



## Comparison between Interdental Brush and Dental Floss for Controlling Interproximal Biofilm in Teeth and Implants

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### Abstract

The presence of dental biofilm is the primary etiological factor in the development of periodontal disease. Dental floss and interdental brushes as adjuncts to dental hygiene provides a greater benefit for disrupting the oral biofilm in the interproximal areas. To compare the use of an interdental brush and dental floss for controlling the dental biofilm around teeth and implants, twelve volunteers (men and women) aged 18 to 50 years were randomly selected. During the first thirty days, patients used the conventional Bass method of brushing associated with cleaning the interproximal space only with dental tape. At the end of this month, a new plaque index was measured. At the beginning of the second month, the patients were instructed to use conventional brushing, and then only interproximal cleaning with interdental. At the end of this second month, a new plaque index was measured. The analysis of variance for randomized blocks revealed a significant difference in the effectiveness of the two cleaning methods used for controlling the interproximal biofilm ( $p=0.023$ ), showing that the plaque index was significantly lower (39.6%) with the interdental brush than when dental floss was used (58.3%). We concluded that, compared with using dental floss, interdental brushes is more effective at controlling the interproximal dental biofilm around teeth and implants.

### Keywords

Dental floss; Toothbrushes; Interproximal brushes; Oral biofilm

### Introduction

Brushing is the most practiced oral hygiene method for plaque removal [1]. The presence of dental plaque is the primary etiological factor in the development of periodontal disease, which is defined as an inflammatory response in the gingival tissue [2]. The prevalence of plaque associated with periodontal disease in adults aged 35 to 44 years is 99% for gingivitis and up to 52.7% for periodontitis [3]. Brushing only is not sufficient for removing plaque, especially at the gingival margin and interproximal region [4].

Conventional toothbrushes are not capable of reaching the proximal surfaces as effectively as the buccal, lingual and occlusal surfaces, nor can they reach the interproximal areas of adjacent teeth. Some studies point to large regions of plaque stagnation, such

as interproximal spaces, gingival margins and areas with defects [5]. Therefore, additional methods have been used to assist in controlling plaque in places with difficult access [6,7]. Individuals who only use conventional brushes often have residual interproximal plaque in their molars and premolars. Plaque removal from these surfaces is crucial because patients susceptible to periodontal disease, gingivitis and periodontitis have a more pronounced accumulation of plaque in these interdental areas [8].

These regions are protected against the natural cleaning mechanisms of the oral tissues; thus emphasis should be placed on the importance of the devices used to facilitate oral hygiene in these areas [9]. Conventional brushes do not adequately penetrate these regions, preventing complete cleaning [1]. The use of dental tape as an adjunct to brushing provides a greater benefit for disrupting biofilm, especially in the interproximal region [10,11]. In addition to being an integral and effective part of a broader regime of daily self-care, the use of conventional toothbrushes is fundamental to maintaining oral health [12].

Biofilm accumulation, which results in the development of periodontal disease, also affects dental implants. Implants are currently the standard treatment for rehabilitating totally or partially edentulous patients due to the mechanical and biological characteristics that contribute to their increasing success rates [13]. Despite these advantages, there are still many losses of implants, and the major causes are inflammation of the mucosa and peri-implantitis [14].

According to the literature, approximately 79% of individuals rehabilitated with implants are affected by mucositis, and 50% of implants are affected [15]. The prevalence of peri-implantitis also shows alarming rates of 5% to 15% [16,17].

The correct mechanical disruption of the oral biofilm [the preconized clinical protocol of sanitization for rehabilitation with endosseous dental implants] should be performed with the use of small head brushes with medium-sized and extra-soft (ultrasoft) bristles. [18]. Moreover, patients should be instructed to perform the modified Bass technique. To achieve high standards of hygiene, both in teeth and implants, the use of dental floss or interdental brushes is important (added to brushing) for effective biofilm removal [19].

