The Science Behind Sonicare AirFloss

PHILIPS
sonicare
sense and simplicity

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Introduction from Dr. Joerg Strate

Vice President, Philips Oral Healthcare,
Clinical & Scientific Affairs

Philips Sonicare AirFloss

The name of our latest innovation is ambitious: Sonicare AirFloss. For decades, floss was the only widely recommended way to manage interdental oral hygiene in addition to the regular use of a toothbrush. Floss may be considered to be a functional solution, but patients find it difficult to use, resulting in infrequent use or complete omission.

Sonicare AirFloss replaces traditional flossing with micro bursts of water and air. Since the technological breakthrough of the first Sonicare power toothbrush, we have learned a lot about fluid forces and their ability to remove plaque biofilm. Sonicare AirFloss is a new technology chapter in the field of oral healthcare. It uses a unique spray of micro bubbles and a small dose of fluid to generate a gentle and convenient, yet highly effective, interdental cleaning action. Not only does it disrupt plaque biofilm structures in critical and hard-to-reach areas, it promotes healthy gums with the targeted release of water/air spray.

Sonicare AirFloss continues the Sonicare legacy of technology leadership within the oral healthcare segment. And while everything about Sonicare AirFloss seems quite different from the design and function of Sonicare toothbrushes, there is one area where AirFloss was submitted to the same rigorous criteria established for all Sonicare products: the meticulous clinical validation and verification of performance and safety requirements. The design and the concept are intriguing in themselves – but our clinical data are extremely convincing. With Sonciare AirFloss, interdental cleaning has just been reinvented.

Safety

in vitro study

Evaluation of surface wear by Philips Sonicare AirFloss and Waterpik Water Flosser on dental restorative materials

Yapp R, Powers JM, Jain V, de Jager M. Data on file, 2010

Objective

To investigate potential surface wear caused by Philips Sonicare AirFloss and the Waterpik Water Flosser on a dental restorative material with a relatively low surface hardness.

Methodology

To make this study a worst-case scenario for evaluating erosion of dental materials caused by pressurized water sprays, Durelon polycarboxylate cement (3M ESPE) was chosen because it is a popular luting cement and one of the softest (Vickers hardness of 20).

The Durelon specimens were flat discs, 10 mm in diameter and 3 mm thick, lightly polished to create flat surfaces and cleaned in an ultrasonic bath to remove any loose particles. Specimens were capped with soft impression material except in their center, where a round opening 2 mm in diameter allowed exposure to the sprays, such that the unexposed areas would serve as a control.

Eight Durelon test specimens were exposed to a total of 2,000 spray pulses with either Sonicare AirFloss or Waterpik Water Flosser (at pressure setting 5). Specimens were positioned at 1 mm distance from the nozzle and perpendicular to the spray, in such a way that water would run off the specimens to avoid interference with successive sprays.

Environmental scanning electron microscope (ESEM) inspection was used to determine if there was any visual evidence of erosion.

Results

Visual analysis with ESEM at 8X and 50X magnification did not disclose any difference between the erosion zones and non-erosion zones of any of the specimens, suggesting that neither the Sonicare AirFloss nor the Waterpik Water Flosser produced any obvious surface damage to the Durelon specimens, through 2,000 spray pulses.

Conclusion

Sonicare AirFloss is safe to use with dental restorative materials.

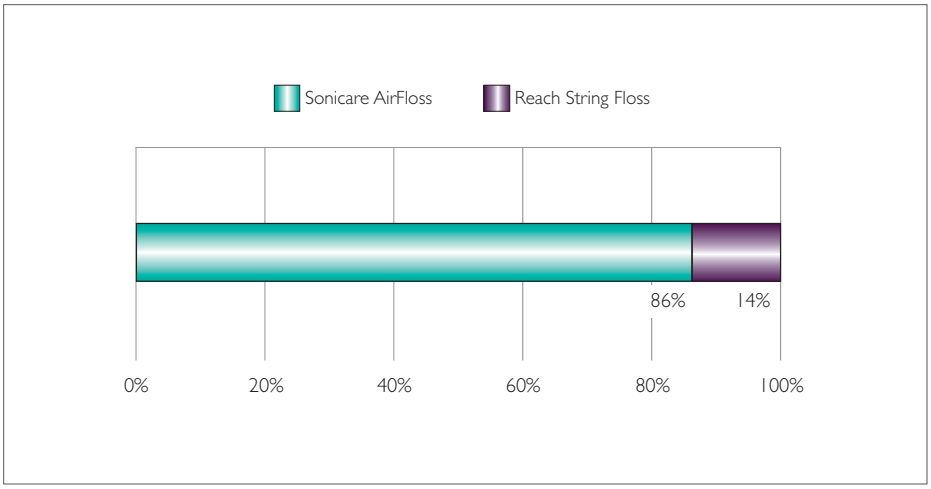
Preference

In-home use test to evaluate ease of use for Philips Sonicare AirFloss versus Reach string floss and Waterpik Ultra Water Flosser

