operated rotary brush in patients who had fixed orthodontic appliances placed in their mouth. Study included 30 orthodontic patients (18-25yrs.) were divided equally into three groups. Group A subjects were made to brush with conventional tooth brush, Group B with orthodontic tooth brush and Group C with electrical tooth brush respectively. Plaque indices were recorded on each patient at the time period of baseline, 7days and 14days. It was found that in comparison to conventional tooth brush, orthodontic tooth brush and powered brushes performed better for removing plaque with same capacity.

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INTRODUCTION

Orthodontic patients with fixed appliances have an increased risk for caries, gingivitis and white spot lesions, as plaque and trapped debris that accumulate around orthodontic brackets are difficult to remove. Hence, maintaining oral hygiene is a must for the successful outcome of orthodontic treatment. Oral hygiene methods include regular brushing, rinsing and often mouth washes as supplemental products. Compliance from both young and adult orthodontic patients has always been a problem during the entire period of treatment and even if the patient becomes non-compliance to other oral hygiene methods, the tooth brush is used with a fair degree of regularity. Mechanical mode of brushing has been the conventional oral hygiene routine. The market is now sensitive to the needs of the orthodontic patient and special orthodontic tooth brushes are available from select brands. Additionally, electrically operated rotary tooth brushes have also found a segment in urban regions. This study was planned with an objective to decipher if there was any difference in the plaque controlling and cleaning effectiveness of brushing with conventional tooth brush, orthodontic tooth brush and an electrically operated rotary brush in patients who had fixed orthodontic appliances placed in their mouth.

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Aims and Objective

1. To check the plaque controlling ability of three different tooth brushes
2. To determine the best tooth brush to be prescribed in orthodontic patients

MATERIALS AND METHODS

This study was undertaken in the department of orthodontic and dentofacial orthopedics. Electric, conventional and orthodontic tooth brushes were used in this study (Colgate Pvt. Ltd.). The samples of 30 adult orthodontic patients in the age group of 18-25yrs. were included in the study.

Inclusion criteria

1. Patients undergoing orthodontic treatment with bonded upper and lower teeth (hostel student were taken having the similar diet and socioeconomic levels)
2. The patients included in the study had no crowding and were in the space closure stage.
3. Absence of any systemic disease and periodontal health problem
4. No use of antibiotics in the past 2 months

Fig.1. With Three Tooth Brushes And Disclosing Solution

All patients were divided into three groups A, B &C and with each group consisting of 10 subjects. The study was conducted over a two week period dedicated for assessment of each type of tooth brush.

Group A: All the 10 subjects were made to brush with conventional tooth brush
Group B: All the 10 subjects were made to brush with orthodontic tooth brush
Group C: All the 10 subjects were made to brush with electrical tooth brush

1. All the subjects brushed with the modified bass technique twice in a day for 2 minutes each time (morning and evening) and with the same toothpaste.
2. Disclosing agent (two-tone disclosing solution, Alpha Plac) was applied with the help of swab (Fig.2) and followed by rinsing the mouth with water after 30 seconds which would stain the old plaque harboring areas blue and new plaque pink (Fig.3).

Fig.2. Disclosing Solution Applied

3. The plaque indices were recorded on each patient at the time period of 0day (beginning), T1(after 1week) and T2(after 2week).
4. The data collected for each patient with each tooth brush was tabulated and subjected to statistical analysis
5. Plaque index (Bonded Bracket Index)[1] for bracketed teeth to determine the amount of microbial plaque accumulation on teeth is used to evaluate plaque accumulation

Fig.3. After Disclosing Agent Rinsed

The scores allotted were as follows

0: No microbial plaque on the bracket or tooth surface.
1: Microbial plaque only on the bracket.
2: Microbial plaque on the bracket and tooth surface, but no spreading towards the gingiva.
3: Microbial plaque on the bracket and tooth surface, spreading toward the papilla.
4: Microbial plaque on the bracket and tooth surface. Part of the gingiva is covered with plaque.
5: Microbial plaque on the bracket and tooth surface. Gingiva is totally covered with plaque

RESULTS

The mean score of plaque index for three tooth brushes were analyzed by one way ANOVA followed post hoc comparison by Bonferroni method.

Table 1. Mean plaque score of three tooth brushes at baseline, T1 and T2

Time interval	Conventional tooth brush	Powered tooth brush	Orthodontic tooth brush
At baseline	0.588 ± .045	0.585 ± .065	0.627 ± .084
T1	0.560 ± .038	0.452 ± .033	0.494 ± .060
T2	0.546 ± .042	0.447 ± .044	0.478 ± .062

To see the change of plaque over period of time Repeated measurement analysis done (two way ANOVA followed post hoc comparison by Bonferroni method).

Table 3 (a, b &c): Decrease in plaque over period of time amongst brushes

Table 2 indicates that at baseline, the mean plaque scores difference for three brushes is statistically insignificant ($p>0.05$). At T1 & T2, the mean plaque score for powered and orthodontic tooth brush is statistically significant in comparison with conventional tooth brush ($p<0.05$). Also for powered and orthodontic tooth brush, the mean plaque score difference at T1 & T2 is non-significant.

