

Encouraging client compliance for interdental care with the interdental brush: The client's perspective

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ABSTRACT

Background: Toothbrushing for daily oral biofilm disruption is well accepted by clients, but dental flossing is not, due to poor dexterity or lack of motivation or both. The interdental brush is considered an easy to use alternative, which may influence daily self care compliance; however it has only been studied in subjects with open embrasures. **Purpose:** To determine whether interdental brush's ease of use influences willingness for daily compliance in subjects with intact interdental papillae. **Methods:** This paper focuses on the secondary outcome of a randomized controlled trial comparing interdental brush to dental floss in 32 adults with intact but bleeding interdental papillae. Subjects received non surgical debridement two weeks prior to intervention phase, and instructions to use toothbrush, dental floss, and interdental brush at baseline (week 0) and week 6. Subject compliance was measured with self reported journals and amount of products used. Exit survey collected information about subjects' perceptions and preferences for interdental brush and dental floss. **Results:** Subjects were more than twice as likely to "strongly agree" that interdental brush was easy to use compared to flossing, with 40% having neutral opinions about dental floss's ease of use. They were also willing to use the interdental brush daily (43.3% strongly agreed and 50% agreed). The subjects' opinions regarding daily dental flossing ranged from "disagree" to "strongly agree" (6.7% to 30.0% respectively). **Discussion:** Study results were similar to other studies that demonstrated client compliance with interproximal oral self care is associated with clients' perceptions of ease of use and motivation. **Conclusion:** Interdental brush is easy to use and well accepted by study subjects, which may positively influence daily interproximal self care compliance.

RESUME

Contexte : La clientèle accepte bien le brossage des dents pour le nettoyage quotidien du biofilm, mais il n'en est pas ainsi de l'usage de la soie dentaire à cause du manque de dextérité ou de motivation, ou des deux. Considérée plus facile à utiliser, la brosse interdendaire peut influencer la pratique des soins personnels quotidiens; toutefois, cela n'a pas fait l'objet d'études chez les sujets ayant des embrasures ouvertes. **Objet :** Établir si la facilité d'utilisation de la brosse interdendaire influence la propension au brossage quotidien chez les sujets dont les papilles interdentaires sont intactes. **Méthode :** Cet article se concentre sur les effets secondaires d'un essai contrôlé et randomisé, comparant le brossage interdendaire à l'utilisation de la soie dentaire chez 32 adultes ayant des papilles interdentaires intactes, mais saignantes. Les sujets ont reçu un débridement non chirurgical deux semaines avant la phase d'intervention et des instructions sur la façon d'utiliser la brosse à dents, la soie dentaire et la brosse interdendaire au départ (semaine 0) et à la 6^e semaine. La propension des sujets a été mesurée à partir de comptes-rendus quotidiens et de la quantité de produits utilisés. Le dernier questionnaire a permis de recueillir de l'information sur la perception et les préférences des sujets concernant la brosse et la soie dentaire. **Résultats :** Les sujets étaient au moins deux fois plus enclins à être « vivement d'accord » sur la facilité d'utilisation de la brosse interdendaire comparativement à la soie dentaire, et 40% se sont dit neutres sur la facilité d'utilisation de la soie dentaire. On était aussi d'accord à utiliser la brosse interdendaire quotidiennement (43,3 % étaient très d'accord et 50 %, d'accord). L'avis des sujets concernant l'usage quotidien de la soie dentaire variait entre « d'accord » et « y êtes d'accord » (6,7 % à 30,0 %, respectivement). **Discussion :** Les résultats de l'étude ressemblent à ceux des autres études qui ont démontré que la propension des clients aux soins buccaux interproximaux personnels s'associe à la perception de facilité d'usage et à la motivation des clients. **Conclusion :** La brosse interdendaire est facile à utiliser et bien acceptée par les sujets de l'étude, ce qui peut influencer positivement la propension aux soins interproximaux personnels et quotidiens.

