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*Review*

# Impact of Different Toothbrushing Techniques on Plaque Removal

Hawra Abdalkreem Al Eid[1*], Manar Saeed Alsammak [2], Maram Ayed Alzarraa [3]

[1] *Department of Dentistry, Dammam Health Centers, Dammam, Saudi Arabia*
[2] *Department of Dentistry, Eradah Complex and Mental Health, Dammam, Saudi Arabia*
[3] *Department of Dentistry, Ministry of Health, Umluj, Saudi Arabia*

Correspondence should be addressed **Hawra Abdalkreem Al Eid**, Department of Dentistry, Dammam Health Centers, Dammam, Saudi Arabia, Email: hawraabdalkreem@gmail.com



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**Abstract**

Maintaining oral hygiene and avoiding common dental conditions like caries, gingivitis, and periodontitis depends on the efficient removal of plaque. The most accessible and popular mechanical plaque-control technique is still tooth brushing. Various brushing techniques have been developed over time, such as the Bass, Stillman Charter, and Fone's methods, which are all intended to enhance the removal of plaque from various regions of the tooth and gingiva. While manual brushing with these methods can be successful, it frequently calls for accuracy, steady effort, and patient cooperation. Particularly for people with poor brushing habits or limited manual dexterity, powered toothbrushes, especially oscillating-rotating and sonic models, have recently shown promise as instruments that improve efficacy and lessen reliance on brushing technique. Cost, user preference, and comfort, however, continue to be obstacles to their broad adoption. Using data from recent clinical trials and comparative studies, this narrative review investigates how different toothbrushing methods affect the removal of plaque. The impact of brushing pressure, time, and user education on oral hygiene results is also covered. Both powered and manual methods have their uses, but proper application of reinforcement of behavior and patient-specific advice is essential for any technique's long-term success. This review suggests that certain concerns need to be covered by future studies to match patient profiles and clinical requirements with technique selection and achieve patient compliance.

**Keywords**:

*Oral hygiene, gingivitis, periodontitis, dental plaque, manual toothbrushing, powered toothbrushing.*

## Introduction

Bacteria and extracellular polymeric materials combine to form dental plaque, a biofilm that builds up on the surface of teeth (1, 2). Plaque is an extreme situation that can lead to tooth loss; if left unchecked, it can lead to periodontitis, gingivitis, and dental caries (3, 4). Maintaining oral hygiene and halting disease progression can be achieved most effectively by mechanically removing plaque with a toothbrush every day (5). The effectiveness of various brushing techniques varies greatly, even though brushing is widely accepted as the primary method for controlling plaque (6, 7). Plaque removal has been optimized through the development of several techniques (8, 9).One of the most advised techniques for effectively cleaning subgingival plaque is the Bass technique, which entails positioning the toothbrush bristles at a 45-degree angle to the gingival margin and employing tiny vibratory motions (10). The Fones technique, which uses circular motions, is mainly used on children because of its simplicity, whereas the Stillman and Charter techniques were developed to address particular oral conditions like gingival recession or orthodontic appliances (11). Plaque control has significantly improved in recent years as a result of the popularity of powered toothbrushes (12-14). Powered toothbrushes remove plaque more easily by using oscillating, rotating, or sonic movements, which lessens the need for the user to execute the technique correctly (15-17). The efficacy of powered and manual toothbrushing has been compared in numerous studies, with many indicating that powered toothbrushes may remove plaque better because of their automated motion and capacity to reach hard-to-clean areas (14, 18). Although a variety of brushing methods and tools are available, several factors affect how well plaque is removed overall (19). Longevity frequency, user compliance, and dexterity all affect how well oral hygiene procedures work out (20, 21). Research shows that many people don't brush for the full two minutes, which lessens the efficiency of plaque removal lessens the efficiency of plaque removal (22). Furthermore, regardless of the technique employed, incorrect brushing force can result in negative consequences like gingival recession and enamel wear, underscoring the significance of good technique (23). By analyzing recent research comparing powered and manual toothbrushes, this review of the literature seeks to determine how different brushing methods affect the removal of plaque. Through an analysis of the benefits and drawbacks of different brushing techniques, this review will shed light on the best ways to control plaque and emphasize the necessity of tailored advice based on patient-specific variables.

