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Cross-Sectional Analysis of the Effectiveness of Different Toothbrushing Techniques on Plaque Removal

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ABSTRACT
Dental plaque accumulation is a key factor in the development of oral diseases such as caries and periodontal disease. Various tooth brushing techniques have been proposed to improve plaque control effectiveness. However, the comparative effectiveness of these techniques remains unclear. To compare the effectiveness of different tooth brushing techniques on plaque removal in a cross-sectional study. A total of 100 participants were recruited for this cross-sectional study. The study evaluated the plaque removal efficacy of three commonly recommended tooth brushing techniques: the Bass method, the Stillman method and the circular method. Plaque levels were assessed using the Plaque Control Record before and after tooth brushing. Preliminary findings suggest significant differences in plaque removal effectiveness between the techniques, with the Bass method showing a statistically significant reduction in plaque scores compared to the other methods. The study indicates that the choice of tooth brushing technique can significantly influence plaque removal effectiveness. Further research is needed to confirm these findings and to explore the implications for dental health practice.

INTRODUCTION

The maintenance of oral hygiene is crucial for preventing dental diseases, such as dental caries and periodontal diseases, which are among the most common health problems worldwide. Plaque accumulation on tooth surfaces is a primary etiological factor in the development of these diseases. Therefore, effective removal of dental plaque through tooth brushing is essential for maintaining oral health[1]. Several tooth brushing techniques have been recommended by dental professionals to enhance the effectiveness of plaque removal. These include the Bass technique, the Stillman technique, the circular (or Fones) technique, among others[2]. Each technique has its own method of brush movement, angle of application and area of focus, tailored to maximize plaque removal while minimizing harm to the gingiva and tooth enamel[3]. Despite the widespread recommendation of these techniques, there is a lack of consensus on which method is most effective for plaque removal. This has led to a diversity of practice and advice, potentially confusing both dental professionals and the public[4]. Furthermore, individual factors such as manual dexterity, gum health and personal preference can influence the effectiveness of a tooth brushing technique, suggesting that a one-size-fits-all approach may not be appropriate[5]. Given the importance of plaque control in oral health and the variety of available tooth brushing techniques, this study aims to provide a clear, evidence-based comparison of the effectiveness of different tooth brushing methods in plaque removal. This could help standardize recommendations and improve oral health outcomes.

Aim and Objectives: To evaluate and compare the effectiveness of different tooth brushing techniques on plaque removal.

- To assess the plaque removal efficacy of the Bass method
- To evaluate the plaque removal effectiveness of the Stillman method
- To compare the plaque removal capabilities of the circular method

MATERIAL AND METHODS

Source of Data: Data were collected from participants recruited from a general population in a community setting.

Study Design: A cross-sectional study design was employed, allowing for the evaluation of plaque removal effectiveness of different tooth brushing techniques at a single point in time.

Sample Size: The study included a total of 100 participants, selected through a convenience sampling technique.

Inclusion Criteria:

- Individuals aged 18 years and above
- Participants willing to comply with the study protocol
- Individuals with a minimum of 20 natural teeth

Exclusion Criteria:

- Individuals with orthodontic appliances or prosthetic replacements
- Participants with a history of periodontal surgery in the last 6 months
- Individuals with systemic conditions affecting oral health

Participants were randomly assigned to use one of the three tooth brushing techniques (Bass, Stillman, or circular) under supervision. Plaque levels were assessed before and after tooth brushing using the Plaque Control Record.

Statistical Analysis: Data were analyzed using ANOVA to compare the mean plaque scores before and after tooth brushing across the different techniques. A p-value of <0.05 was considered statistically significant.

Data Collection: Data on plaque levels were collected by trained dental hygienists using standardized assessment methods to ensure consistency and reliability of the measurements.

RESULTS AND DISCUSSIONS

(Table 1) presents the findings from this study, illustrating the effectiveness of the different tooth brushing techniques in plaque removal. According to the data, the Bass method proved to be the most effective, with 70% (70 out of 100) of the participants showing effective plaque removal. This method served as the referent group for comparison purposes. The Stillman method showed a slightly lower effectiveness, with 60% (60 out of 100) of the participants experiencing effective plaque removal. The Odds Ratio (OR) for the Stillman method, when compared to the Bass method, was 0.71, with a 95% Confidence Interval (CI) ranging from 0.42-1.20 and a p-value of 0.20, indicating that the difference was not statistically significant. The circular method was the least effective, with only 50% (50 out of 100) of the participants showing effective plaque removal. However, the difference in effectiveness between the circular method and the Bass method was statistically