Table 2. Multiple comparisons of various time point plaque among three brushes

	Type of tooth brush (I)	(J) brush	Mean Difference (I-J)	Std. Error	Sig.
Plaque score at baseline	Conventional	Powered toothbrush	.0033000	.0297770	1.000
	tooth brush	Orthodontic tooth brush	-.0387000	.0297770	.614
	Powered	Conventional tooth brush	-.0033000	.0297770	1.000
	tooth brush	Orthodontic tooth brush	-.0420000	.0297770	.509
	Orthodontic	Conventional tooth brush	.0387000	.0297770	.614
	tooth brush	Powered tooth brush	.0420000	.0297770	.509
Plaque score at T1	Conventional tooth brush	Powered tooth brush	.1080000*	.0203670	.000
		Orthodontic tooth brush	.0660000*	.0203670	.009
	Powered tooth brush	Conventional tooth brush	-.1080000*	.0203670	.000
		Orthodontic tooth brush	-.0420000	.0203670	.147
	Orthodontic tooth brush	Conventional tooth brush	-.0660000*	.0203670	.009
		Powered tooth brush	.0420000	.0203670	.147
Plaque score at T2	Conventional tooth brush	Powered tooth brush	.0990000*	.0206218	.000
		Orthodontic tooth brush	.0680000*	.0206218	.008
	Powered tooth brush	Conventional tooth brush	-.0990000*	.0206218	.000
		Orthodontic tooth brush	-.0310000	.0206218	.433
	Orthodontic tooth brush	Conventional tooth brush	-.0680000*	.0206218	.008
		Powered tooth brush	.0310000	.0206218	.433

For conventional tooth brush (Table 3a)

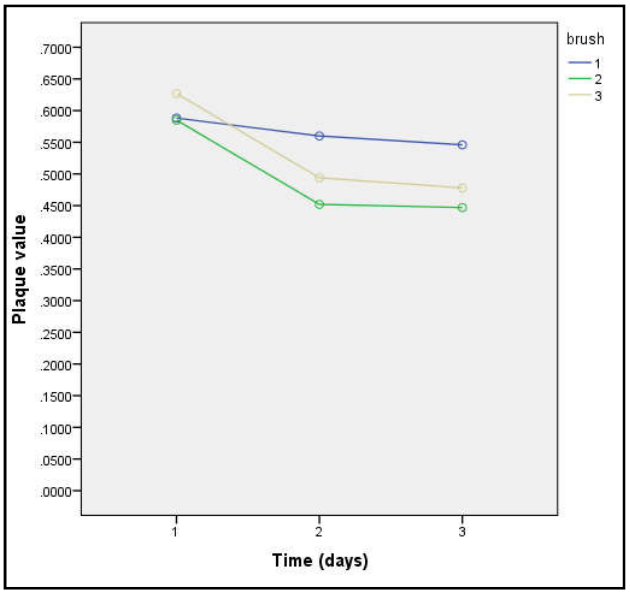
(I) plaque	(J) plaque	Mean Difference (I-J)	Std. Error	Sig.[c]
Baseline	T1	.028*	.008	.015
	T2	.042*	.012	.019
T1	Baseline	.028*	.008	.015
	T2	.014	.009	.518
T2	Baseline	.042*	.012	.019
	T1	.014	.009	.518

For powered tooth brush (Table 3b)

(I) plaque	(J) plaque	Mean Difference (I-J)	Std. Error	Sig.[c]
Baseline	T1	.133*	.012	.000
	T2	.138*	.015	.000
T1	Baseline	-.133*	.012	.000
	T2	.005	.012	1.000
T2	Baseline	-.138*	.015	.000
	T1	-.005	.012	1.000

For orthodontic tooth brush (Table 3c)

(I) plaque	(J) plaque	Mean Difference (I-J)	Std. Error	Sig.[c]
Baseline	T1	.133*	.021	.000
	T2	.149*	.026	.001
T1	Baseline	-.133*	.021	.000
	T2	.016	.012	.600
T2	Baseline	-.149*	.026	.001
	T2	-.016	.012	.600



Graph 1. Indicating changes in plaque scores of three tooth brushes at baseline, T1&T2 time interval

Table 3 indicating, the mean plaque scores decrease at different time interval for each brush. For three brushes, there is significantly reduction in plaque scores ($p<0.05$) at T1than between T1 and T2 time interval. Between time period of baseline and T2, the only 7% reduction in plaque scores seen in case of conventional tooth brush and for others two brushes, its 23% reduction in plaque scores.

DISCUSSION

Tooth brushing has significant result on plaque removal, but it is very difficult to influence the personal tooth brushing to maximize the efficacy. Most of the people, brush their teeth for shorter than optimal period and some are using the inadequate technique to remove plaque properly. So, our practical approach is to developed an effective toothbrush that has potentially good response of removing plaque specially in orthodontic patients and less dependent on tooth brushing technique. Our study compare the plaque removing ability of conventional, orthodontic and powered tooth brush in orthodontic patients and indicating that 23% plaque reduction seen in case of powered and orthodontic tooth brush than the conventional tooth brush (only 7%) within a time period of two week. The reason for these results attributed to the unique bristles design of powered and orthodontic tooth brush to reach the gingival margins of the brackets where plaque is trapped without the needs of special manual skills. Christina erbe *et al* in their study concluded that electric tooth brush, with either orthodontic or regular brush head demonstrated significantly plaque removal than manual brush. Also, the orthodontic brush head superior to the regular head. Borutta *et al.* (2002) compare the effectiveness of powered tooth brush versus manual tooth brush for orthodontic pt. and conclude that powered tooth brush are better and can be recommended in orthodontic patients. However, presently there are few studies related to the efficiency difference between powered and orthodontic tooth brush. Silvestrini *et al.* (2010) study manual vs. electric tooth brush and found oscillating-rotatory tooth brush to be better in controlling plaque than the manual orthodontic tooth brush. Further study with more sample size and extended time interval is needed to throw light on the efficacy difference between powered and orthodontic tooth brush in plaque controlling.

Conclusion

Powered and orthodontic tooth brushes are equally capable of removing plaque and are better than the conventional tooth brush. Moreover, powered tooth brush is less technique sensitive, so can be prescribed in orthodontic patients who are unable to follow the proper tooth brushing method.

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