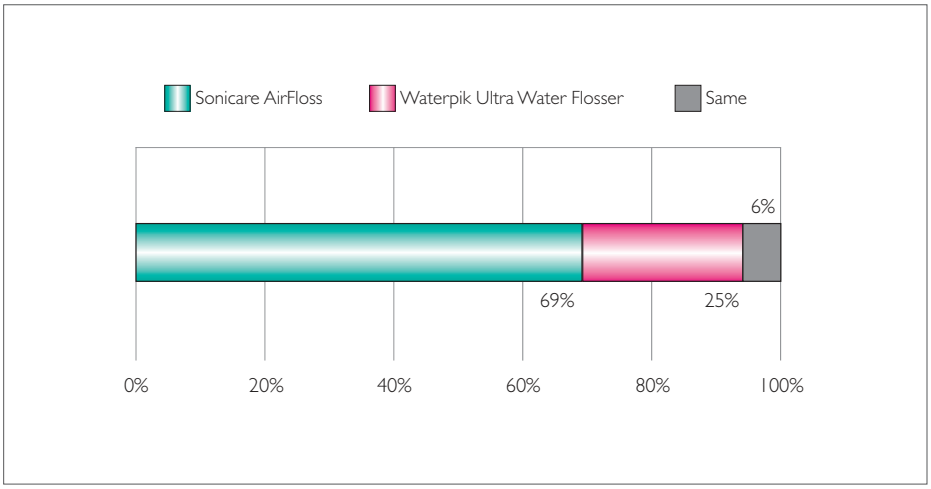
Krell S, Kaler A, Wei J. Data on file, 2010

Objective	To assess ease of use of Philips Sonicare AirFloss and two commercially available interproximal cleaning devices after using each device at home for one week.
Methodology	Eligible participants included 59 adult irregular flossers (floss from one time per month to three times per week). The study utilized a three-period, randomized crossover design. The three interproximal cleaning products tested were Sonicare AirFloss, Johnson & Johnson Reach unwaxed string floss and Waterpik Ultra Water Flosser (an oral irrigator). The study included four weekly, on-site visits, during which a new device was exchanged for the previous device until all of the three interproximal cleaning products were used, per randomized assignment. Participants were given a survey to report their feedback for the use of each product at the fourth visit. Feedback was recorded through an online questionnaire (Survey Monkey).
Results	All of the 59 participants completed the study and survey. Overall, participants were highly satisfied with the use of the Sonicare AirFloss. 86% and 69% of study participants reported Sonicare AirFloss as easier to use than string floss or an oral irrigator, respectively. 78% reported Sonicare AirFloss as gentler on the teeth and gums than string floss. 81% reported that Sonicare AirFloss provided better access to the back of the mouth than string floss.
Conclusion	Among a sample of irregular flossers, Sonicare AirFloss was reported by users to be a preferred alternative for cleaning between teeth, relative to other commonly used modalities. It elicited significantly higher scores for ease of use than floss or an oral irrigator, and Sonicare AirFloss rated higher for gentleness on teeth and gums and its ability to provide better access to the back of the mouth compared to string floss.

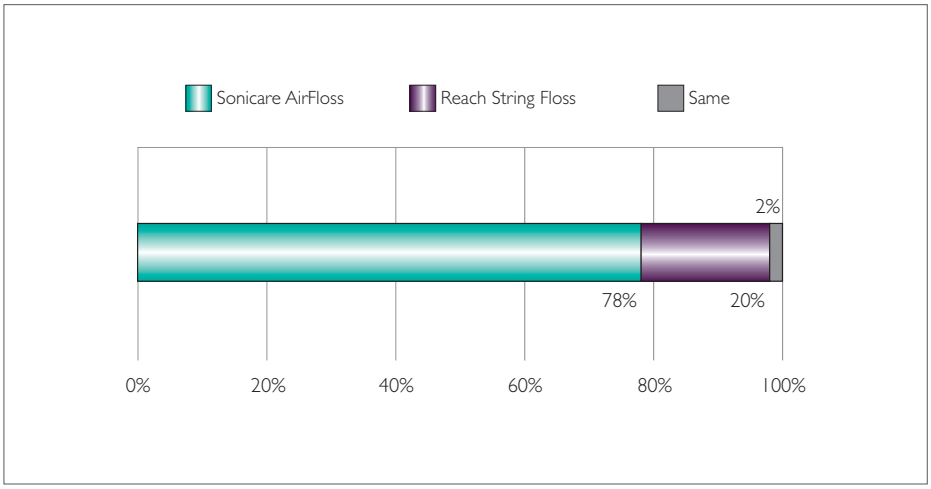
Which product was easier to use?