Careful plaque removal techniques can modify both the quantity and the composition of the gingival plaque, changing the composition of the micro biota of the pocket and reducing the percentage of periodontal bacteria [20].

The increased use of oral hygiene products and investments in advertisements directed at consumers [21] is evidence of the increased awareness of the value of good oral care.

The ideal brushing technique is one that allows for complete plaque removal in the shortest time possible, without causing tissue damage [22]. Thus, a comparison between the effectiveness of dental floss versus the interdental brush is crucial.

### Aim

The aim of this study was to evaluate the efficacy of an interdental brush compared with dental tape for controlling interproximal plaque around teeth and dental implants.

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## Methods

This study was approved by the Research Ethics Committee of the Faculty of Dentistry and CPO São Leopoldo Mandic (approval number 280.809).

This study was performed in the Clinic of Periodontology of the College of Dentistry São Leopoldo Mandic in Campinas, Brazil.

In total, 12 volunteers of both genders, with ages between 18 and 50 years, were selected. All volunteers met the inclusion criteria and did not meet any of the exclusion criteria. The inclusion criteria were as follows: good health; age between 18 and 50 years; having sufficient motor skills for the suggested interproximal cleaning; plaque index greater than 20%; presence of premolar and molar teeth or the correspondent implants; interproximal space that allowed entry of interdental brushes; and diagnosis of periodontitis and peri-implantitis. The exclusion criteria were as follows: smoking; decompensated diabetics; low motor skills; plaque index lower than 20%; missing posterior teeth or implants that made interproximal contacts impossible; patients who did not wish to participate; patients who showed no motivation; and patients who did not commit to following the recommended daily use of the dental tape and interdental brush. An informed consent form was signed by all the volunteers.

The medical history and plaque index [23] were assessed during the first and second months. During the first thirty days, patients used the conventional Bass method of brushing associated with cleaning the interproximal space only with dental tape. At the end of the month, a new plaque index was measured. At the beginning of the second month, the patients were instructed to use conventional brushing, and then only interproximal cleaning with interdental brushes 07 (access diameter of 0.7 mm and effectiveness diameter of 2.5 mm) and 09 (access diameter of 0.9 mm and effectiveness diameter of 4.0 mm) (CURADEN, Switzerland). At the end of this second month, a new plaque index was measured. The study used the plaque index data collected in the first and second months and thus can be considered a crossover study. The statistical calculations were performed with the statistical package SPSS 20 (SPSS Inc., Chicago, IL, USA), and the level of significance was 5%.

## Results

The analysis of variance for randomized blocks revealed a significant difference in the effectiveness of the two cleaning methods used for controlling the interproximal biofilm ( $p=0.023$ ). Table 1 and Figure 1 show that the plaque index was significantly lower (39.6%) with the interdental brush than when dental floss was used (58.3%).

## Discussion

The periodontal and peri-implant diseases and their incidence have been studied over the years, and the presence of an oral biofilm has been characterized as the main etiological factor of these diseases [24-31].

Maintaining good oral hygiene is essential for promoting oral health and prevention of these diseases [32]. Although some studies have shown that plaque and gingivitis/periodontitis are safely controlled with brushing and interproximal cleaning [7,33,34], there are still questions as to which interproximal cleaning method is the most effective. Nonetheless, in the field of implants, virtually nothing has been studied [18].

The best method for cleaning the oral spaces that have difficult access must be defined for each patient. The method selection depends on the size and shape of the interdental space, as well as the morphology of the proximal surface of the tooth. Thus, interdental plaque removal, which cannot be performed with conventional toothbrushes, is paramount to most patients [35].

Among all the methods used for interproximal plaque removal, dental floss is the most common. Some studies have shown that when dental floss is used in addition to a toothbrush, a greater amount of interproximal plaque is removed compared with using conventional brushes alone [36,37]. Waerhaug [38] states that when dental floss is properly used, it removes more than 80% of the interproximal plaque. Moreover, dental floss can even remove sub gingival plaque if it is introduced 2.0 to 3.5 mm into the gingival sulcus.

