



A Comparative Evaluation of The Plaque Removal Efficacy of The Manual and Powered Toothbrush

¹Dr. Mekhala Mukherjee, ²Dr. Ravi Prakash, ³Dr Manoj Kumar Singh, ⁴Dr. Abhijit Chakraborty, ⁵Dr Surupa Dutta, ⁶Dr Trishik Basak

¹Assistant Professor, ^{2,3}Professor, ⁴Professor, and Head, ^{5,6}Assistant Professor
BDS, MDS, Department of Periodontics, Guru Nanak Institute of Dental Science and Research, Kolkata, West Bengal, India

***Corresponding Author:
Dr Mekhala Mukherjee**

Flat 5N, Tower 2, Alcove Gloria, 403/1, Dakhshindari Rd., Sreebhumi, Lake Town, Kolkata 700048

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Abstract

Introduction: Dental plaque removal is the key to maintaining good oral hygiene. Toothbrushing is widely accepted as the primary method of mechanical plaque removal. Two types of toothbrushes are widely used, manual and powered toothbrushes. Here an attempt has been made to observe the comparative natures of the two brushes.

Aim: To determine the efficacy of powered and manual toothbrush in the mechanical removal of dental plaque.

Method: Fifteen dental college students were selected. Subjects were advised to visit the Department of Periodontics, Guru Nanak Institute of Dental Sciences and Research, for two consecutive days. On day 1, the plaque score was recorded using disclosing agent and after scaling a baseline score was recorded. The subjects were refrained from all oral hygiene aids for 24 hours. After 24 hours plaque score was recorded. The right quadrants both upper and lower was brushed using the powered toothbrush and the left quadrants were brushed using manual toothbrush. The plaque score was recorded once again.

Results: It was observed that the efficacy of the manual toothbrush was slightly better when compared to the powered toothbrush but this was statistically insignificant.

Conclusion: Both manual and powered toothbrushes significantly reduced the plaque score, although to different degrees. Powered brushes proved to be a good alternative to manual toothbrush.

Keywords: Powered Toothbrush

INTRODUCTION

Periodontal diseases are highly prevalent and can affect up to 90% of the world population [1]. Loe et al, in the year 1960 established the role of dental plaque as the etiological agent responsible for periodontal disease [2]. Dental plaque is defined clinically as structured, resilient yellow greyish substance that adheres tenaciously to the intraoral hard surfaces including removable and fixed restorations [3]. Periodontal diseases occur when the plaque biofilm is present in the susceptible host[4].

Today, the market is flooded with various brands/types of toothbrushes, some with more attractive packaging and the others with effective advertising, stating the size, shape, pliability, colour, other physical features each claiming superiority over the other. This makes it very difficult for the consumer to select a suitable toothbrush of specific clinical use. Thus it is necessary to provide guidelines to both toothbrush manufacturers as well as the consumer.

Based on comparative studies that related to the variety of the efficacy of the toothbrushes this study was designed to compare and evaluate the efficacy of manual and powered toothbrushes.

AIMS AND OBJECTIVES:

The aim of the study is to determine the plaque removal efficacy of the manual and the powered toothbrush.

Objective of the study is to compare the plaque removal efficacy of the Colgate Slim-Soft toothbrush and the battery powered Colgate toothbrush that will be judged on the dental students.

MATERIALS AND METHODS:

The present study was carried out with market available Colgate™ 360-degree Surround, battery powered toothbrush and Colgate™ SlimSoft manual toothbrush.

The Colgate™ 360 Surround Toothbrush has vibrating bristles. The cleaning power of the brush is 20000 strokes per minute. The Surround design of the brush includes bristles that clean all the surfaces of the teeth. The brush head is similar to the conventional toothbrush and is not replaceable.

The Colgate™ SlimSoft manual toothbrush is used for deep cleaning yet gentle. It has slim tip bristles that are specially designed for a deep and gentle clean to sweep away the food debris and plaque from the gingival margin area.

The study was performed in the Department of Periodontics, Guru Nanak Institute of Dental Sciences and Research, Panihati, Kolkata – 700114. Fifteen dental college students were selected as the subjects for this study. This specific group was selected for their awareness of the oral hygiene measures.

Moreover, the author has recorded all the data throughout the study period in order to eliminate inter-examiner error.

On the first visit the plaque score of the subject was recorded. Then the plaque score was made 0 at the base line by doing ultrasonic scaling for the standardization. Then the subject was instructed to refrain from all oral hygiene aids for 24 hours prior to the next visit, the next day. The subject was also instructed to refrain from eating, drinking, chewing gums and smoking at least 4 hours prior to the visit.