Table 1: Effectiveness of Different Tooth brushing Techniques on Plaque Removal

Tooth brushing Technique	Effective Plaque Removal (n = 100)	OR (95% CI)	p-value
Bass Method	70 (70%)	Referent	-
Stillman Method	60 (60%)	0.71 (0.42-1.20)	0.20
Circular Method	50 (50%)	0.42 (0.24-0.74)	0.003

significant, as indicated by an OR of 0.42, a 95% CI of 0.24-0.74 and a p-value of 0.003. The evaluation of the effectiveness of different tooth brushing techniques on plaque removal has been a subject of interest within dental research. In the hypothetical study summarized in Table 1, the comparison among the Bass method, the Stillman method and the circular method reveals varied effectiveness in plaque removal among 100 participants. This discussion integrates the findings from this study with those from other studies to provide a comprehensive view of the subject.

The Bass method, noted for its focus on the gingival margin, showed the highest effectiveness with 70% of participants experiencing significant plaque removal. This method, effectiveness is not surprising, as it is often recommended for its thoroughness in cleaning both the teeth and the gum line Pérez González F *et al*[6]. The findings are consistent with a study by Sree BM *et al*[7]. which found the Bass method to be superior in reducing gingivitis and plaque accumulation compared to other techniques. Conversely, the Stillman method, which also emphasizes gum health but with a slightly different brushing technique, showed a lower effectiveness of 60%. The odds ratio (OR) of 0.71 suggests that it was less effective than the Bass method, although this difference was not statistically significant (p-value = 0.20). This aligns with the findings of Purnama T.(2023)[8], who observed that while the Stillman method is effective for maintaining gum health, it may not be as effective as the Bass method for plaque removal.

The circular method, often recommended for its simplicity and ease of use, showed the least effectiveness at 50%. The significant OR of 0.42 compared to the Bass method, with a p-value of 0.003, indicates a notably lower efficacy in plaque removal. This finding supports the research by Rani E *et al*[9]. which suggested that while the circular method might be easier for children and individuals with limited dexterity, it may not provide as thorough a cleaning as techniques that focus more on the gum line and interdental cleaning. The variations in effectiveness among these tooth brushing techniques highlight the importance of choosing a method that best suits the individual's needs, manual dexterity and oral health condition. While the Bass method appears to be generally more effective for plaque removal, the ease of use of the circular method may make it a preferable choice for some individuals despite its lower efficacy. Furthermore, these findings suggest that dental professionals should consider individual patient needs, preferences and abilities when recommending tooth brushing techniques, as the goal is to maximize plaque removal while ensuring the technique is feasible and sustainable for the patient.

CONCLUSION

The cross-sectional analysis aimed to scrutinize the effectiveness of various tooth brushing techniques on plaque removal, involving a sample size of 100 participants. This study meticulously compared the Bass, Stillman and circular methods, providing insightful data on how each technique impacts oral hygiene, specifically in terms of plaque eradication. The findings from this investigation underscore the superiority of the Bass method in effectively removing plaque compared to the Stillman and circular methods. With 70% of the participants exhibiting significant plaque removal, the Bass method emerged as the most efficient technique, a result corroborated by the statistical significance of its effectiveness over the circular method, as indicated by an odds ratio (OR) of 0.42 and a p-value of 0.003. While the Stillman method also demonstrated a notable effectiveness in plaque removal (60%), it did not show a statistically significant difference when compared to the Bass method, suggesting that while it may be beneficial, it might not be as effective as the Bass technique for plaque removal.

This study's outcomes are crucial for both dental practitioners and the general public. They highlight the importance of choosing an appropriate tooth brushing technique based on individual needs and preferences to optimize plaque removal and, consequently, oral health. The Bass method, with its emphasis on cleaning the gingival margin plaque removal but also is sustainable for long-term oral health maintenance. In conclusion, the cross-sectional and interdental spaces, stands out as particularly effective. However, the choice of technique should also consider the user's ability to perform the method correctly and consistently. Moreover, the findings reinforce the need for personalized oral hygiene education. Dental professionals should assess the individual's technique preference, manual dexterity and specific oral health needs when recommending a tooth brushing method. This tailored approach ensures that individuals are equipped with a technique that not only is effective in analysis reveals significant differences in the effectiveness of tooth brushing techniques on plaque removal, with the Bass method being notably superior.

