

Comparison between powerful Waterpik flosser with dental floss as an adjunct to tooth brushing

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ABSTRACT

Background: Removing dental plaque is important to maintain a good oral hygiene and prevent periodontal disease; this could not be accomplished by the use of toothbrush alone, it needs the help of interdental aids or intra-oral irrigator devices. The aim of this study was to compare the effect of using Waterpik flosser as adjunct to tooth brushing than using the dental floss with the brushing.

Materials and methods: A single blind, six weeks study included 45 subjects divided into three groups of 15 subjects at each group. Group B (brushing) was instructed to use the toothbrush only, group BF (brushing & flossing) was instructed to use dental floss and tooth brushing while group BW (brushing and Waterpik flosser) was instructed to use Waterpik flosser in addition to the toothbrush. Plaque index, gingival index and bleeding on probing were measured at the 1st visit, after 3 weeks (2nd visit) and finally after 6 weeks (3rd visit).

Results: The plaque index was significantly reduced in group BF and BW at the 3rd visit, while it showed no significant differences in group B. The mean percentage reduction of gingival index at the 3rd visit was higher in group BW than group B and group BF. Using the chi-square test, bleeding on probing showed no significant difference in group B, while there was significant reduction in group BF and highly significant reduction ($p < 0.001$) in group BW between the visits.

Conclusion: Waterpik flosser was more effective in reducing dental plaque and bleeding than dental floss.

Key words: brushing, Waterpik Flosser, dental floss. (J Bagh Coll Dentistry 2015; 27(3):89-92).

INTRODUCTION

Daily removal of dental plaque biofilm is important to maintain a healthy gingiva and prevent gingivitis and periodontitis, ⁽¹⁾ because this biofilm contains the bacteria responsible for caries formation and the development of gingivitis and periodontitis ⁽²⁾.

The most common device used for mechanical plaque control is the tooth brush. Brushing the teeth will remove the supragingival plaque from tooth surfaces ⁽³⁾, but it will not clean the interdental areas or the subgingival areas, so using interdental aids such as the dental floss, tooth picks or interdental brush is important to clean these areas. Recently, new devices have been developed and designed to aid brushing ⁽⁴⁾. One of these devices is the water flosser. A dental water flosser which is an electric oral irrigator device, that delivers pulsating water with controlled pressure to remove the interdental and subgingival plaque biofilm on tooth surfaces and reduce inflammation as a supplement to tooth brushing ⁽⁵⁾.

Pulsation and pressure are the two main physical features of water flossing action. A combination of these two actions will disrupt the bacterial activity and causing expulsion of subgingival bacteria, removing the loosely lodged debris and food particles, hence research has determined the appropriate levels of pressure that should be applied during usage which is about 50–90 psi (pounds of pressure per square inch).

Both healthy and inflamed tissues can comfortably handle this pressure without tissue damage ^(6,7).

The daily use of oral irrigator devices has been shown to reduce bleeding, gingivitis dental plaque, dental calculus, probing pocket depth, count of periodontal pathogens, and host inflammatory mediators ^(8,9). The aim of this study was to compare the effect of using the Waterpik flosser as adjunct to tooth brushing than using the dental floss with the brushing.

MATERIALS AND METHODS

Study Design

A single blind, six- weeks study included 45 adult subjects with an age range between 25 to 50 years old were recruited for this study without regard to sex. All subjects were systemically healthy, non smoker and had at least 20 evaluable teeth, not including the third molars, and not suffering from periodontitis or attachment loss, other exclusion criteria included pregnancy, lactation, using of contraceptive pills and the presence of orthodontic or prosthodontics appliances.

The subjects had a history of at least one-time daily brushing and should be suitable for the use of dental floss as interdental aids. The subjects were divided into 3 groups (group B (brushing), group BF (brushing & flossing) and group BW (brushing and Water Flosser) each group included 15 subjects. All the subjects in the three groups received instructions about the Modified Bass technique of brushing and were instructed to brush twice daily for two minutes each time using a provided toothbrush with soft bristle.

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Group B used a manual toothbrush only with no interdental aids or therapeutic mouth rinses. Group BF used a manual toothbrush and unwaxed dental floss. The subjects in this group were instructed to floss once daily in the evening by wrapping the floss around the middle fingers and using the index fingers and thumb to guide the floss, contour it around the side, move the floss up and down the tooth and to introduce the floss subgingivally for 2mm.

The third group (group BW) used a manual toothbrush and a Waterpik dental water jet (Figure 1). The subjects in group BW were relatives to ensure their continuous use of the Waterpik flosser according to the given instructions. They were instructed to use the Waterpik Flosser once daily in the evening using a medium pressure and 500ml of warm water.

The Waterpik Flosser is a power-driven device, which has a reservoir of water, pressure control, and delivers a pulsating stream of water directed at the gingival margin and interproximal areas. The water will strike the tooth at the gingival margin and then deflected subgingivally and interdentally. The Subjects were instructed to use the classic jet tip and directed it at the gingival margin following a pattern around the whole mouth.