On the second visit, i.e. 24 hours after the first visit, the plaque score of the subject was recorded using a disclosing agent (Fig 1a, Fig 1b). The plaque score was recorded by Turesky Gilmore modification of Quigley-Hein Plaque Index. The right quadrants both upper and lower of the subject was brushed using a powered toothbrush. Similarly, the left quadrant which included both upper and lower was brushed using the manual toothbrush. The plaque score of the subject were recorded once again after brushing using a disclosing agent (Fig 2a, Fig 2b).

RESULTS:

The plaque scores were recorded during the study and they were tabulated and statistically analyzed in order to compare the efficacy of the powered and the manual toothbrush. The first plaque score was taken on the first day before ultrasonic scaling. Then the second plaque score was taken after one day which denoted the plaque deposition of 24 hours. Then the comparative evaluation of the left and the right side was done after brushing. It was observed that the efficacy of the manual toothbrush was found slightly better when compared to the powered toothbrush but this difference was statistically not significant.

Table 1: Distribution of mean buccal at 24 hours before brushing in two Groups

		Number	Mean	SD	Minimum	Maximum	Median	p-value
Buccal at 24 hrs Before brushing	Left (Manual)	15	1.4667	.3442	1.0700	2.1400	1.2800	0.6904
	Right (Power)	15	1.4187	.3081	1.0000	2.1500	1.4200	

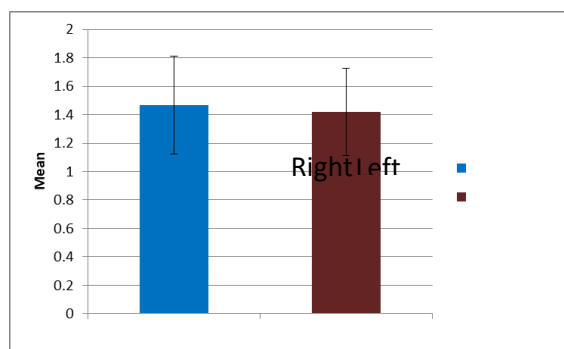


Fig 3. Distribution of mean buccal before brushing

Mean plaque score was higher in left than right for buccal at 24 hours before brushing but this difference was not statistically significant ($p=0.6904$).

Table 2: Distribution of Mean Lingual at 24 hours before brushing in Two Groups

		Number	Mean	SD	Minimum	Maximum	Median	p-value
Lingual 24 hrs. Before brushing	Left (Manual)	15	1.2753	.2259	0.9200	1.7100	1.2800	0.6521
	Right (Power)	15	1.2393	.2063	1.0000	1.5700	1.2100	

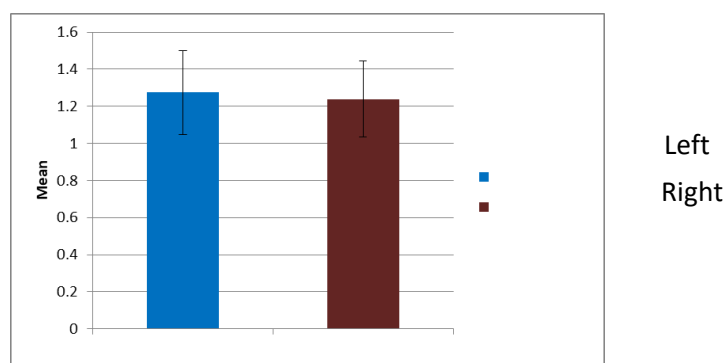


Fig 4: Distribution of Mean Lingual at 24 hours before brushing in Two Groups

Mean plaque score was higher in left than right for lingual at 24 hours before brushing but this difference was not statistically significant ($p=0.6521$).

Table 3: Distribution of Mean Buccal After brushing in Two Groups

		Number	Mean	SD	Minimum	Maximum	Median	p-value
Buccal After brushing	Left (Manual)	15	.2687	.2505	0.0700	0.8500	0.1400	0.8332
	Right (Power)	15	.2860	.1923	0.0700	0.7600	0.2100	

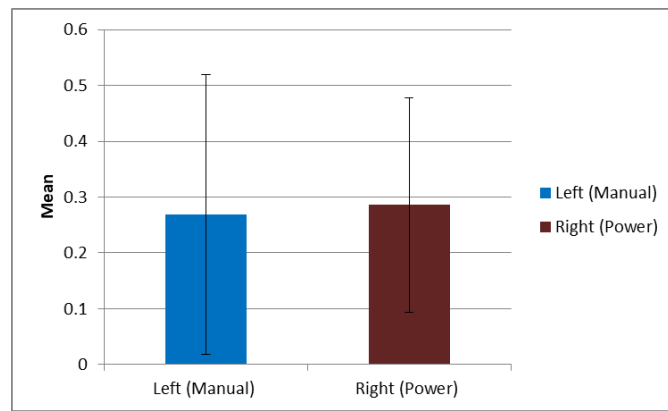


Fig 5: After brushing, the mean plaque score was less in the left buccal as compared to the plaque score in the right buccal but this difference was not statistically significant.