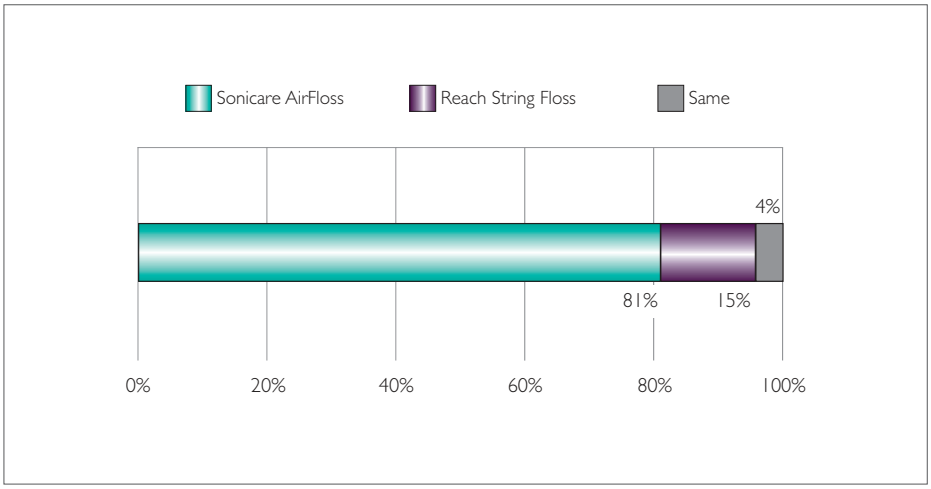
Which product was easier to use?



Which product was gentler on your teeth and gums?



Which product provided better access to the back of your mouth?



Plaque Biofilm Disruption

in vitro study

In vitro evaluation of interproximal biofilm removal with Philips Sonicare AirFloss

de Jager M, Hix J, Aspiras M, Schmitt P. Data on file, 2010

Objective

To evaluate, in vitro, the additional removal of interproximal plaque biofilm of Philips Sonicare AirFloss when used in combination with Philips Sonicare FlexCare.

Methodology

This study evaluated interproximal biofilm removal of Sonicare FlexCare with or without subsequent use of Sonicare AirFloss. An in vitro tooth model was used to assess the efficacy in removing dental plaque biofilm from the interproximal spaces of molar teeth. The dental plaque model was a multispecies oral biofilm grown on hydroxyapatite discs. In a typodont, the discs with biofilm were located on interproximal sites of molar teeth at a distance of 2-4 mm from the tip of the bristles or the nozzle. The typodont was exposed to the dynamic fluid activity generated by the high-frequency bristle movement from the activated Sonicare FlexCare (15 seconds) and by the high-velocity droplet air spray from Sonicare AirFloss (single shot). An inactivated Sonicare FlexCare was used as a control. Plaque removal efficacy was determined by enumeration of the percentage of viable bacteria removed from the discs as a result of these exposures.

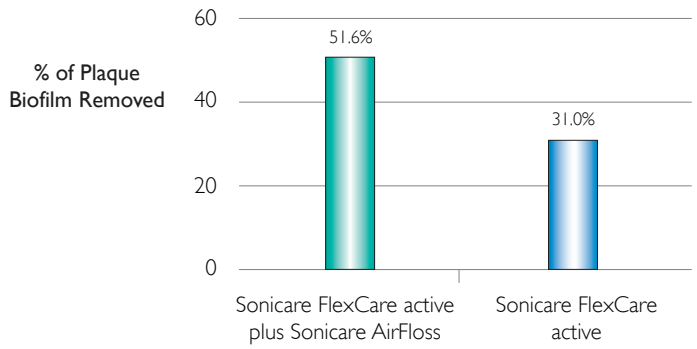
Results

Sonicare AirFloss in conjunction with Sonicare FlexCare removed 66% ($p<0.0001$) more interproximal biofilm than the active Sonicare FlexCare alone. Sonicare FlexCare active removed significantly more biofilm than Sonicare FlexCare inactive ($p<0.0001$).

Conclusion

Sonicare AirFloss removed 66% more interproximal plaque biofilm than Sonicare FlexCare alone.

