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Efficacy of the Dr. Best e-Flex 3® Battery Toothbrush

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Objective

To compare the cleaning efficacy of a battery-powered Dr. Best e-Flex 3® tooth-brush (Fig. 1) (SmithKline Beecham, Bühl, Germany) and a standard flat trimmed manual toothbrush (Fig. 2) (Elmex 39, GABA GmbH, Lörrach, Germany).



Fig. 1: Dr. Best e-Flex 3 toothbrush

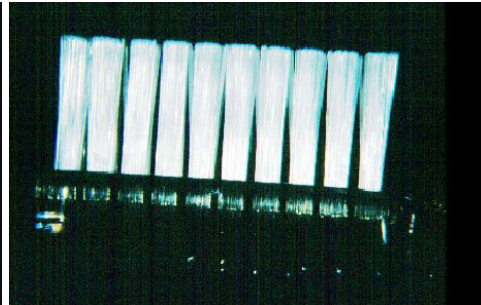


Fig. 2: Elmex 39 manual toothbrush

Materials and Methods

Subjects

78 healthy subjects were recruited for this single-use, cross-over clinical study. To be included, subjects had to be between 18 and 65 years of age with a minimum of 20 scorable teeth (excluding third molars, crowns and orthodontic appliances). Exclusion criteria included among others any physical limitation to normal toothbrushing, excessive caries, periodontal conditions that would require treatment or follow-up and the use of antibiotics/anti-inflammatory drugs in the last month.

Course of the study

At the start of the study, subjects reported to the test facility not having brushed their teeth in the previous 48 hours. Each subject was randomly provided with one of two toothbrushes, according to a randomisation schedule. Subjects received written manufacturer's instructions in the use of the battery powered toothbrush, but no practical instructions were given.

Prior to brushing at the first visit, assessment of all hard and soft oral tissues was carried out. Any gross effects on hard tissues and dental restorations were noted. All tooth surfaces were then lightly air dried and disclosed using Mira-2-Tone (Hager & Werken GmbH & Co.KG, Duisburg, Germany) to stain for presence of plaque. Plaque was assessed for all scorable teeth at six sites per tooth (mesio-buccal, buccal, disto-buccal, disto-lingual, lingual, and mesio-lingual), using the Turesky-Gilmore-Glickman modification of the Quigley and Hein plaque index.

Subjects brushed for 1 minute (as this is representative of the average brushing time used in the home situation) with a standard tooth paste (Blend-a-med classic, Blendax, Mainz, Germany) out of the view of the clinical investigator carrying out the plaque assessments. Post brushing assessment of soft and hard tissues was then made after which teeth were again disclosed and plaque evaluated.

Subjects were instructed to return to their usual method of oral hygiene for 10 - 12 days before returning to the test facility for the second half of the study. Following the wash out period, subjects returned for the second leg of the crossover having not brushed their teeth in the previous 48 hours. Subjects then brushed with the alternate toothbrush. Pre- and post-brushing assessments of plaque and soft and hard tissues were obtained as described above.

Statistical Analysis

Data were included for all subjects who completed the study. The data from subjects who were known or suspected to have violated the protocol were excluded from the statistical analysis. Data from the two phases of the cross-over study were pooled prior to statistical analysis. The primary analysis compared the plaque removal between the two brushes. The statistical unit was the single subject. The significance level was set at $p = 0.05$. Differences from pre- to post-brushing and differences between the two toothbrushes in mean percentage plaque removal were analyzed by means of the non-parametric Wilcoxon test for paired samples.

Results

All 78 subjects enrolled, completed the study. The study population was comprised of 31 males and 47 females with an age range from 18 to 29 years and a mean age of 22.9 ± 2.7 years. No adverse events were reported during the study and no changes in hard and soft oral tissues were observed after brushing.

Independent from the brush used, the initial plaque score was in total about 25% lower at the second visit compared to the first. Dependent on the sites analysed, this difference varied between 0% and 75% (data not shown). As the difference from the first to the second visit was independent of the toothbrush used, data from the two visits was pooled prior to analysis.

