

Abstract

Fluoride dentifrices play an essential role in caries prevention and removal of stained pellicle. The role of dentifrice in the removal of plaque during toothbrushing is less defined. The objective of this study was to determine the relative importance of dentifrice in plaque removal during toothbrushing. The plaque removal efficacy of a manual toothbrush with water (TB+W) was compared to the same manual toothbrush with a commercial fluoride dentifrice (TB+D) following a single, unsupervised use. Ninety-three subjects completed an examiner-blinded, crossover designed clinical trial conducted among an urban population. Subjects meeting defined entrance criteria abstained from all oral hygiene for 23 to 25 hours prior to each visit. Oral hard and soft tissue examinations and plaque assessments were conducted at each visit. Plaque was evaluated using the Proximal/Marginal Plaque Index both before and after brushing for 60 seconds. Subjects were randomly assigned to the TB+W or TB+D treatment groups and returned approximately 2 weeks later to repeat the procedure with the alternate treatment. All subjects were supplied the same commercial TB (Oral-B[®] Indicator[®]) and dentifrice (Crest[®] Regular Cavity Protection). Differences between treatments were analyzed using an ANOVA. Both treatments yielded significant ($p=0.0001$) reductions in whole mouth plaque compared to Baseline values. The TB+W group yielded a significantly ($p=0.0020$) greater plaque reduction of 38.3% compared to the TB+D group with a 34.9% reduction. These results suggest that dentifrice does not play a major role in the removal of plaque during a single use brushing.

Introduction

Toothbrush and fluoride dentifrice are essential components of the oral care routine to maintain oral health and cleanliness. The toothbrush is the most effective and safest device for plaque removal.¹ Fluoridated dentifrice is well established to be important for the prevention of caries and dentifrice abrasives are recognized as the major cleansing agents for the removal of stained pellicle. However, the relative roles of the toothbrush and dentifrice in the removal of plaque during brushing have not been clearly elucidated. Studies suggest that abrasives in dentifrice do not play a major factor in removal of plaque relative to the mechanical action of the toothbrush.^{1,2}

Objective

This study was conducted to establish the relative roles of the toothbrush and dentifrice in plaque removal during brushing.

Study Design

A total of ninety-three subjects completed this randomized, examiner-blinded, crossover designed clinical trial. Prior to enrollment, subjects provided written informed consent and medical history forms were completed. At each visit, an oral hard and soft tissue examination and a plaque assessment, using the Proximal/Marginal Plaque Index³ (PMI), were performed on

subjects who had refrained from all oral hygiene for the previous 23 to 25 hours. Subjects meeting defined entrance criteria and a whole mouth plaque level of 2.20 or greater were enrolled into the study. Upon enrollment, subjects were randomly assigned to one of two treatment sequence groups and brushed unsupervised for one minute using their usual manner of brushing with their assigned toothbrush and either water (TB+W) or the supplied dentifrice (TB+D). After brushing, subjects were again disclosed and evaluated for plaque. Subjects continued with their normal oral care routine except for refraining from all oral hygiene for 23 to 25 hours prior to the second visit, approximately two weeks later, to repeat the procedure with the alternate treatment. All subjects were supplied with the same commercial toothbrush (Oral-B Indicator, Oral-B Laboratories, Belmont, CA, USA) and dentifrice (Crest Regular Cavity Protection, Procter & Gamble, Cincinnati, OH, USA). Subjects were exited from the study following completion of all safety and efficacy assessments

Statistical Analyses

EFFICACY

Plaque reduction efficacy was evaluated using mean whole mouth, approximal, and gingival margin PMI plaque scores. Changes in PMI levels from pre- to post-brushing were analyzed using a paired t test to assess the treatment effects of a single brushing. An analysis of variance (ANOVA) was also conducted to determine differences between treatment groups to evaluate the changes in PMI levels from pre- to post-brushing.

SAFETY

Oral hard and soft tissue examinations were conducted at each visit to evaluate the safety of the treatments. Differences between treatments were evaluated by comparing the distributions of abnormal findings in each treatment group. The chi-square test for homogeneity was conducted to analyze differences between treatment groups at each visit.

Table 1. Demographics of Study Population

	Treatment Sequence Group		p value
	TB+W/TB+D	TB+D/TB+W	
Number of Subjects			
Female (%)	35 (74%)	30 (65%)	0.3309
Male (%)	12 (26%)	16 (35%)	
Total	47	46	
Age (years)			
Mean \pm S.D.	40.7 \pm 7.8	38.9 \pm 11.2	0.3545
Range	21-56	20-62	

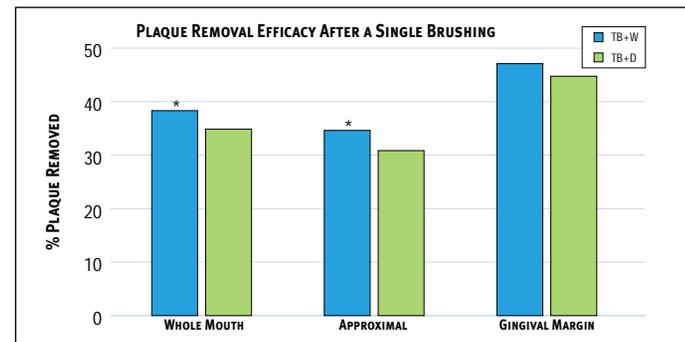
Results

STUDY POPULATION

There were no statistically significant differences between treatment sequence

	Treatment	Pre-Brushing PMI (s.d.)	Post-Brushing PMI (s.d.)	Mean Plaque Reduction (s.d.)*	% Plaque Reduction	p value
Whole Mouth	TB+W	2.96 (0.45)	1.83 (0.52)	1.13 (0.34)	38.3%	0.0020
	TB+D	2.99 (0.43)	1.94 (0.48)	1.04 (0.35)	34.9%	
Approximal	TB+W	3.14 (0.44)	2.05 (0.52)	1.09 (0.33)	34.7%	0.0001
	TB+D	3.16 (0.44)	2.19 (0.49)	0.97 (0.35)	30.8%	
Gingival Margin	TB+W	2.59 (0.52)	1.37 (0.57)	1.22 (0.43)	47.1%	0.2981
	TB+D	2.64 (0.48)	1.46 (0.55)	1.18 (0.40)	44.8%	

* Mean plaque reductions within each group were significant at $p = 0.0001$



* Significant difference between groups, $p = 0.0020$

groups for gender, age, or Baseline mean PMI scores (Table 1 and 2).

PLAQUE REMOVAL EFFICACY

Both the TB+W and TB+D treatment groups demonstrated statistically

Conclusions

Dentifrice does not perform a significant role in plaque removal during brushing.

The mechanical action of the toothbrush is the primary mechanism for plaque removal during brushing.

References

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