Key words: dental home care devices, client compliance, oral hygiene, interdental cleansing/aids

INTRODUCTION

Oral biofilm, known as dental plaque, is a complex bacterial community that naturally develops on a tooth surface, and contributes to the host's defences by preventing the colonization of exogenous species.¹ However if left undisturbed, there is a gradual shift in the bacterial flora to Gram-negative anaerobes that have been associated with periodontitis.²⁻⁴ Plaque induced gingivitis is the early, reversible stage of periodontal disease.² Although not all sites with gingivitis will progress to periodontitis, oral health professionals are unable to predict the level or rate of progression,²⁻⁴ which necessitates the prevention and treatment of gingivitis.²

Daily mechanical disruption of the oral biofilm remains the primary self care method for achieving and maintaining oral health because studies have demonstrated that bacteria are protected in the biofilm from orally delivered antimicrobial agents.^{5,6} Although toothbrushing is well accepted, interdental self care is not.⁷ The toothbrush is unable to

penetrate intact interdental areas to disrupt the biofilm where periodontal disease is prevalent.^{7,8} Dental hygienists commonly recommend dental floss for their client's interproximal oral biofilm disruption, but clients' compliance for daily flossing is usually low, ranging from 10% to 30%, due to lack of dexterity and motivation.⁷ Studies have demonstrated that individuals who experience difficulties with dental floss are less motivated to floss daily.⁷

Other interdental aids have been developed to facilitate easier oral self care and thus, attempt to address the compliance issue.^{9,10} The interdental brush is a small cylindrical or cone shaped brush that is inserted interproximally. Usually the interdental brush is studied in subjects with clinical attachment loss who present with

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Figure 1: Coloured probe and corresponding interdental brush inserted interproximally. **A.** The coloured probe is inserted horizontally into the interproximal site until snug. **B.** The visible colour on the buccal aspect corresponds to the best fitting interdental brush for the site.

larger interdental embrasure spaces.⁸ In subjects with large embrasure spaces, the interdental brush reduced probing depths, bleeding scores, and had superior plaque reducing abilities compared to dental floss.⁸ However there is no published literature on the efficacy of interdental brush for clients with intact interdental papillae. Since it is desirable to treat gingivitis with the aim to prevent possible progression to periodontitis and clinical attachment loss, oral health professionals need alternative, evidence based interdental oral self care aids to recommend to their clients who are adverse to or cannot floss.

This paper focuses on the subjects' perceived ease of use with the interdental brush and dental floss, as well as how this perception may influence their willingness for daily self care compliance. A separate paper will be published later reporting the clinical findings surrounding the relative effectiveness of interdental brush to dental floss in individuals with intact interdental papillae.

MATERIALS AND METHODS

Study design

The study was an examiner blinded, split mouth, three month, randomized controlled trial comparing interdental brush to dental floss on premolars, first and second molars in thirty-two healthy adults with intact, but bleeding interdental papillae. Clinical outcomes and subjects perceptions were measured. This paper will focus on the subjects' perceptions in the exit survey. The study protocol was reviewed and approved by the University of British Columbia's Clinical Research Ethics Board. The study is registered with www.clinicaltrials.gov (Identifier NCT00743548).

Study recruitment and enrolment

Subjects were recruited via a newspaper ad in the local paper, Vancouver Craig's List, flyers posted on the University of British Columbia's (UBC) campus, and orally through the Vancouver Westside dental community. Participation was not limited by race or gender. Study subjects

were not dental or dental hygiene students, but were recruited from the general population. All study visits were held at the Nobel Biocare Oral Health Centre, which is the dental clinic located on UBC's Point Grey campus in Vancouver, Canada.

All potential subjects were screened to inform them of the nature of the study and to determine whether they met the inclusion/exclusion criteria. Inclusion criteria consisted of:

1. a minimum of four interproximal areas per side that could accommodate a minimum 0.6 mm interdental brush width as determined with the Curaprox probe™ (Curaden Swiss, Amlehnstrasse, Switzerland),
2. a minimum of eight interproximal bleeding sites upon stimulation with a Stimu-Dent™ (Johnson & Johnson Inc., NB, Canada) inserted horizontally four times,
3. dexterity to use waxed dental floss without any additional aids, and
4. ability to attend five study visits.

Subjects were only required to present with interdental papillae filling the interdental spaces of adjacent teeth that are in contact. Interdental brush width was determined by horizontally inserting the Curaprox coloured probe™ from the buccal aspect until snug, and by observing the colour left visible as shown in Figure 1. Each colour on the probe corresponds to a brush diameter. The diameters range from 0.6 mm (dark green on the probe) to 2.0 mm (light green).

Subjects were excluded from the study if they:

1. required premedication with antibiotics prior to dental therapy,
2. used chlorhexidine or over the counter mouthwash during the study,
3. used tobacco products, and/or
4. had full orthodontia.

Subjects who met the study's inclusion/exclusion criteria were invited to participate in the study, and they signed informed consent.

Maintaining client anonymity and randomization

The subjects were assigned an individual identification number upon study enrolment. Only the medical health history form contained the subjects' personal information. All data collection forms, compliance forms, and surveys were coded and separated from the medical history form to maintain the subjects' confidentiality and anonymity.