Figure 1: Waterpik Flosser

Periodontal assessment

The periodontal assessment of clinical periodontal parameters included: Plaque index (PLI)⁽¹⁰⁾, gingival index (GI)⁽¹¹⁾ and bleeding on probing (BOP) were measured for all the teeth (excluding third molars) and four sites for each tooth were examined (buccal, lingual, mesial and distal). The means of the PLI and GI were calculated by dividing the sum of the surfaces

scores on the number of the surfaces.

BOP was measured by inserting a blunt periodontal probe to the bottom of the gingival sulcus and moving it gently along the tooth surface. If bleeding occurs within 30 seconds after probing, the site was given a score (1) and a score (0) for non bleeding sites⁽¹²⁾.

Examinations were performed for all the subjects at first visit and after three weeks (2nd visit), while the third examination was after six weeks (3rd visit). Subjects were asked to abstain from any oral hygiene for 12 hours before each study visit. Data analyses were conducted by using Microsoft Excel 2010.

RESULTS

All the 45 subjects completed the study and no adverse events were reported.

Plaque index: Means and standard deviations of PLI were listed in table (1). In all the groups the means of PLI were reduced at the third visit. Using t-test, the results showed no significant differences of PLI between 1st & 2nd ($p=0.28$), and 1st & 3rd ($p=0.073$) visits for group B. while there were highly significant differences ($p<0.001$) of PLI between 1st & 2nd, 1st & 3rd visits in group BF and group BW (table 2). The mean percentage reduction in the PLI at 2nd visit, for group B was 7.84% while for groups BF and BW were 27.63% and 73.09%, respectively. The mean percentage reductions in the PLI at 3rd visit, for groups B, BF, and BW were 12.93%, 35.36%, and 89.16%, respectively (Table 3).

Gingival index: The mean of the GI at the first visit was 1.091, 1.08 and 1.22 and it was reduced at the 3rd visit to 1.0003, 0.799 and 0.436 for group B, group BF and group BW respectively (Table 1).

The t-test showed no significant difference ($p=0.15$) of GI between 1st & 2nd visits and significant difference ($p=0.016$) between 1st & 3rd visits in group B, while both group BF and BW showed highly significant differences ($p<0.001$) of GI between the visits (Table 2).

The mean percentage reductions in the GI at 2nd visits were 4.62%, 17.41%, and 35.65%, while at the 3rd visits, were 8.31%, 26.02%, and 64.26%, for groups B, BF, and BW respectively (Table 3).

Bleeding on probing: The percentage of bleeding sites in the 1st visits, were 9.33%, 7.09%, and 19.16%, and they were reduced at the 3rd visits, to 7.44%, 4.65%, and 1.16%, for groups B, BF, and BW respectively (Table 4).

Using the chi-square test, the reduction in BOP were of no significant difference ($p=0.06$) in

group B, while there were significant reduction (p=0.003) in group BF and highly significant reduction (p<0.001) in group BW (Table 5).

Table 1: Descriptive statistics of the plaque index and gingival index for each group at different visits

Groups	Mean & SD of PLI			Mean & SD of GI		
	1 st visit	2 nd visit	3 rd visit	1 st visit	2 nd visit	3 rd visit
Group B	1.047± 0.219	0.965± 0.193	0.912± 0.178	1.091± 0.096	1.041± 0.091	1.0003± 0.098
Group BF	1.035± 0.213	0.749± 0.096	0.669± 0.096	1.08± 0.138	0.892± 0.061	0.799± 0.089
Group BW	1.375± 0.33	0.37 ± 0.208	0.149± 0.041	1.22 ± 0.144	0.785 ± 0.193	0.436 ± 0.192

Table 2: Comparison between visits at each group for PLI and GI

Groups	PLI		GI	
	1 st & 2 nd visit	1 st and 3 rd visit	1 st & 2 nd visit	1 st and 3 rd visit
Group B	0.28 NS	0.073 NS	0.15 NS	0.016 S
Group BF	<0.001 HS	<0.001 HS	<0.001 HS	<0.001 HS
Group BW	<0.001 HS	<0.001 HS	<0.001 HS	<0.001 HS

Table 3: Mean percent reduction of the PLI and GI between visits at each group

Groups	PLI		GI	
	1 st & 2 nd visit	1 st and 3 rd visit	1 st & 2 nd visit	1 st and 3 rd visit
Group B	7.84%	12.93%	4.62%	8.31%
Group BF	27.63%	35.36%	17.41%	26.02%
Group BW	73.09%	89.16%	35.65%	64.26%

Table 4: Percentage of BOP (score 1) for each group at different visits

Groups	1 st visit	2 nd visit	3 rd visit
Group B	9.33%	7.62%	7.44%
Group BF	7.09%	5.3%	4.65%
Group BW	19.16%	4.38%	1.16%