One minute brushing with both toothbrushes resulted in significant reductions in plaque, as shown in Tables 1 and 2. Whole mouth plaque scores were reduced by 23.2% in the Dr. Best e-Flex 3® group and by 37.8% in the manual toothbrush group. Analysis of buccal and lingual scores revealed that the greatest percentage reduction with both toothbrushes was on buccal surfaces. Pre-brushing plaque scores were considerably lower on lingual surfaces and plaque reduction post-brushing was much lower than on buccal surfaces. Analysis of plaque removal by tooth type (data not shown) revealed significant reductions in plaque scores post-brushing with both tooth-brushes for all tooth types.

A comparison of the two toothbrushes showed that the manual toothbrush consistently removed more plaque than the power toothbrush (Tables 3 and 4), the differences being statistically significant for all sites and surfaces with the exception of lingual surfaces. Analysis by tooth type also revealed significant advantages in favor of the manual toothbrush with the exception of second molars where the difference did not achieve statistical significance (data not shown).

Surfaces	Brush	Pre-brushing	Post-brushing	Absolute reduction	p-value	% reduction
Whole mouth	Powerclean	2.03±0.59	1.56±0.51	0.48±0.28	<0.001	23.2±11.5
	Elmex 39	1.98±0.64	1.24±0.52	0.74±0.36	<0.001	37.8±14.0**
Buccal	Powerclean	2.61±0.84	1.81±0.67	0.80±0.52	<0.001	30.0±14.5
	Elmex 39	2.60±0.82	1.29±0.61	1.32±0.65	<0.001	50.2±17.0**
Lingual	Powerclean	1.46±0.60	1.30±0.55	0.16±0.26	<0.001	9.7±16.1
	Elmex 39	1.37±0.65	1.20±0.61	0.16±0.26	<0.001	11.9±20.2

Statistically significant difference between groups, **= $p < 0.001$.

Table 1: Pooled whole mouth, buccal and lingual pre- and post-brushing Quigley and Hein plaque scores for the Dr. Best e-Flex 3® and the Elmex 39 manual toothbrush

	Brush	Pre-brushing	Post-brushing	Absolute reduction	p-value	% reduction
Mesial	Powerclean	2.12±0.56	1.68±0.50	0.44±0.26	<0.001	20.6±11.0
	Elmex 39	2.08±0.61	1.36±0.54	0.73±0.34	<0.001	35.7±14.8**
Central	Powerclean	1.85±0.64	1.31±0.54	0.54±0.33	<0.001	28.6±15.7
	Elmex 39	1.85±0.70	1.01±0.51	0.79±0.42	<0.001	44.5±15.8*
Distal	Powerclean	2.12±0.60	1.66±0.51	0.46±0.30	<0.001	21.1±12.1
	Elmex 39	2.04±0.62	1.35±0.53	0.69±0.36	<0.001	34.2±14.6**
Approximal	Powerclean	2.13±0.58	1.68±0.50	0.45±0.26	<0.001	20.9±10.6
	Elmex 39	2.07±0.61	1.36±0.53	0.71±0.34	<0.001	34.9±14.0**

Statistically significant difference between groups, *= $p < 0.01$, **= $p < 0.001$.

Table 2: Pooled mesial, central, distal and approximal (mesial+distal) pre- and post-brushing Quigley and Hein plaque scores for the Dr. Best e-Flex 3® and the Elmex 39 manual toothbrush

Conclusion

Both toothbrushes removed a significant amount of plaque. However, the manual toothbrush was more effective in terms of plaque removal than the Dr. Best e-Flex 3® battery-powered toothbrush.

Acknowledgements

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This poster was submitted by Dr. Eric von Bethlenfalvy.

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Efficacy of the Dr. Best e-Flex 3[®] Battery Toothbrush.

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Figure 1. Dr. Best e-Flex 3[®] toothbrush. Figure 2. Elmex 39 manual toothbrush

Materials and Methods

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Statistically significant difference between groups, ** $p < 0.001$.

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