The non blinded examiner randomized subjects upon initial subject contact, before screening information was collected. The non blinded examiner randomized the subjects without knowledge of any subject information such as dominant hand, number of bleeding sites, and size of interdental spaces. The left side of the subjects' mouths was randomly assigned by flip of coin to interdental brush or dental floss with the right side receiving the remaining oral self care aid. There was no attempt to balance the distribution of interdental brush or dental floss to left side of the subjects' mouths, but the resulting distribution was fairly equal.

Study schedule

Upon enrolment and prior to the intervention phase of the study, all subjects received non surgical periodontal debridement using a combination of ultrasonic and hand instrumentation with no time limit, by an experienced dental hygienist two to three weeks before baseline data collection.

Subjects were given verbal and hands on oral hygiene instructions by the non blinded examiner at baseline and Week 6. Modified Bass tooth brushing method using Curaprox CS 5460 Prime ultra-soft compact toothbrush™ (Curaden Swiss, Amlehnstrasse, Switzerland), spool flossing with waxed dental floss and no flossing aids (Johnson & Johnson Inc., NB, Canada), and Curaprox Prime IDB™ (Curaden Swiss, Amlehnstrasse, Switzerland). Instructions were provided until the subject was comfortable with the techniques and had no unanswered questions. During the oral hygiene instructions the subjects' dominant hand was noted as the one the subjects used to brush, floss, and interdentally brush. Subjects were instructed to brush their teeth twice a day, morning and before bed; floss once a day on the assigned side preferably at night, and use the appropriate colored interdental brush inserted once in and out on the assigned side, once a day, again preferably at night. All subjects were instructed to use only these products and the toothpaste provided, Colgate Cavity Protection Regular toothpaste, (Colgate-Palmolive Canada Inc.) and to refrain from using professional dental hygiene services and over the counter and prescription mouthwashes during the study period. Subjects were given a compliance folder to note their daily progress with the interdental brush or dental floss. The compliance folder included a diagram of the teeth and indications as to where to use the dental floss and specific interdental brush, which included a maximum of three colours representing differing diameters. Subjects were encouraged to place this diagram in their bathroom as a reference and reminder. Subject compliance was evaluated through the self reported journal, and product wear and usage at Weeks 6 and 12.

The exit survey was distributed and collected by the non blinded examiner at the end of the Week 12 visit. A 5-point Likert scale, ranging from "Strongly agree" to "Strongly

disagree", was used for the exit survey to capture the study subjects' opinions regarding the interdental brush or dental floss. The survey consisted of four closed item statements and one open ended question to provide subjects with an opportunity to add their own comments.

Exit survey statements:

1. The interdental brush was easy to use.
2. The dental floss was easy to use.
3. I would use dental floss every day.
4. I would use the interdental brush every day.
5. Please add additional comments, concerns, or suggestions regarding the interdental brush and/or dental floss used in this study.

Statistical analyses

Descriptive statistics and chi-square tests were used to analyze the exit survey data and the major theme was extracted from the subjects' comments.

RESULTS

There were no reported or observed side effects during the study, suggesting that the interdental brush, dental floss, and toothbrush were well tolerated by the subjects. Thirty adults completed the three-month study. Two adults were unable to be contacted upon completion of the debridement, and did not enter the intervention phase of the study.

The exit survey results indicated 50% of the study subjects strongly agreed and 46.7% agreed that the interdental brush was easy to use (Figure 2). In the survey, subjects stated that the "interdental brush was easier to use even with a busy schedule and was faster than dental floss." Other subjects commented, "I like the interdental brush over flossing because of the ease of use; I can reach parts [with the interdental brush] that I find difficult to clean with dental floss." Subjects had no prior experience with the Curprox™ IDB system because this product is unavailable in western Canada.

