Acceptability of Powered Toothbrushes for Elderly Individuals

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Abstract

Objectives: *This study evaluated the usefulness of powered toothbrushes in elderly individuals for removing supragingival plaque and improving gingival health and comparing this to the use of regular manual toothbrushes.* ***Methods:*** *Fourteen persons aged 68–85 years having moderate gingivitis were included in the study. A crossover clinical trial consisting of two phases of three months' duration each was carried out. All the participants were given an oral prophylaxis, following which they were instructed to use the manual toothbrush for three months. Again, for the same subjects, an oral prophylaxis was given and they were asked to use the powered toothbrush for the next three months. Plaque Index and Gingival Index scores were recorded one, two, and three months after the use of each toothbrush. Oral hygiene instruction was reinforced only at baseline.* ***Results:*** *The powered toothbrush was more effective than a regular manual toothbrush in removing plaque and controlling gingivitis.* ***Conclusion:*** *The powered toothbrush may prove to be a good alternative to the manual toothbrush for this segment of the population, as it does not require any special dexterity to use. [J Public Health Dent 2004;64(2):115-17]*

Key Words: preventive dentistry, toothbrushing, oral health, geriatrics, dental plaque, gingivitis.

The fastest growing population segment in most countries is adults older than 80 years. It is estimated that by 2050 they will make up nearly 20 percent of the world's elderly population. In India, 7.6 percent of the total population, an estimated 76 million people, are older than age 60 years. In older individuals, it is more common to find compromised general conditions such as altered mental status, use of medications with oral side effects, and deficits in mobility, dexterity, and coordination that may negatively affect their ability to maintain a standard of self-performed plaque control above the individual threshold level of disease. Other factors—such as existing restorations, missing teeth, and gingival recession—also complicate plaque removal. Hence, in many older adult patients absolute periodontal health may not be possible and, rather than preventing or eliminating all clinical signs of periodontal inflammation, the goal of periodontal therapy should be to preserve a functional dentition throughout life by controlling disease progression. The aim of this six-month crossover clinical study was to evaluate the usefulness of powered toothbrushes in elderly individuals regarding removal of plaque and reduction of gingivitis in comparison to manual toothbrushes.

Methods

At the beginning of the study, informed consent as approved by the Institutional Review Board was obtained from all 15 subjects. A crossover clinical trial, which consisted of two phases of three months' duration each, was carried out. At the start of the first phase, the teeth were professionally cleaned to reduce the plaque scores to zero. Oral hygiene instruction was reinforced and the subjects were given the manual toothbrushes. They were asked to continue brushing as they had been doing previously with a standard dentifrice twice a day for three minutes. The subjects were then recalled at the end of one month, two months, and three months. At each appointment, the plaque and gingival status were recorded. At the end of three months, the subjects were again given an oral prophylaxis to reduce the plaque scores to zero and were instructed in the use of the powered toothbrushes according to the manufacturer's instructions and the same procedure was repeated for the next three months.

Fifteen subjects (seven males and eight females) aged 68–85 years were included in the study after obtaining their consent. Eight subjects were patients who visited the dental clinics of the College of Dental Surgery, Manipal, and seven were residents of an old-age home. All the subjects included in the study had a moderate amount of plaque and gingivitis, a minimum of 20 natural teeth, no oral lesions or systemically related gingival enlargement, and no history of organic heart valve damage or prosthetic implants.

A medium-textured manual multitufted nylon brush (Colgate Zig Zag™), a standard commercial dentifrice, and a battery-powered oscillating toothbrush (8,800 cycles/minute—Colgate Actibrush™) were provided to each of the patients. All the assessments were carried out by the same examiner. The Turesky modification of the Quigley Hein Plaque Index (1) and the Löe and Silness Gingival Index (2) were used to assess plaque and gingivitis, respectively. The collected data were entered into the computer database and analyzed using the SPSS Version 7.0 statistical package. Wilcoxon signed-rank sum test and Mann Whitney U-tests were used for comparisons. A *P*-value of less than .05 was considered statistically significant.

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Results

Among the 15 subjects who participated in the study, 14 remained until the end of the study. One subject withdrew from the study after the second visit. After being given a professional oral prophylaxis at the start of each phase, the subjects were recalled at the end of one, two, and three months to record the plaque and gingival index scores.

At the beginning of the study, the baseline plaque scores were reduced to 0 by an oral prophylaxis. In 12 of the 14 subjects, the plaque scores showed a reduction and in two subjects an increase was recorded from the first to the third month. A statistically significant decrease was recorded in the mean plaque scores at all intervals.

In nine of the 14 subjects, a reduction in gingival score was recorded; in five subjects, an increase was recorded. A statistically significant decrease of 0.10 was recorded in the mean Gingival Index score from the first month to the second month, with a statistically insignificant increase of .02 from the second to the third month.

