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ORIGINAL ARTICLE

Plaque Removal Efficacy of Dental floss Compare to Water Jet Following Single Use

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ABSTRACT

Background: Dental plaque (biofilm) is a well-known contributor to the onset and progression of many dental illnesses. Plaque is a natural biofilm that develops on oral surfaces and contains a wide variety of organisms. As a result, it is critical to control plaque formation, particularly in the young population, by implementing effective preventive strategies.
Objective: To assess and compare plaque removal efficacy of water flosser and string floss in patients.
Study design: Randomized controlled trial
Place and Duration of study: Department of Periodontology, Sardar Begum Dental College, Gandhara University from 1st March 2019 to 31st May 2019.
Methodology: Seventy patients were enrolled. Patients were randomly allocated to one of two groups, group A (using dental floss) as the control group and group B (using waterpik) as the intervention group, using the lottery technique. Patients were randomly allocated to one of two groups, group A (control group), using dental floss and group B (intervention group), using waterpik utilizing the lottery technique. All participants were taught correct brushing technique utilizing the Modified Bass technique and manufacturer's instructions for using waterpik as well as normal flossing instructions for using Dental floss.
Results: The mean age presentation was 34.23±6.78 years. The females were 42 (60%) males were 28 (40%). The mean percentage showed that those using water flosser with tooth brushing had low plaque score than using string floss with tooth brushing. The independent t test showed that water flosser is significantly more effective (p=0.001) in plaque reduction than conventional string floss.
Conclusion: A water flosser coupled with hand brushing is more effective in eliminating plaque than string floss. Plaque removal was 20-30% higher in the group that used a water flosser.
Key words: Efficacy, Dental floss, Water jet

INTRODUCTION

Periodontal disorders are widespread, and the prevalence of these illnesses varies according on the population. Estimates of prevalence, on the other hand, are influenced by differences in oral hygiene as well as the methods used to determine prevalence. Dental plaque is a key risk factor for a variety of periodontal illnesses therefore it should be kept under control or eliminated on a regular basis by brushing. People in the industrialized world used to clean their teeth once a day.[1,2] However, epidemiological studies suggest that this once-daily brushing has less than desirable results, with a substantial increase in gingivitis and advanced periodontal disease after this routine.[3] Even those who brush their teeth properly can only clean 60% of their tooth surfaces, leaving a considerable amount of plaque in the interdental regions, which are difficult to reach with a toothbrush alone.[4] Plaque eradication from the interdental surfaces of teeth is perhaps the most important. Because interdental regions are a perfect site for biofilm buildup and proliferation, and its removal from this area is difficult, most periodontal disorders begin and progress in these areas.[5] String floss has long been regarded the gold standard for removing plaque from between the teeth. Despite the fact that dental floss was originally introduced in the late 1800s, many dental experts still suggest it for cleaning interdental regions.

According to research, dental plaque builds in a certain pattern in various people. So far, the interproximal areas have been linked to higher plaque scores. As a result, plaque removal from the teeth's proximal surfaces is receiving a lot of attention. According to studies, a single toothbrush usage may eliminate plaque in the range of 28-53 percent, with an average of 43 percent. Gingivitis can be caused by a gradual accumulation of plaque at the gingival and proximal edges, and bacteria present in the plaque can then migrate subgingivally to begin periodontal disease.[6,7]

It is critical to remove or disrupt dental plaque or biofilm on a daily basis in order to improve and maintain gingival health. Tooth brushing is the conventional prescription for supragingival plaque removal, but it will not clean the interdental region, necessitating the use of interdental aids such as dental floss, interdental brush, or tooth pick. Several studies have demonstrated the effectiveness of dental floss in cleaning the interproximal areas of teeth and the benefits of using it to supplement tooth brushing, regardless of the type of floss used. Dental floss is an interdental cleaning tool used to remove dental plaque biofilm from the teeth's proximal surfaces.[8,9]

Oral irrigation is a new method for reducing subgingival pathogens, and it changes the biofilm composition. Oral irrigation permanently harms bacterial cells in addition to reducing subgingival dental plaque bacteria. Even if plaque remains on irrigated teeth's surfaces, it contains bacteria with burst cell walls and incomplete cell content, making plaque less powerful and pathogenic.[10,11]

Waterpiks were created to aid in tooth brushing. Waterpik is a power-driven instrument with a reservoir and pressure control that delivers a pulsating water stream to the gingiva's margins and adjacent areas. Pulsation and pressure are the two main physical features of a water flosser. The combined effect of these two activities will destroy bacterial activities and cause an increase in the removal of bacteria present subgingivally as well as loosely lodged food particles and debris. The reservoir holds enough water to clean the whole mouth, including the facial, lingual, marginal, and proximal surfaces.[12,13]

String floss is technique-dependent, requires patient cooperation, and can cause tissue damage if done incorrectly. These issues can be best addressed with water floss. The goal of this study is to see if water floss is more effective at removing plaque and if it is a better option.

MATERIALS AND METHODS

This randomized controlled trial was carried out in Department of Periodontology, Sardar Begum Dental College, Peshawar Pakistan from 1st March 2019 to 30th May 2019 and comprised 70 patients. They were divided into two equal groups; group A (using the string dental floss) and group B (utilizing the waterpik flosser). Male and female subjects with age 20-50 years, subjects having at least 20 caries-free permanent teeth except third molars were included. All subjects who consume or recently consumed any tobacco product,

systemic diseases affecting the oral health (e.g. chronic uncontrolled diabetes mellitus, chronic autoimmune diseases) and advanced periodontal disease, crowns and orthodontic appliances or removable dentures were excluded. All the subjects instructed to brush by using Modified Bass Technique. They were also advised to use the single same tooth paste and brush (medium soft), provided by the researcher to all the participants in order to lessen/prevent the confounding impacts. Moreover, manufacturers guidelines were followed for using the Waterpik as well as for conventional dental floss usage.