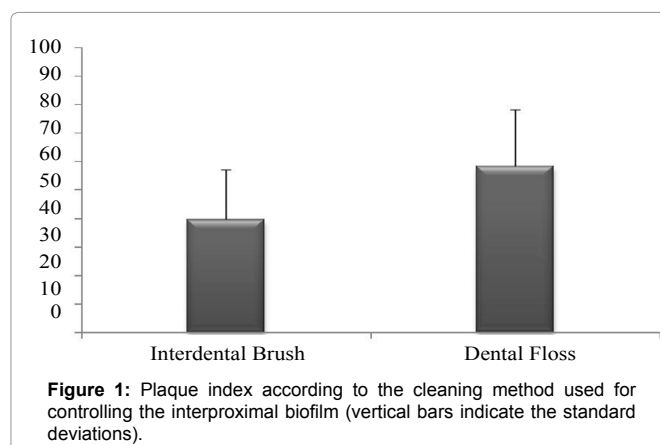
Studies that compare the use of dental floss with interdental brushes are still scarce in the literature. The sole use of toothbrushes is not indicative of high standards of oral hygiene. In adults, most studies have demonstrated that conventional toothbrushes are not as effective in plaque removal as would be expected. Jepsen [39] demonstrated that most individuals remove only 50% of plaque with conventional brushing, whereas Lindhe and Lang [35] asserted that most people do not properly perform oral hygiene and most likely carry much plaque on their teeth, although they brush their teeth at least once a day.

Regarding the results obtained in this study, a statistical analysis demonstrated a significantly lower rate of plaque with the use of interdental brushes compared with dental floss, which corroborates the findings of Christou et al. [40] and Jackson et al. [41]. Christou demonstrated that patients with moderate to severe periodontitis who used an interdental brush [to remove plaque and reduce periodontal pockets] obtained a higher efficacy than those individuals who used dental floss. Jackson, in his most recent work, observed a significant greater reduction in all parameters [plaque index, level of papillae and probing depth] in the group using interdental brushes compared

**Table 1:** Means and standard deviations of the plaque index according to the cleaning method used to control the interproximal biofilm.

Interproximal biofilm	Mean	Standard	Minimum	Maximum
Cleaning method		Deviation	value	value
Interdental brush	39.6% <b>A</b>	17.4%	7.4%	64.4%
Dental floss	58.3% <b>B</b>	20.0%	24.0%	99.1%

Obs: Standard deviation in parenthesis. The means followed by different letters indicate statistically significant differences between the methods.



**Figure 1:** Plaque index according to the cleaning method used for controlling the interproximal biofilm (vertical bars indicate the standard deviations).

with the group that used dental floss, after 12 weeks of observation. Waerhaug [42,43] also showed that individuals who habitually employed interdental brushes were able to keep the proximal supragingival surface free of plaque and even remove some of the sub gingival plaque. In addition to the results found in our study, patient compliance is to be evaluated with regard to the long-term use of interproximal cleaning devices.

The ease of using an interdental brush compared with dental floss, as reported by the patients, might have been instrumental in the results. This is an important factor to be considered, as it highlights the major difficulties reported by our patients regarding using dental floss. We must also note that even patients with lower motor skills can consider interdental brushes easier to use; thus, their use should be encouraged.

The method of interproximal cleaning with interdental brushes can be used with confidence for biofilm removal in the proximal region because no articles in the literature contradict this idea.

However, employing any of the two methods associated with brushing with the Bass technique provides more complete oral hygiene, thereby leading to a lower risk for developing periodontal and peri-implant disease, especially in the interproximal space-which was the focus of this study.

Compared with dental floss, the use of an interdental brush showed greater efficacy in controlling the interproximal biofilm around teeth and dental implants. Thus, we must educate and encourage our patients to use these specific methods of interdental cleaning on a daily basis for effective biofilm control. Because of the lack of publications on this subject, further clinical trials should be conducted to discuss and improve the use of these interproximal cleaning methods.

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