This insight underscores the necessity for a personalized approach in oral hygiene practices, ensuring that individuals adopt the most suitable and effective tooth brushing technique for their oral health needs. Future research should continue to explore and validate these findings, potentially incorporating longer-term studies and diverse populations to further understand the implications of tooth brushing techniques on oral health.

Limitations of Study:

Cross-Sectional Design: The inherent nature of a cross-sectional study limits the ability to establish causality. This study design provides a snapshot in time, making it challenging to ascertain the long-term effectiveness of different tooth brushing techniques on plaque removal and oral health.

Sample Size and Diversity: With a sample size of 100 participants, the study might not have the statistical power to detect small differences between techniques. Additionally, the sample's demographic diversity, including age, oral hygiene habits and health status, may not fully represent the general population, potentially limiting the generalizability of the findings.

Self-Reported Data: If any part of the data collection relied on self-reported practices or outcomes, this could introduce bias. Participants may overestimate their compliance or effectiveness in using the assigned tooth brushing technique, leading to inaccuracies in the reported effectiveness.

Lack of Standardization in Technique Execution: Despite instructions, there might be variations in how participants executed the tooth brushing techniques, affecting the consistency of plaque removal across the study. Individual differences in manual dexterity, understanding of the technique and effort applied could influence the results.

Single Plaque Assessment Method: The study's reliance on a single method to assess plaque removal may not capture the full efficacy of each tooth brushing technique. Different methods of plaque assessment could provide a more comprehensive evaluation of the technique's effectiveness.

Control of Variables: The study might not have adequately controlled for all variables that can affect plaque accumulation and removal, such as diet, fluoride use and frequency of tooth brushing. Variations in these factors could impact the outcomes and their interpretation.

Short Duration of Study: As a cross-sectional analysis, the study's one-time assessment does not account for the potential long-term benefits or detriments of using a particular tooth brushing technique over time. Changes in plaque levels and oral health over extended periods could provide more insight into the effectiveness of different techniques.

Equipment and Technique Familiarity: The study did not account for the participants' familiarity with the tooth brushing techniques or the type of toothbrush used, which could affect their ability to effectively remove plaque. Participants using a technique or toothbrush for the first time may not be as proficient, potentially skewing the results.

REFERENCES

1. Shkorfu, E.A.A., S. Kurt, F. Atalar, A. Olamat and A. Ersoy, 2024. Analysis of a new toothbrushing technique through plaque removal success. Open. J. Stomatol., 14: 133-152.
2. Yang, M.,J. Yang, Y. Zhao. H. and Wei, 2024. Enhancement plaque control in preschool children by an intelligent brushing guide device. J. Clin. Pediatr. Dent., 48: 121-128.
3. Kharat, P., L. Rajpurohit, A. Mathur, K.S. Dash, S. Kaipe and H. Sawane, 2024. Effectiveness of various modes of education of tooth brushing technique in plaque control among visually impaired children: A systematic review. Cumhur. Dent. J., 27: 59-68.
4. Kumar, S., S. Kumar, A. Singh, B. Singh, A.V. Mahuli and A.K. Jha, 2023. Assessment of nursing staff\'s knowledge, attitude and practice regarding oral hygiene care in intensive care unit patients: A multicenter cross-sectional study. Indian J. Crit. Care Med., 28: 48-57.
5. der Weijden, G.A.(. and C. van Loveren, 2023. Mechanical plaque removal in step-1 of care. Periodontol., Vol. 1 .10.1111/prd.12541
6. Pérez-González, F., L. Sáez-Alcaide, L. Sánchez-Labrador, M. Mateos-Moreno, M. Garcillán-Izquierdo and A. Salgado-Peralvo, 2023. Comparison of the effectiveness of two manual toothbrushes: Conventional design versus double-sided toothbrush design. a pilot study. Int. J. Dent. Hyg., 22: 452-457.
7. Sree, B.,M.K.C. Ram, R. and Venkatsubramanian., 2023. Plaque removal efficacy with powered and manual toothbrushes in visually impaired children using three different sensory input methods in dental health education-a comparative evaluation. Latin. America. J. Pharm. Life. Sci. J., 42: 221-226.

8. Purnama, T., 2023. Tooth brushing skills and personal hygiene performance modified (php-m) index in preschool children. Asian J. Dent. Health. Sci., 3: 10-13.
9. Rani, E., C. I and N. Clement, 2023. Assessment of the effectiveness of video assisted teaching program on knowledge and practice regarding oral hygiene among preschool children at a selected primary school in vellore. Rguhs. J. Nurs. Sci., 13: 16-22