

Comparative Evaluation of Effectiveness of Manual and Electric Tooth Brush (Oral - B) in Elimination of Dental Plaque and Gingivitis

Dr. Abdul Basith¹, Dr. Monica GS¹, Dr. M. S. M. Bhir²

¹Post Graduate Students, Department of Periodontology, Maharaja Ganga Singh Dental College and Research Centre, Rajasthan, India.

²Head and Professor, Department of Periodontology, Maharaja Ganga Singh Dental College and Research Centre, Rajasthan, India.

Corresponding Author: Dr. Monica GS

ABSTRACT

Aim: Comparative evaluation of effectiveness of manual and electric tooth brush (oral - B) in elimination of dental plaque and gingivitis.

Materials and methods: Eighty Dental Students in the age group of 18 to 28 years participated in the study for 2 months.

Result: Both the brushes significantly reduced the plaque accumulation, improves gingival health and oral hygiene index, yet powered brushing shows a greater degree.

Conclusion: Powered tooth brush is efficient in controlling the plaque and in improving the oral hygiene and gingival health when compare to manual tooth brush.

Keywords: Plaque, Manual tooth brush, Electric tooth brush, Oral B

INTRODUCTION

Bacterial plaque is the principal etiological agent in gingival and periodontal disease. Thus both prevention and treatment of these conditions must be based on extent of plaque control.

Early studies by Loe et al [1] demonstrated the close association between dental plaque biofilms and inflammation of the gingiva. Supragingival plaque accumulation can be rapid gingival inflammation may appear in few days and if untreated can lead to more serious periodontal conditions.

Daily plaque removal with the toothbrush is an important component of the oral hygiene programs intended to prevent and treat periodontal diseases. This

mechanical cleaning procedure by toothbrush is efficient, provided the method used is sufficiently thorough and performed regularly. The bristle toothbrushes appeared about the year 1600 in China. It was first patented in America in 1857 and has since undergone little change. A Swedish water maker Fredrick Wilhelm Tornberg is credited with designing the first mechanical toothbrush in 1885. [2] The electric toothbrush is both efficient and surprisingly appealing to patients. For these reasons it has a definite use for some patients, such as, individuals lacking fine motor skills, especially the handicapped and those who lack digital dexterity.

Since the arrival and development of the electric tooth-brush there has been continuing controversy whether or not it is more effective than a manual toothbrush. Some reports seem to indicate that electric toothbrushes are superior to manual one's in terms of removing plaque and improving gingival health. [3,4]

The study aimed to evaluate the safety and efficacy of Oral - B powered toothbrush for the removal of supragingival plaque and improving gingival health and to compare it to a regular manual toothbrush, Oral - B

MATERIALS AND METHODS

The study was conducted in the Department of Periodontics and Oral Implantology, Maharaja Ganga Singh Dental College and Research Centre, Eighty Dental Students in the age group of 18 to 28

years were participate in the study .A Proforma was prepared for the Study, so as to have a systematic and methodical recording of all observations and information. Clinical examinations were done in the dental chair under standard conditions of light using mouth mirror and William’s periodontal probe.

Scaling and polishing was done for all subjects, and their course were made zero. Each subject then instructed to brush twice a day for two minutes using prescribed brushing technique and tooth paste. Subjects were given appointments to return at 1, 3, 8 weeks. Plaque disclosing agent Alpha Plac DPI (Dental Product India Company, India) was used to visualize plaque on patients teeth and the parameters are assessed by using-

- Oral Hygiene Index- Green and Vermillion. [5]
- Loe and Silness Gingival Index. [6]
- Turesky - Gillmore - Glickman modification of the Quigley Hein Plaque Index. [7]

Group-A consisted of 40 individuals who were assigned to use a manual tooth brush with Modified Bass method of brushing.

Group-B consisted of 40 individuals who were assigned to use a powered toothbrush and instructed to the brush with the bristles perpendicular to the gingival margin or sulcus.

INCLUSION CRITERIA

- Systemically healthy patient with good oral hygiene
- No periodontal therapy during the past 3 months
- Moderate gingivitis (at least 25% of test sites showing bleeding on probing)
- Ability to attend the hospital at recall intervals
- Full complement of teeth present, except third molars.