Fewer subjects agreed that dental floss was easy to use (Figure 2). Although there was no statistically significant difference between interdental brush and dental floss for ease of use, $X^2(1, n=30)=0.9, p<0.05$, forty per cent of subjects were neutral about dental floss's ease of use. Study subjects comments included, "the dental floss is slippery and difficult to grasp, which made it less convenient than the interdental brush. I found dental floss irritating to use, especially trying to maneuver it in the back teeth." The majority of subjects (97%) entered the study with no history of daily flossing, but by the end of the study, 30% of the subjects strongly agreed and 36.7% agreed that they were willing to use dental floss every day (Figure 2). These subjects attributed their willingness to floss daily to learning the proper flossing technique and the structure created within the study. The other 26.7% held neutral opinions on daily flossing, and 6.7% were not willing to floss daily beyond the study because they found it difficult to use and time consuming (Figure 2). Subjects "strongly agreed" (43.3%) and "agreed" (50.0%) that they were willing to brush interdentally daily (Figure 2). In particular, the majority of the subjects' open comments indicated they would more likely use the interdental brush daily although

there was no statistically significant difference between interdental brush and dental floss for daily use preference in the closed items, $X^2(1, n=30)=0.87, p<0.05$. Ease of use was a major theme, and this may have influenced the subjects' willingness to continue and use the interdental brush daily. Subjects commented, "I really prefer the interdental brush; I can still clean my teeth before bed, even in a busy daily schedule, with the interdental brush, but this is not the case with dental floss." Two subjects, who were neutral about using the interdental brush daily, commented they had difficulty accessing the interproximal site between the last two molars and did not like changing the brush tips for the various sites.

DISCUSSION

Many dental hygienists focus on instructing their clients in the use of dental floss for oral health maintenance and treatment of gingival diseases because they have been taught flossing in their dental hygiene education, and are familiar with the product.⁷ However client compliance with dental floss is historically low⁷ in spite of dental hygienists providing oral health education and flossing instructions. Clients frequently choose not to floss because of lack of motivation and ability.⁷

Motivation to change behaviour may be imposed externally, which may then develop into an internally valued belief that is sustained.¹¹ In this study, subjects became keenly aware of the sites that were bleeding, and became interested in monitoring these sites while using the interdental brush and dental floss. The presence of bleeding, which is an objective sign of gingival inflammation, became an effective external motivator for the subjects.¹² Subjects commented that they were motivated to brush interdentally and floss to attain non bleeding status, and began to equate non bleeding sites with gingival health. In this study, several subjects stated they now understood the importance of self care for oral health. The internalization of health beliefs, such that external motivators no longer play a role in compliance, needs further investigation.¹³

Simply being in the study may have also motivated the study subjects to comply with interdental brush and dental floss. The Hawthorne Effect occurs when subjects are immersed in an environment that supports positive behaviours.¹⁴ In this study, subjects were required to report their daily use of interdental brush and dental floss in a journal. The journal had to be submitted to the non blinded examiner along with the subjects' dental products at Weeks 6 and 12 to be inspected for usage, and thus, subjects may have been motivated to please the examiners.

Study subjects were also motivated by the frequent, intensive oral hygiene instructions that encouraged them to continue to improve their oral self care techniques as well as their daily use of interdental brush and dental floss. According to Stewart and Wolfe,¹⁵ subjects who received two 30-minute sessions of oral hygiene instruction were able to maintain their newly acquired self care skills a year later, but other studies have shown that educational attempts at modifying client behaviour for daily flossing is unsuccessful.⁷ Since the present study had no long term follow up, it is unknown if these study subjects would continue their daily interdental self care routine. A long term

study is needed to observe whether intensive, continuous oral hygiene instructions in self care skill acquisition and oral health knowledge would assist clients in achieving long term interdental self care compliance.

According to Asadoorian, motivation to self care interdentally is closely linked to the individual's ability to use the aid.⁷ Although there was no statistically significant difference for subjects' product preference in the present study, the overall theme collected from the subjects' comments was that "ease of use" played a significant role in their willingness to continue the daily use of the interdental brush. In this study, almost all subjects agreed that the interdental brush was easy to use. The interdental brush could be used with one hand and subsequently, without the use of a mirror. The study findings were similar to those reported by Slot et al.,⁸ in which patients considered the interdental brush to be simpler to use, in spite of the brush's tendency to bend and distort.

While subjects were familiar with dental floss, and had received flossing instructions previously from their oral health professionals, the majority of the subjects did not floss daily prior to enrolling in this study because they did not like dental floss, found it difficult to use, and/or were not motivated to use it. Dental floss takes a certain amount of dexterity and instruction to achieve optimal interproximal oral biofilm disruption⁷ and this was apparent in this study. Subjects received intensive one-on-one flossing technique instructions at baseline and week 6, and even with repeated instructions, two subjects were unable to master the skill as evidenced by their stable interproximal plaque scores. For some subjects, the repeated flossing instructions not only assisted them with achieving the correct technique, they became more accustomed to dental floss, and thus indicated that they were more willing to continue with daily flossing on the exit survey. These findings support Asadoorian's comment that ability and motivation are closely linked.⁷

There are numerous health behavioural theories, such as the Health Belief Model, Trans Theoretical Model, Stages of Change, Self Efficacy, and Locus of Control Model that have explored oral health behaviour modification.^{16,17} These models focus on individuals assuming responsibility for their own health.^{16,17} A complete review of oral health behaviour models can be found elsewhere.^{16,17} Having a clear understanding of these models and the clients' stage of behaviour are critical for identifying, modifying or changing behaviours that contribute to optimal oral and overall health.