Mean plaque score was higher in right (Powered brush) than left (Manual brush) for buccal after brushing but this difference was not statistically significant ($p=0.8332$).

Table 4: : Distribution of Mean Lingual After brushing in Two Groups

		Number	Mean	SD	Minimum	Maximum	Median	p-value
Lingual After brushing	Left (Manual)	15	.2787	.2488	0.0000	0.7900	0.1400	0.8712
	Right (Power)	15	.2940	.2643	0.0000	0.9200	0.2100	

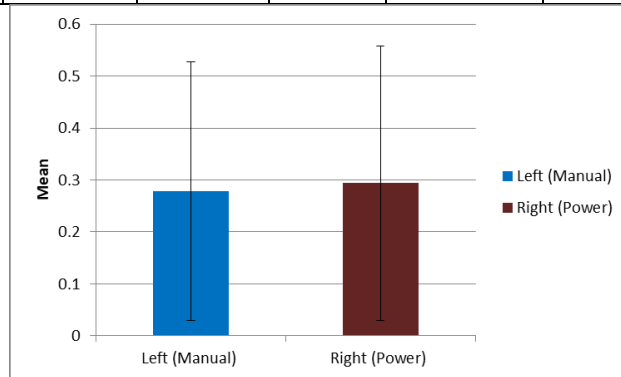


Fig 6: After brushing, the mean plaque score of the right lingual side was more than the left lingual side but this difference was statistically insignificant.

Mean plaque score was higher in Right (Power) than Left (Manual) for Lingual after brushing but this difference was not statistically significant ($p=0.8712$).

DISCUSSION:

Toothbrushing is the most widespread mechanical means of personal plaque control techniques in the world due to its effectiveness, convenience, cost and it is considered to be an important factor in the long term maintenance of periodontal health. Patients who have not received any professional advice regarding the

type of brush to be used for cleaning, usually choose brushes of their own, which is based on cost, availability, advertising planes, family tradition or habit.

Manual toothbrush aims for innovations in the brush head design that will help to compensate for sub-optimal brushing technique and brushing time. The technique sensitivity that is required for the proper brushing of the teeth using a particular method is the major disadvantage of the manual toothbrush. Some individuals regardless of health or physical status

cannot master dental biofilm removal with the manual toothbrush. Switching to a powered toothbrush may be the perfect solution for these patients. The decision to recommend a powered toothbrush or a manual toothbrush depends on a variety of circumstances. It has been seen in various studies that general population especially the elderly and handicapped individuals find it advantageous to use powered toothbrushes over manual toothbrushes. With the conventional method of toothbrushing the subjects have to be taught a particular technique for effective cleaning, but with powered toothbrush the action is built into the toothbrush. For this reason it good for people with less dexterity, skill and people with autism. Apart from the elderly and specially abled patients, children are also benefited from the powered toothbrush, as it is very difficult for them to master the manual toothbrushing techniques. It is also highly efficient in patients undergoing orthodontic treatment.

Several studies have been done to compare the efficacy of the manual and powered toothbrush. Studies showed that the powered brush was significantly more efficient in removing plaque and improving gingival health than manual toothbrush (Lazarescu *et al*, Haffajee *et al.*)[5,4]. In several studies it was seen that there was no significant difference in the overall plaque removal of manual and powered toothbrush (McCracken *et al*, Walsh *et al*)[6,7]. However there are also studies that concluded that the conventional manual toothbrush improved the effectiveness of cleaning when compared to powered toothbrush (Elliott *et al*)[8].

In the present study it was observed that only in the right upper buccal quadrant the plaque score after brushing was less as compared to the left upper buccal quadrant denoting that the powered brush was more efficient in removing the 24 hour plaque, but this difference was statistical not significant. Apart from this the plaque score in the left quadrants were lesser as compared to the right quadrants , denoting that the efficacy of the manual brush was more than the powered brush, but even in this the difference between the plaque score was not statistically significant.

CONCLUSION:

The manual and the powered toothbrush both significantly reduced the plaque accumulation, though to different degrees. Powered toothbrush may prove to be a good alternative to manual toothbrush as it is not technique sensitive. At the same time concerning the cost effectiveness, the manual toothbrush is more economical than the powered toothbrush.

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FIGURES



Fig 1(a) Plaque on the Right Side Before Brushing at 24hrs



Fig 1(b) Plaque on the Left Side before brushing at 24hrs



Fig 2(a) Plaque Score on the right side after brushing



Fig 2(b) Plaque Score on the left side after brushing