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Evaluating the efficacy of parental brushing utilizing powered and manual tooth brush: A comparative study

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Abstract

Background

Dental caries is a common childhood condition influenced by oral hygiene practices. Parental assistance in brushing plays a vital role in improving oral health outcomes for children. This study aimed to evaluate the efficacy of parental brushing using powered and manual toothbrushes in reducing plaque and improving oral hygiene.

Materials and Methods

This randomized controlled trial included 60 children aged 4–8 years, divided into two groups: powered toothbrush (Group A, n=30) and manual toothbrush (Group B, n=30). Parental brushing was standardized for both groups using detailed instructions. Baseline plaque scores were recorded using the Plaque Index (PI). Parents were instructed to brush their child's teeth twice daily for four weeks, and plaque scores were reassessed at the end of the study period.

Results

At baseline, mean plaque scores were comparable between Group A (2.6 ± 0.4) and Group B (2.5 ± 0.5). After four weeks, Group A showed a significant reduction in mean plaque scores (1.1 ± 0.3), while Group

B exhibited a moderate reduction (1.8 ± 0.4) ($p<0.05$). The powered toothbrush group demonstrated a 58% reduction in plaque scores compared to 28% in the manual toothbrush group. Parental compliance was reported to be higher in Group A.

Conclusion

Parental brushing using a powered toothbrush is more effective in reducing plaque and improving oral hygiene in children compared to a manual toothbrush. Powered toothbrushes may also enhance parental compliance, making them a favorable choice for managing children's oral hygiene.
Keywords

Parental brushing, powered toothbrush, manual toothbrush, plaque reduction, oral hygiene, children, comparative study

Introduction

Maintaining optimal oral hygiene in children is critical for preventing dental caries, gingivitis, and other oral health issues. Despite advancements in oral health awareness, dental caries remains a prevalent condition among children worldwide (1). Parental involvement in a child's oral hygiene routine is considered essential, especially during early childhood when motor skills are still developing. Parents play a pivotal role in guiding and assisting their children in tooth brushing to ensure effective plaque removal (2,3).

Toothbrushing is widely recognized as a cornerstone of oral hygiene practices, with manual and powered toothbrushes being the most common tools used. While manual toothbrushes have been the traditional choice for decades, powered toothbrushes have gained popularity due to their advanced technology, promising better plaque removal and ease of use (4). Studies suggest that powered toothbrushes may offer superior efficacy in plaque reduction compared to manual toothbrushes, particularly in children and individuals with limited manual dexterity (5,6). However, the role of parental brushing using these tools has not been adequately explored.

This study aims to evaluate and compare the efficacy of parental brushing utilizing powered and manual toothbrushes in children aged 4–8 years. The findings will help identify the more effective method for improving oral hygiene and reducing plaque levels, thereby aiding in the development of evidence-based recommendations for parents and caregivers.

Materials and Methods

Study Design and Participants

This randomized controlled trial was conducted over a period of four weeks at a pediatric dental clinic. The study included 60 children aged 4–8 years, recruited through convenience sampling. Inclusion criteria were children with a minimum of 20 primary teeth, no active caries requiring immediate intervention, and cooperative behavior for clinical examinations. Children with systemic illnesses, orthodontic appliances, or a history of using powered toothbrushes were excluded. Informed consent was obtained from the parents or guardians of all participants, and ethical approval was secured from the institutional review board.

Randomization and Group Allocation

Participants were randomly assigned into two groups of 30 each using a computer-generated randomization table:

- **Group A**: Powered toothbrush group
- **Group B**: Manual toothbrush group

Both groups received detailed instructions on proper brushing techniques, including a demonstration by a pediatric dentist. Parents were instructed to brush their children’s teeth twice daily for two minutes.

Baseline and Follow-Up Assessments

Baseline plaque scores were recorded using the Plaque Index (PI). A calibrated examiner performed all assessments to ensure consistency. After the initial examination, parents were provided with toothbrushes specific to their assigned group and a fluoridated toothpaste.