EXCLUSION CRITERIA

- Poor manual dexterity
- Use of drugs that could affect the state of the gingival tissues

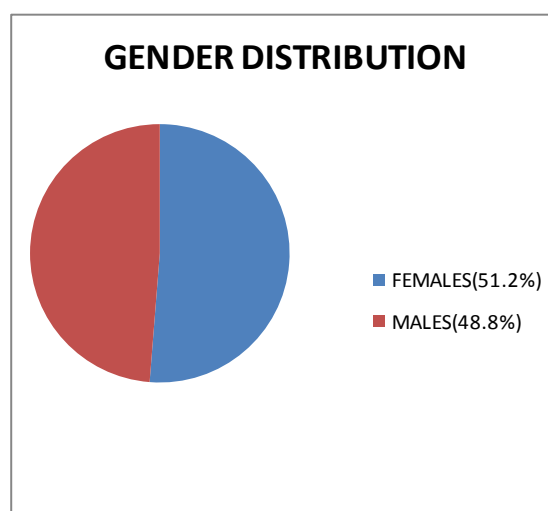
- Patient having mucogingival problem and orthodontic therapy.
- Five or more carious teeth requiring immediate treatment
- Use of any other supplemental plaque control measures, such as interdental cleansing aids or mouthwashes
- A habit of taking alcohol, smoking or chewing tobacco.

RESULTS

Study population consisted of 80 patients randomly divided into manual tooth brush with Modified Bass method of brushing (group 1) and powered tooth brush with circular and vibratory motions (group 2). All the selected patients were assessed for clinical parameters like plaque index, gingival index, oral hygiene index.

The scores were statistically analyzed by calculating the mean values and standard deviation. Unpaired t-test was used to compare values within and between the groups.

Fig./Table 01: Distribution of Study Subjects According to Gender

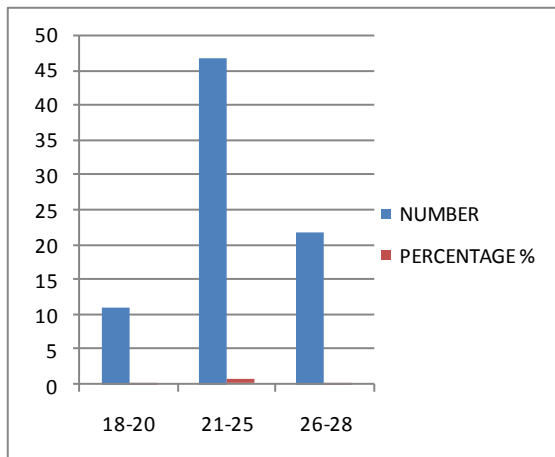


Among the total 80 subjects, 41 (51.2%) were females and 39 (48.8%) were males whose mean value is 0.4875 and standard deviation is of 0.503.

The study population was of 80 subjects randomly divided into 2 groups, where 11 (13.5%) patients was from the age group of 18-20 and 47 (58.7%) subjects from the age group of 21-25 and 22

(27.50%) subjects from age group of 26-28, which is explained in bar diagram below:

Fig./Table 02: Distribution of Study Subjects According to Age



The mean age of the study group (group 1+ group 2) is 23.8875 and the standard deviation is of 2.55568 respectively.

The intra and inter group comparison of gingival scores among study subjects using manual tooth brush and electronic tooth brush were analyzed whose p value is highly significant, explained below in the table 3 and 4

Table 03: Intra Group Comparison of Gingival Scores among Study Subjects Using Manual Tooth Brush and Electric Tooth Brush

Intra group comparison of gingival score	Mean value		Standard deviation		T value		P value	
	MTB	ETB	MTB	ETB	MTB	ETB	MTB	ETB
0 Day : 1 Week	.16750	.37250	.16233	.19998	6.526	11.780	.000(H.S)**	.000(H.S)**
0 Day : 3 Week	.28500	.88750	.26072	.29456	6.914	19.056	.000(H.S)**	.000(H.S)**
0 Day : 8 Week	.49250	1.22500	.28500	.32875	10.929	23.567	.000(H.S)**	.000(H.S)**
1 Week: 3 Week	.11750	.51500	.18521	.27132	4.012	12.005	.000(H.S)**	.000(H.S)**
1 Week: 8 Week	.32500	.85250	.23832	.33049	8.625	16.314	.000(H.S)**	.000(H.S)**
3 Week: 8 Week	.20750	1.22500	.18999	.32875	6.907	23.567	.000(H.S)**	.000(H.S)**