At the completion of the first phase of the study an oral prophylaxis was given again to reduce the plaque scores to baseline. A statistically significant decrease was found in the mean Plaque Index and Gingival Index scores at all intervals. The comparative analysis of the mean plaque scores at the end of the second and third month showed a statistically significant difference, but the comparative analysis of the mean gingival index scores between the two groups was found to be statistically significant at all time intervals.

Discussion

Physical handicaps and psychological factors such as depression and loneliness are known to play a major role in daily care activities in this segment of the society. The use of both types of toothbrushes by the same subjects helped to minimize many possible variations that occur because of interindividual differences, such as age, habits, manual dexterity, plaque levels, and compliance. As the current study was designed to evaluate the efficacy of the toothbrushes in regular home use for the geriatric population, it was not supervised on a daily basis and professional instruction was given only at the beginning of each phase. As all the subjects were given an oral prophylaxis at the beginning of each phase, no baseline data were recorded. With the use of the manual toothbrush, a decrease in the mean plaque score was observed at the second and third clinical assessments, thus showing an increased efficiency with time. When the individual Plaque Index scores were observed, an increase was recorded in two subjects, which may be attributed to the probable failure of the subjects to comply with the oral hygiene instruction (3). Poor manual dexterity also could have contributed to the decrease in efficiency because the same subjects showed comparatively lower scores when using the powered toothbrush.

The reduction in Gingival Index scores was commensurate with the reduction in Plaque Index scores for the first two months. A slight, but statistically insignificant, increase was recorded in the mean gingival score from the second to the third month. When the individual gingival scores were observed, an increase was recorded in only five of the subjects. In two of these subjects, the rise in values corresponded to increased plaque scores; in three subjects, however, the increase in Gingival Index score did not correspond with the Plaque Index scores. This finding incidentally has also been observed in a few other studies (4,5). Reasons for this lack of association are difficult to corroborate, but may include the presence of undetected subgingival and interproximal plaque or intersubject variation in the pathogenicity of plaque. Improved performance while brushing on the day of evaluation may have also contributed to decreased plaque scores as related to gingival scores. Ainamo et al. (6) observed a similar "Hawthorne effect" that results from a change in behavior in subjects who anticipate involvement in a clinical study.

When a comparison of the plaque scores was made between the manual and the powered toothbrush, it was found to be statistically insignificant at the end of the first month. The difference at the second and third months was statistically significant. The ease of using the powered toothbrush plays a major role in patient compliance and motivation. It has been seen that powered toothbrushes also have a novelty effect that helps to enhance the compliance (7). Elderly people have reduced manual dexterity as a result of aging and other physical disabilities, such as arthritis, which contributes to poor oral hygiene. With the conventional method of toothbrushing, the subjects have to be taught to use the brush in a particular manner for effective cleaning, but with the powered toothbrush the action is built into the toothbrush. The handle of the powered toothbrush, being bulkier than that of the manual toothbrush, may enhance grasp and the ease of brushing.

When the mean Gingival Index

TABLE 1
Comparison of Mean Plaque Index (PI) and Mean Gingival Index (GI) Scores of Manual and Powered Toothbrushes (SD=Standard Deviation)

	Manual Mean (SD)	Powered Mean (SD)	Test of Significance Z Score	*P*-value
First month				
PI	2.27 (0.66)	1.86 (0.53)	1.265	.0206
GI	0.74 (0.36)	0.46 (0.22)	2.474	.013*
Second month				
PI	2.15 (0.61)	1.63 (0.42)	2.178	.029*
GI	0.64 (0.28)	0.31 (0.20)	3.783	.000†
Third month				
PI	1.96 (0.83)	1.44 (0.39)	1.972	.049*
GI	0.66 (0.34)	0.24 (0.19)	3.943	.000†

SD=standard deviation.
*$P<.05$.
†$P<.001$.

scores were compared at the end of first month, they were found to be statistically significant. At the end of the second and third month, it was very highly significant. The increase in efficiency of brushing as the subjects became more accustomed to the toothbrushes may have resulted in better plaque removal from the interproximal sites, which could have contributed to the improvement in gingival condition (8,9).

The gingival massage provided with the powered toothbrush seems to play a significant role in improving gingival condition. Likewise, Glickman (10) stated that the improved gingival condition observed subsequent to toothbrushing and other oral hygiene procedures might be because of a concurrent massage effect associated with the cleansing action.

Conclusions

Even though in the current study powered toothbrushes have shown better efficacy in plaque control, further long-term evaluation may be necessary to conclusively say that the powered toothbrush may be the best device to be used by elderly patients. Limitations such as high cost and availability also should be considered and efforts should be made to make the powered toothbrushes available and affordable to the general public.

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