Comparison of In Vitro Interproximal Plaque Removal



Gingivitis Reduction and Plaque Removal

in vivo study

Effect of Philips Sonicare AirFloss on interproximal plaque and gingivitis

de Jager M, Jain V, Schmitt P, DeLaurenti M, Jenkins W, Milleman J, Milleman K, Putt M.
J Dent Res 90 (spec iss A), 2011

Objective

Philips Sonicare AirFloss is a rechargeable interproximal cleaning device that uses a high-velocity burst of air and water droplets to clean between teeth. The objective of this study was to evaluate the effect of Sonicare AirFloss on interproximal plaque and gingivitis when used in addition to manual toothbrushing.

Methodology

One hundred forty-eight adults (98 females, 50 males; mean age 39.5 years) with moderate gingivitis participated in this single-blind, four-week, parallel, randomized controlled clinical trial. Ethical approval and written informed consent were obtained. Subjects were randomized either to a manual toothbrush (two minutes, twice a day) or to a manual toothbrush plus Sonicare AirFloss (once daily, evening). Changes in gingival inflammation were measured using the Modified Gingival Index (MGI) and Gingival Bleeding Index (GBI) at baseline, two weeks and four weeks. The amount of interproximal plaque was evaluated by analyzing the residual protein concentration (RPC) of six plaque samples collected from four posterior sextants (one interproximal site per sextant) and two anterior sextants (three interproximal sites per sextant). Baseline plaque samples were collected prior to any intervention. At two weeks, the plaque removal efficacy from a single use of Sonicare AirFloss was assessed by collecting interproximal plaque samples immediately after subjects used their assigned treatment regimen. Safety of the products was assessed through oral examination, prior to all other assessments.

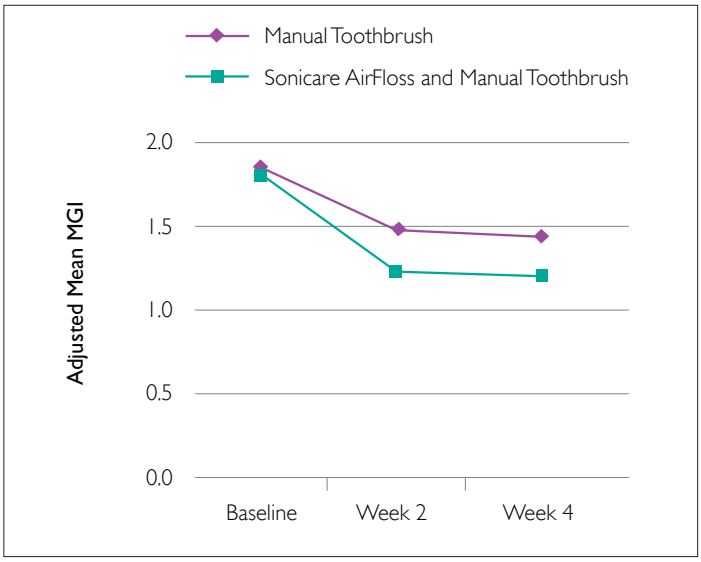
Results

Sonicare AirFloss, when used in addition to a manual toothbrush, provided significantly greater reductions in gingivitis and bleeding sites ($p<0.01$) than a manual toothbrush alone. After four weeks, Sonicare AirFloss reduced gingivitis by 33% more, gingival bleeding by 75% more and the number of bleeding sites by 86% more than a manual toothbrush alone. Interproximal plaque evaluated after a single use showed that Sonicare AirFloss removed significantly more plaque than a manual toothbrush alone ($p<0.01$). Both products were safe to use.

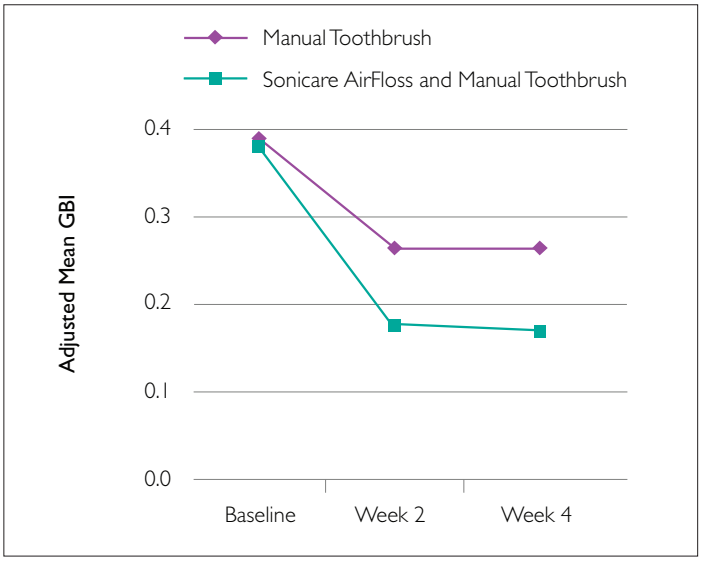
Conclusion

Sonicare AirFloss, when used in addition to manual brushing, removed significantly more interproximal plaque and resulted in significantly greater reductions of gingivitis after two weeks and four weeks of use, compared to manual brushing alone.