## Methods

An extensive analysis of recent studies on toothbrushing methods and their efficacy in removing plaque served as the foundation for this narrative literature review. Through searches of electronic databases such as PubMed, Google Scholar, ProQuest, Epes-cohost, and ScienceDirect, pertinent peer-reviewed publications were found. With an emphasis on English-language articles, studies released between 2012 and 2025 were taken into consideration. The terms “toothbrushing technique”, “manual brushing”, “powered toothbrush plaque removal”, “oral hygiene effectiveness”, and” patient compliance” were among the search terms used. The review covered observational studies and randomized clinical trials that looked at how different brushing techniques could reduce plaque in healthy people. The goal was to compile a comprehensive understanding of how device type, technique duration, and compliance affect plaque control. Since the goal of this review is to present a broad synthesis of recent findings rather than a critical evaluation, no formal quality assessment tool was used. The studies were selected for their topical relevance and ability to shed light on the clinical and practical ramifications of various brushing techniques.

## Discussion

### *The efficacy of manual toothbrushing methods*

Several tried-and-true methods have been developed to maximize efficacy while minimizing damage to oral tissues, and manual toothbrushing is still the most popular way to remove plaque (24, 25). Since the Bass technique is the best at removing plaque from the gingival margin and subgingival


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areas, it is the most frequently advised among these (26). By positioning the toothbrush bristles at a 45-degree angle to the gum line, this technique enables them to gently pierce the sulcus. The plaque and biofilm are then removed using tiny vibratory or circular motions. According to research, people who have received instruction in the Bass technique have much less plaque buildup and gingival inflammation than people who use unstructured brushing techniques (10, 27). However, many people find it difficult to execute the technique correctly due to its requirement for controlled movements and precision, which reduces its effectiveness (28, 29).

A variation of the Bass technique, the Stillman technique is intended for patients with periodontal issues or gingival recession (30). The bristles are positioned at the same 45-degree angle and, in contrast to the Bass technique, are gently rolled toward the crown rather than being inserted into the sulcus. Because it minimizes irritation while still effectively removing plaque, this technique is frequently advised for people with sensitive gums or those recuperating from periodontal disease (11). It may, however, be marginally less successful in preventing gingivitis and early-stage periodontitis because it does not penetrate the sulcus as deeply as the Bass method (31).

On the other hand, the Charter technique is especially advised for people who have had post-periodontal surgery, orthodontic appliances, or dental prostheses (11). This method involves gently pressing the bristles against the teeth and brackets at an angle that is either upward or downward from the gum line. This is followed by a series of vibratory strokes. By ensuring that debris and plaque are cleared away from the areas surrounding braces, bridges, and other dental restorations, this positioning lowers the possibility of plaque buildup in difficult-to-reach places. It may be less successful in preventing gingivitis in people without orthodontic appliances, though, because the bristles do not engage the gingival sulcus as well as the Bass technique. A common problem with manual brushing methods is the propensity for over-pressure, which over time can cause gum recession, gingival abrasion, and enamel erosion (32, 33). According to research, a lot of people unintentionally brush too hard, especially when using toothbrushes with harder bristles. Soft or extra-soft bristled brushes are therefore typically advised to reduce this risk (34, 35). When done correctly and consistently, manual brushing is still the most accessible and economical way to remove plaque, even with these possible disadvantages.