**P VALUE = 0.000 (highly significant)

Table 04: Inter Group Comparison of Gingival Scores among Study Subjects Using Manual and Electric Tooth Brush

Inter group	Mean± Std. Deviation(M)	Mean± Std. Deviation(E)	't'	p Value
0 Day (M) : 0 Day(E)	1.462±0.293	1.582±0.265	1.9204	0.0585 (N.S)
1 Week (M) : 1 Week(E)	1.295±0.239	1.293±0.248	0.0459	0.9635 (N.S)
3 Week (M) : 3 Week(E)	1.177±0.258	0.975±0.252	3.5539	0.0006 (H.S)**
8 Week (M) : 8 Week(E)	0.970±0.252	0.635±0.235	6.1459	0.0001 (H.S)**

**p value = highly significant, whereas the inter group comparison of gingival scores among subject using manual and electric tooth brushing on day 0 and 1st week are 0.0585 and 0.9635 respectively which are not significant.

The intra and inter group comparison of plaque scores among study subjects using manual tooth brush and electric tooth brush were analyzed whose p value is highly significant, explained below in the table 5 and 6.

Table 05: Inter Group Comparison of Plaque Scores among Study Subjects Using Manual Tooth Brush and Electric Tooth Brush:

Inter group comparison of plaque score	Mean value		Standard deviation		T value		P value	
	MTB	ETB	MTB	ETB	MTB	ETB	MTB	ETB
0 Day : 1 Week	.37250	.81000	.19998	.41498	11.780	12.345	.000(H.S)**	.000(H.S)**
0 Day : 3 Week	.88750	1.14750	.29456	.37960	19.056	19.119	.000(H.S)**	.000(H.S)**
0 Day : 8 Week	1.22500	1.82250	.32875	.39190	23.567	29.412	.000(H.S)**	.000(H.S)**
1 Week: 3 Week	.51500	.33750	.27132	.14796	12.005	14.427	.000(H.S)**	.000(H.S)**
1 Week: 8 Week	.85250	1.01250	.33049	.23771	16.314	26.939	.000(H.S)**	.000(H.S)**
3 Week: 8 Week	1.22500	.67500	.32875	.17939	23.567	23.798	.000(H.S)**	.000(H.S)**

**P VALUE = 0.000 (highly significant)

Table 6: Inter Group Comparison of Plaque Scores among Study Subjects Using Manual and Electric Tooth Brush

Inter Group	Mean± Std. Deviation(M)	Mean± Std. Deviation(E)	't'	p Value
0 Day (M) : 0 Day(E)	2.538±0.322	2.460±0.384	0.9793	0.3305 (N.S)
1 Week (M) : 1 Week(E)	2.165±0.349	1.650±0.191	8.1883	0.0001 (H.S)**
3 Week (M) : 3 Week(E)	1.650±0.191	1.312±0.107	9.7643	0.0001 (H.S)**
8 Week (M) : 8 Week(E)	1.312±0.107	0.638±0.150	23.2269	0.0001 (H.S)**

**p value= highly significant, whereas the inter group comparison plaque score among subjects using manual and electronic tooth brushing on day 0 is 0.3305 which is not significant.

The intra and inter group comparison of oral hygiene index scores among study subjects using manual tooth brush and electronic tooth brush were analyzed whose p value is highly significant, explained below in the table 7 and 8

Table 07: Intra Group Comparison of Oral Hygiene Index Scores among Study Subjects Using Manual Tooth Brush and Electric Tooth Brush

Intra group comparison of oral hygiene index score	Mean value		Standard deviation		T value		P value	
	MTB	ETB	MTB	ETB	MTB	ETB	MTB	ETB
0 Day : 1 Week	1.60000	3.47500	.67178	1.35850	15.064	16.178	.000(H.S)**	.000(H.S)**
0 Day : 3 Week	3.47500	6.07500	1.01242	1.43915	21.708	26.697	.000(H.S)**	.000(H.S)**
0 Day : 8 Week	6.07500	8.65000	1.26871	1.25167	30.284	43.708	.000(H.S)**	.000(H.S)**
1 Week: 3 Week	1.87500	2.60000	.79057	.81019	15.000	20.296	.000(H.S)**	.000(H.S)**
1 Week: 8 Week	4.47500	5.17500	1.01242	.98417	27.955	33.256	.000(H.S)**	.000(H.S)**
3 Week: 8 Week	2.60000	2.57500	.81019	.71208	20.296	22.871	.000(H.S)**	.000(H.S)**