Intervention Protocol

Parents in both groups were educated on standardized brushing techniques and advised to brush their child's teeth in the morning and before bedtime for four weeks. A brushing log was maintained by parents to monitor compliance.

Outcome Measurement

At the end of the study, plaque scores were reassessed by the same examiner. The primary outcome was the reduction in plaque scores from baseline to the end of the study. Secondary outcomes included parental adherence to the brushing regimen and any adverse effects reported during the study period.

Statistical Analysis

Data were analyzed using SPSS software version 26.0. Mean and standard deviations were calculated for continuous variables. Independent t-tests were used to compare plaque reduction between groups, with $p<0.05$ considered statistically significant.

Results

The baseline and post-intervention plaque scores are presented in **Table 1**. At baseline, both groups had comparable plaque scores (Group A: 2.6 ± 0.4, Group B: 2.5 ± 0.5). After four weeks, a significant reduction in plaque scores was observed in Group A (1.1 ± 0.3) compared to Group B (1.8 ± 0.4).

Table 1: Comparison of Plaque Scores Between Groups

Group	Baseline Plaque Score (Mean ± SD)	Post-Intervention Plaque Score (Mean ± SD)	% Reduction in Plaque Score
Group A	2.6 ± 0.4	1.1 ± 0.3	58%
Group B	2.5 ± 0.5	1.8 ± 0.4	28%

The powered toothbrush group (Group A) demonstrated a significantly greater reduction in plaque scores compared to the manual toothbrush group (Group B) ($p<0.05$). Additionally, parental compliance and satisfaction were higher in Group A, as reported through follow-up questionnaires.

These results suggest that parental brushing with a powered toothbrush is more effective in reducing plaque levels in children, supporting its use in improving oral hygiene practices (**Table 1**).

Discussion

The findings of this study demonstrate that parental brushing using a powered toothbrush is significantly more effective in reducing plaque levels in children compared to a manual toothbrush. These results are consistent with previous studies indicating the superior efficacy of powered toothbrushes in plaque removal (1,2).

Plaque control is a critical factor in maintaining oral health and preventing dental caries and gingival inflammation. While manual toothbrushes are widely used due to their affordability and accessibility, their effectiveness often depends on the technique and consistency of use. In contrast, powered toothbrushes provide consistent oscillating or rotating motions, which enhance plaque removal with minimal user

dependency, making them ideal for children whose motor skills are still developing (3,4).

The observed 58% plaque reduction in the powered toothbrush group aligns with previous meta-analyses highlighting the superior plaque-removing capabilities of powered toothbrushes compared to manual brushes (5,6). The significant difference in plaque reduction between the two groups may also be attributed to better parental compliance and ease of use associated with powered toothbrushes (7). Parents in this study reported higher satisfaction with the powered toothbrush, which likely contributed to more consistent and thorough brushing sessions.

Studies have also indicated that powered toothbrushes are particularly beneficial for individuals with poor manual dexterity or limited oral hygiene skills (8,9). In children, the interactive features and appealing designs of powered toothbrushes may further enhance compliance and make brushing a more enjoyable experience (10).

However, manual toothbrushes remain a viable option, especially in settings where powered toothbrushes may not be economically feasible. Proper parental education on brushing techniques and the use of adjunctive oral hygiene aids can significantly improve the effectiveness of manual brushing (11,12).

While this study provides valuable insights, it is not without limitations. The relatively short duration of four weeks may not capture the long-term effects of parental brushing practices. Future studies with longer follow-up periods and larger sample sizes could provide more robust evidence. Additionally, factors such as diet, fluoride exposure, and oral health behaviors outside the study protocol were not controlled and could have influenced the results (13-15).

Conclusion

In conclusion, this study reinforces the advantages of powered toothbrushes in improving plaque control in children through parental brushing. However, the choice of toothbrush should consider individual needs, parental preferences, and economic constraints. Education and awareness about proper brushing techniques remain critical for ensuring optimal oral health outcomes.

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