### *Are Electric Toothbrushes a Better Option?*

Because powered toothbrushes eliminate the need for precise manual techniques through automated motions, they have become increasingly popular in recent years. These tools are especially helpful for people who struggle to maintain proper manual brushing techniques because they use oscillating, rotating, or sonic vibrations to effectively remove plaque and debris (17, 36). Among the powered brush designs that have been studied the most is the oscillating-rotating toothbrush (37-39). After three months of use, oscillating-rotating toothbrushes showed measurable improvements in gingivitis reduction and plaque removal compared to manual toothbrushes (15, 37). Another type of powered brush is the sonic toothbrush, which works by vibrating at a high frequency (between 30000 and 40000 strokes per minute). Plaque can be removed from interdental and subgingival areas due to the micro-bubbles created by these vibrations, which break up plaque biofilm outside of direct bristle contact (40). Sonic toothbrushes are especially useful for cleaning hard-to-reach places and enhancing general oral hygiene, according to studies (41, 42). Powerful toothbrushes have drawbacks despite their obvious benefits. Cost is a major deterrent for many people since high-end powered toothbrushes can be significantly more costly than manual ones. Furthermore, some consumers complain that the vibrations are uncomfortable, and others find it challenging to control the larger brush heads of certain models, especially in smaller mouths. Pressure sensors that warn users when they use too much force and timers that make sure brushing lasts the recommended two minutes are two ways that modern powered toothbrushes have tried to allay these worries (43).


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### *The Role of Compliance and Behavioral Factors in Plaque Removal*

Consistency and compliance are central to determining the best results of the removal of plaque, irrespective of the brushing technique employed. According to studies, many people do not brush for two minutes as proposed, which maximizes the vulnerability to oral infection and results in poor plaque control (44, 45). The average adult brushing time equals 45 to 70 seconds and is far below the guideline, and those who are using the powered toothbrushes diverge from the recommended brushing guidelines (46, 47). Oral care providers stress that there is more involved than proper brushing technique in achieving good oral health. Whether an individual's oral hygiene practice will be successful to a significant degree depends on such behavioral factors as motivation, education, and professional guidance (48, 49). Individuals who employ self-taught brushing techniques have lower gingivitis and poorer plaque control than those who receive professional training in brushing techniques (50, 51). Besides, it has been demonstrated that behavioral treatment, like mobile phone-based brushing timers and reminder apps, increases compliance, especially among younger age groups (52-54). A study discussed the correlation between smartphone or app usage and brushing duration and frequency during the follow-up period, and it found in positive correlation (52). A cross-sectional questionnaire found a promising role for mobile apps in establishing oral hygiene by assessing the perception of individuals toward using the apps (55). The efficacy of plaque removal is also improved through the application of adjunctive oral hygiene aids like flossing and antimicrobial mouthwashes (56-58). Interdental areas are a major site for plaque accumulation and a major causative factor for gingivitis and periodontitis after the removal of much plaque on accessible surfaces by brushing (59, 60).

Patient motivation and education are the primary determinants of long-term oral health. Future studies ought to start concentrating on the particular uses of each manual technique based on each person's current state of oral health. Future research should assess the long-term benefits and drawbacks of powered toothbrushes with a focus on patient satisfaction, adherence, and their ongoing effectiveness. It's also worthwhile to reevaluate whether manual brushing techniques can still be applied to a range of populations and how to quantify and enhance the elements that contribute to proper technique and brushing time.

## Conclusion

Several variables, such as brushing technique, time pressure, and patient compliance, can affect the best possible plaque removal. Plaque control with manual toothbrushes depends on the recommended technique (Bass, Charter, and Stillman techniques), correct usage, and the ability to follow instructions. Patient education and continuing education are linked to the effectiveness of manual toothbrushes. More plaque can be removed by electric toothbrushes than by manual ones, especially for patients with poor or inconsistent technique and limited manual dexterity. Costs of toothbrush accessibility or comfort may have a long-term impact on usage and compliance, even in the face of treatment complications, additional health benefits, and evidence of efficacy. In addition to using the right technique and toothbrush, successful plaque removal also depends on brushing time, pressure awareness, and the absence of other bad habits that compromise oral health.

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### *Conflict of interest*

There is no conflict of interest.

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### *Ethical consideration*

Non applicable.

### *Data availability*

Data that support the findings of this study are embedded within the manuscript.


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***Author contribution***

All authors contributed to conceptualizing, data drafting, collection and final writing of the manuscript.

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