**P VALUE = 0.000 (highly significant)

Table 8: Inter Group Comparison of Oral Hygiene Scores among Study Subjects Using Manual and Electric Tooth Brush

Inter group	Mean± Std. Deviation(M)	Mean± Std. Deviation(E)	't'	p Value
0 Day (M) : 0 Day(E)	10.400±1.128	10.400±1.128	0.0000	1.0000 (N.S)
1 Week (M) : 1 Week(E)	8.800±1.091	6.925±0.888	8.4300	0.0001 (H.S)**
3 Week (M) : 3 Week(E)	6.925±0.888	4.325±0.859	13.3074	0.0001 (H.S)**
8 Week (M) : 8 Week(E)	4.325±0.859	1.750±0.670	14.9509	0.0001 (H.S)**

**p value= highly significant, whereas the inter group comparison of oral hygiene score among subjects using manual and electric tooth brushing on day 0 is 1.000 which is not significant.

DISCUSSION

The main aim of this study is to to evaluate the safety and efficacy of Oral - B powered toothbrush for the removal of supragingival plaque and improving gingival health and to compare it to a regular manual toothbrush (Oral – B). In the mid-1900s, periodontal diseases were believed to result from accumulation of plaque over time, eventually in conjunction with a diminished host response and increased host susceptibility with age. [8, 9] Numerous clinical studies have shown a direct relationship between oral hygiene status, the quality of plaque, and the prevalence and severity of periodontal diseases [10]

Plaque control normally can be accomplished either mechanically or chemically: sometimes the two procedures are combined. Various chemical and mechanical methods have been advocated for this purpose; however, tooth brushing still remains the most commonly used, effective and safe therapeutic method to remove plaque and also the most reliable means of controlling the diseases including to some extent, controlling dental caries. Various designs of toothbrushes, have been recommended to enhance the mechanical

removal of dental plaque like manual, powered, ionic and sonic brushes. [11, 12]

Hand brushing requires a certain degree of manual dexterity. A number of investigations showed that children generally are not capable of obtaining a sufficient oral hygiene level by manual brushing due to their under developed motor skills, lack of knowledge about oral hygiene, effective brushing, less amount of time spent on brushing than recommended or a combination of these. Hence ionic and powered brushes have been introduced to facilitate tooth cleaning and improve the oral hygiene of the patients. [13] Oral-B complete action Power Deep clean tooth brush is battery operated that uses rotated head with criss cross bristle which improve cleaning action. Oral- B cross action pro-health manual tooth brush having criss-cross bristles which removes plaque from tight interproximal spaces. [14]

In the present study, there were no significant differences seen between the treatment groups with respect to day 1 and 1st week mean scores for plaque, p value (p value -0.3305) gingival (p value- 0.0585 & 0.963) oral hygiene index (p value- 1.000). These findings are similar to the findings of Forgas Brockman et al. [15] The

plaque score, gingival score, oral hygiene index score in the 8th week showed highly significant results between manual and electric groups (p value- 0.000). These findings are similar to those obtained by Baab and Johnson et al and Drisko et al. [16]

Both the brushes significantly reduced the plaque accumulation, improves gingival health and oral hygiene index, yet powered brushing shows a greater degree. Similar results were obtained from the study conducted by Lazarescu *et al.* Jongenelis, Martin *et al.* (1987), Baab and Johnson, and Preber *et al.* (1991). [10,17,18] The results from the present study is in contrary with William *et al.* in which they compared the effectiveness of an electric brush and a regular hand brush in preventing or removing dental plaque and concluded that both brushes were equally effective in removing plaque. [19]

On the basis of results obtained in the present study, their comparisons here-in along with similar findings by other studies as quoted above, simplicity of use of electrical tooth brush vis-à-vis manual tooth brushes, it is possible to confirm that, the use of former resulted in a significant reduction of dental plaque and improved gingival health over subjects with manual tooth brush.