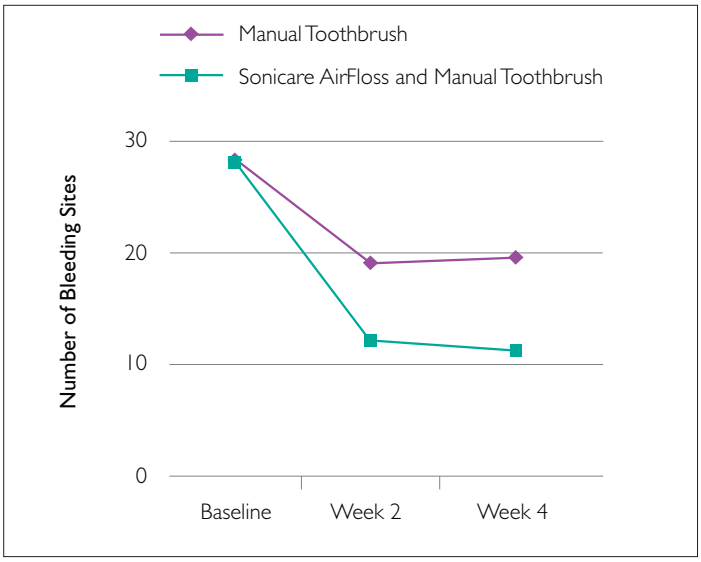
Modified Gingival Index



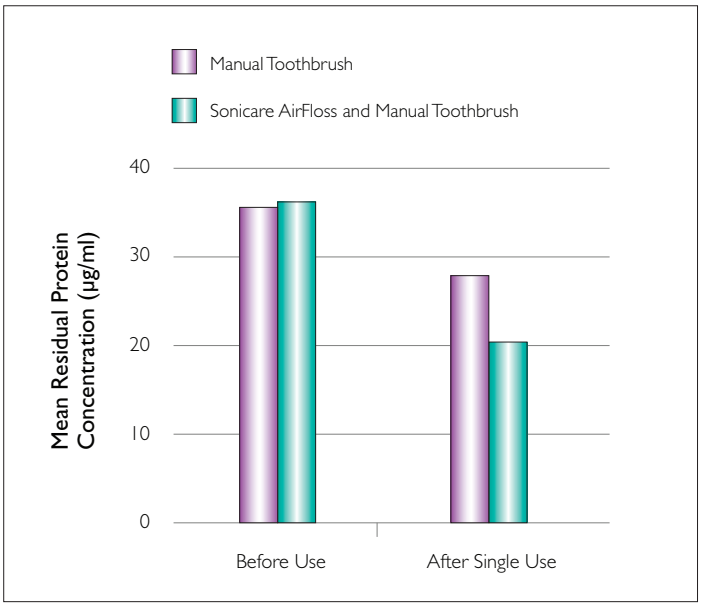
Gingival Bleeding Index



Bleeding Sites



Interproximal Plaque (RPC)



Compliance

in vivo study

In-home use test to assess compliance of Philips Sonicare AirFloss

Krell S, Kaler A, Wei J. Data on file, 2010

Objective	To assess compliance of Philips SonicareAirFloss in a sample of irregular flossers after one month of home use.
Methodology	Eligible participants included 56 adult irregular flossers (floss from one time per month to three times per week). Participants were given a product-usage diary to self report the frequency of usage of the product. The study utilized a single-arm design. All participants received the Sonicare AirFloss with a nozzle and travel charger, a daily-usage diary and product instructions. Per the study instructions, each participant used the Sonicare AirFloss at home and recorded his or her usage in the diary. In addition, feedback was recorded using an online questionnaire (Survey Monkey) at the end of one month. Participants were not restricted from using any other flossing products but were advised to use Sonicare AirFloss in their regular flossing routine.
Results	Fifty-one participants completed and returned their daily-usage diary after the first month of use. On average, irregular flossers used Sonicare AirFloss 1.3 times a day. 96.1% of the participants used Sonicare Airfloss four or more days per week.
Conclusion	96% of irregular flossers reported use of Sonicare AirFloss four or more days per week.

Notes

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