Table 5: Chi square for BOP (score 1) between visits at each group

Groups	1 st & 2 nd visit	P value	1 st & 3 rd visit	P-value
Group B	3.081	0.08 NS	3.814	0.06 NS
Group BF	6.21	0.01 S	8.827	0.003 S
Group BW	172.9	<0.001 HS	291.9	<0.001 HS

DISCUSSION

Tooth brushing alone is not enough to maintain a good oral hygiene; it needs to be supplemented by a device that can clean the subgingival and interdental areas. In this study we compared the use of dental floss with Waterpik Flosser. The plaque index was significantly reduced in group BF and BW, but the mean percent reduction showed a superior effect of the Waterpik Flosser to the dental floss. This result agrees with researchers who found that using of water Flosser alone or as an adjunct to tooth brushing, showed superior or equivalent reductions in plaque accumulations^(13,14). Based on these results, it appears that tooth brushing, with the use of Waterpik Flosser once daily with plain water, is more effective than brushing and flossing, which agrees with Shibley et al, who found that Waterpik is an effective alternative to dental floss⁽¹⁵⁾. Previous studies linked the

superiority of Waterpik flosser to both the ability of irrigation to reduce subgingival bacteria and to modulate the host response. Using the electron microscope, the investigators demonstrated that oral irrigation reduced periodontal pathogens, and reduced the fibrin-like network which houses the plaque. Cobb, *et al.* found that non-irrigated areas had plaque in fibrin-like mesh, while no or little fibrin mesh present in irrigated sites⁽¹⁶⁾. Another study found that the Water Flosser with the Classic Jet Tip removed 99.9 percent of plaque biofilm⁽¹⁷⁾.

Socransky and Haffajee noted that hydrodynamics affect the rate at which nutrients are transported to the plaque and affect the physical shear stress and these will impact the growth and structure of the plaque⁽¹⁸⁾.

Regarding the gingival inflammation and bleeding areas, the Waterpik flosser was more effective than brushing, brushing and flossing in

improving the gingival health and reducing gingival bleeding.

Different hypotheses have been put forward to explain this effect. One of the hypotheses is that supragingival irrigation alters the population of key pathogens, reducing gingival inflammation⁽¹⁹⁾. Another hypothesis is that a change in the host response may be produced by the oral irrigation. Cutler, et al demonstrated this change by showing that daily irrigation with water reduced the gingival crevicular fluid measures of pro-inflammatory mediators Interleukin 13 and prostaglandin PGE2. They linked the reduction of bleeding sites to the reduction of Interleukins. They noted that only the addition of irrigation produced this host modulatory change⁽²⁰⁾. So the results of this research indicated that oral irrigation when combined with tooth brushing is an effective alternative to traditional dental floss for reducing the plaque, bleeding and gingival inflammation.

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الخلاصة

الخلفية: إزالة لوحة الأسنان مهمة للحفاظ على نظافة جيدة للضمغ ومنع أمراض اللثة، هذا لا يمكن أن يتحقق عن طريق استخدام فرشاة أسنان وحده، فإنه يحتاج إلى مساعدة من مساعدات التنظيف بين الأسنان أو أجهزة الري داخل الفم. وكان الهدف من هذه الدراسة لمقارنة استخدام جهاز Waterpik flosser كمساعد لفرشاة الأسنان من استخدام خيط تنظيف الأسنان مع الفرشاة.

المواد والأساليب: استمرت الدراسة 6 أسابيع. وتضمنت 45 شخص مقسمين إلى ثلاث مجموعات من 15 شخصا في كل مجموعة. وقد أوزع إلى المجموعة B (تفريش) باستخدام فرشاة الأسنان فقط، مجموعة BF (تفريش والخيط) وأوزع لها باستخدام خيط تنظيف الأسنان والفرشاة بينما مجموعة BW (الفرشاة وجهاز ري ما بين الأسنان) فأوزع لهم باستخدام Waterpik flosser بالإضافة إلى فرشاة الأسنان. تم قياس مؤشر الصفيحة الجرثومية، مؤشر اللثة ونزيف اللثة في الزيارة 1، وبعد 3 أسابيع وأخيرا بعد 6 أسابيع.

النتائج: تم تخفيض مؤشر الصفيحة الجرثومية بشكل كبير في مجموعة BF و BW في الزيارة الثالثة، في حين أنه لم تظهر أي اختلافات كبيرة في مجموعة B. وكان تخفيض نسبة مؤشر اللثة في الزيارة الثالثة أعلى في مجموعة BW من المجموعة B و BF. مؤشر نزف اللثة لم يظهر أي اختلاف كبير في المجموعة B، في حين كان هناك انخفاض كبير في مجموعة BF وانخفاض كبير للغاية ($P < 0.001$) في مجموعة BW بين الزيارات. الاستنتاج: كان Waterpik flosser أكثر فعالية في تقليل مؤشر الصفيحة الجرثومية ونزيف اللثة من خيط تنظيف الأسنان