CONCLUSION

Manual tooth brush has been so far the preferred mode of plaque control. However electric tooth brush has confirmed an effective reduction of dental plaque and gingivitis. It does not require a special technique unlike manual tooth brush where an arduous, time consuming skill has to be mastered.

Thus, despite its high cost vis-a-vis manual tooth brush, electric tooth brush offers a range of benefits. It may replace a manual tooth brush thus, leading to a healthy periodontium.

REFERENCES

1. Loe H, Theilade E, Jensen JB. Experimental gingivitis in man. J Periodontol 1965; 36:177-187
2. Fridus A, Van der Weijden GA, Shelly L. Campbell, Christof E Dörfer, Carlos González-Cabezas, Dagmar E. Slot. Safety of Oscillating-Rotating Powered Brushes Compared to Manual Toothbrushes: A Systematic Review. J Periodontol 2011; 82(1):5-24.
3. Glavind L, Zeuner E. The effectiveness of rotary electric toothbrush on oral cleanliness in adults. J Clin Periodontol 1986; 13:135-38.
4. Heasman PA, Stacey F. Heasman I, Sellers P, Macgregor TD. A comparative study of the Philips HP 735 Braun oral B 07 and the Oral B35 Advantage toothbrushes. J Clin Periodontol 1998; 26:85-90.
5. Greene JC, Vermilion JR. The simplified Oral Hygiene Index. J Am Dent Assoc 1964; 68:7-13.
6. Loe H, Silness J. Periodontal disease in pregnancy I. Prevalance and severity. Acta Odontol Scand 1963; 21:533-521.
7. O'Leary TJ, Drake RB, Naylor J. The Plaque control record. J Periodontol.1972; 43:38.
8. Lovdal A, Arno A, Waerhaug J: Evidence of clinical manifestations of periodontal disease in light of oral hygiene and calculus formation. J Am Dent Assoc 1958; 56:21
9. Russel AL: Epidemiology of periodontal disease. Int Dent J 1967; 17:282
10. Lazarescu D, Boccaaneala S, Illiescu A, De Boever JA. Efficacy of plaque removal and learning effect of a powered and a manual toothbrush. J Clin Periodontol 2003;30:726-31.
11. Brandtzaeg P: The significance of oral hygiene in the prevention of dental diseases. Odont T 1964; 72:460.
12. Heanue, M., Deacon, S. A., Deery, C., Robinson, P. G., Walmsley, A. D., Worthington, H. V. & Shaw, W. C. (2003) Manual versus powered toothbrushing for oral health (Cochrane Review). In: The Cochrane Library, Issue 1. John Wiley & Sons, Oxford: Update Software
13. Rugg -Gunn AJ, Macgregor ID. A survey of tooth brushing behaviour in children and young adults. J Periodontol Res 1978;13:282-89. Niemi ML, Ainamo J, Etemadzadeh H. Gingival abrasion and

- plaque removal with manual versus electric tooth brushing. *J Clin Periodontol*. 1986; 13(7):709-13.
14. Jongenelis AP, Wiedemann W. A comparison of plaque removal effectiveness of an electric versus a manual toothbrush in children. *ASDC J Dent Child* 1997;64:176-82,165.
 15. Forgas Brockman LB, Carter Hansen C, Killoy WJ: The effects of an ultrasonic tooth brush on plaque accumulation and gingival inflammation. *J Clin periodontol* 1998; 25: 375-379.
 16. Drisko C.L.: Periodontal self-care: evidence-based support. *Periodontol*. 2000, 2013, 62, 243–255.
 17. Jongenelis AP, Wiedemann W. A comparison of plaque removal effectiveness of an electric versus a manual toothbrush in children. *ASDC J Dent Child* 1997;64:176-82,165.
 18. Baab DA, Johnson RH. The effect of a new electric toothbrush on supragingival plaque and gingivitis. *J Periodontol* 1989;60:336-41.
 19. William AS, Ash M. A clinical evaluation of an electric toothbrush. *J Periodontol* 1964;35:127-36.
- How to cite this article: Basith A, Monica GS, Biir MSM. Comparative evaluation of effectiveness of manual and electric tooth brush (oral - B) in elimination of dental plaque and gingivitis. *International Journal of Science & Healthcare Research*. 2019; 4(1): 45-50.