This study demonstrates the importance of assessing the client's abilities and source of motivation prior to making an oral self care recommendation for optimal compliance. Frequent client centred oral hygiene instruction and support is necessary to nurture the new behaviour until the client becomes accustomed to the technique and routine. Dental hygienists must consider their own biases and preferences in addition to the scientific evidence when recommending oral self care products to their clients.

CONCLUSION

The interdental brush is an easy to use alternative, interdental self care aid for clients with gingivitis and intact

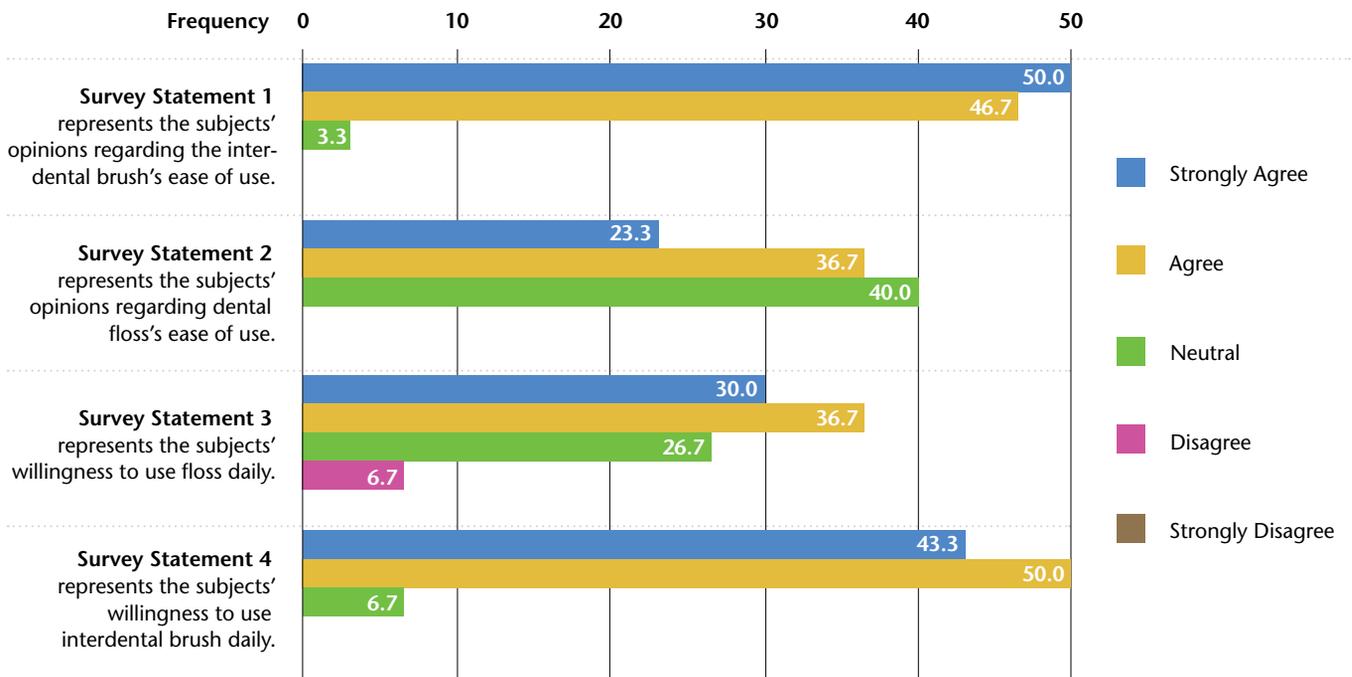


Figure 2: Frequency of subjects' responses to exit survey. The coloured bars represent the five point Likert scale ranging from "Strongly Agree" to "Strongly Disagree" that subjects used. The length of the bars represents the frequency of the subjects' responses for each statement.

interdental papilla in the posterior sites, who cannot or choose not to use dental floss as part of their oral self care preventive routine. Study subjects were more willing to use the interdental brush than dental floss for their daily interdental self care due to its ease of use, which may enhance oral self care compliance.

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