A single examiner (who was blinded to cleaning method used) carried out the clinical examination for detection and scoring of dental plaque, by using Rastogi Modification of Navy Plaque index (RMNPI).[13] RMNPI divide each tooth into nine sections for each of the facial and lingual side, in this way total 18 sites. The sites having plaque were scored as (1) and sites with no plaque were scored as (0). All the sites having score 1 were combined by adding to obtain pre-cleaning score. After that, patients brushed their teeth using Modified Bass Technique and then they rinse and immediately start cleaning with either Water jet or Dental floss, plaque score was recorded again to compare it with baseline. Mean plaque score was calculated by dividing the sum of the plaque scores by the total number of sites separately for proximal, marginal, lingual and buccal sides of the teeth. Percent change was determined by dividing mean change in plaque score by mean pre cleaning plaque score and multiplying by 100.Percent change in Plaque score was compared between two groups (A and B).

SPSS-22 was used to analyze the data. The mean plaque score between the two groups was compared using an independent t-test. Statistical significance was defined as a p value of ≤0.05.

RESULTS

The age was 34.23±6.78 years. Males were 28 (40%) while females were 42 (60%). The mean pre-cleaning and post-cleaning plaque score were determined as given in Table 1. Using an independent sample t-test, it was discovered that the mean percent change in Plaque Score for Facial was considerably higher in Group B water flosser than in Group A string floss, with a p-value of 0.001 (Table 2). Applying an independent sample t-test, it was found that Group B Water flosser had a substantially higher percent change in plaque score for Lingual than Group A String floss, with a p-value of 0.001 (Table 3). Similarly, it was discovered that Group B Water flosser had a substantially higher percent change in plaque score for Marginal than Group A String floss, with a p-value of 0.001 (Table 4). Percent change in Plaque score for Proximal was found to be substantially higher in Group B Water flosser than in Group A String flosser, using independent sample t-test (p-value = 0.001) Table 5. All-embracing, it was found that Group B Water flosser had a substantially higher percent change in plaque score for the whole mouth than Group A String floss, with a p-value of 0.001 (Table 6).

Table 1: Mean pre-cleaning and post cleaning plaque score

Site	Groups	Pre cleaning score	Post cleaning score	Change score
Facial	Group A	0.753±0.053	0.363±0.018	0.39±0.053
	Group B	0.760±0.053	0.171±0.010	0.588±0.051
Lingual	Group A	0.742±0.055	0.396±0.015	0.345±0.051
	Group B	0.763±0.035	0.189±0.015	0.574±0.035
Proximal	Group A	0.731±0.030	0.348±0.020	0.383±0.022
	Group B	0.647±0.025	0.162±0.015	0.485±0.027
Marginal	Group A	0.812±0.060	0.425±0.024	0.387±0.055
	Group B	0.725±0.038	0.167±0.019	0.558±0.044
Whole mouth	Group A	0.670±0.040	0.303±0.026	0.368±0.037
	Group B	0.613±0.020	0.125±0.010	0.488±0.021

Group A = String Floss (SF) Group B=Water Flosser (WF)

Table 2: Comparison of percent decrease in plaque score for facial in both groups (n = 70)

Groups	Pre-cleaning mean score	Post-cleaning mean score	Mean change score	Mean percentage	p-value
Groups A	0.753 (0.053)	0.036 (0.018)	0.39 (0.053)	51.55±3.74	0.001
Group B	0.760 (0.053)	0.171 (0.010)	0.588 (0.051)	77.39±1.72	

Table 3: Comparison of percent decrease in plaque score for lingual in both groups (n=70)

Groups	Pre-cleaning mean score	Post-cleaning mean score	Mean change score	Mean percentage	p-value
Groups A	0.742(0.055)	0.396(0.015)	0.345(0.051)	46.33±3.66	0.001
Group B	0.763(0.035)	0.189(0.015)	0.574(0.035)	75.19±1.96	

Table 4: Comparison of Percent decrease in plaque score for Marginal in both groups (n=70)

Groups	Pre-cleaning mean score	Post-cleaning mean score	Mean change score	Mean percentage	p-value
Groups A	0.812(0.060)	0.425(0.024)	0.387(0.055)	47.45±3.86	0.001
Group B	0.725(0.038)	0.167(0.019)	0.558(0.044)	76.92±2.94	

Table 5: Comparison of percent decrease in plaque score for proximal in both groups (n=70)

Groups	Pre-cleaning mean score	Post-cleaning mean score	Mean change score	Mean percentage	p-value
Groups A	0.731(0.030)	0.348(0.020)	0.383(0.022)	52.43±1.98	0.001
Group B	0.647(0.025)	0.162(0.019)	0.485(0.027)	74.99±2.24	

Table 6: Comparison of percent decrease in plaque score for Whole mouth in both groups (n=70)

Groups	Pre-cleaning mean score	Post-cleaning mean score	Mean change score	Mean percentage	p-value
Groups A	0.670(0.040)	0.303(0.026)	0.368(0.037)	54.77±3.71	0.001
Group B	0.613(0.020)	0.125(0.010)	0.488(0.021)	79.61±1.63	

DISCUSSION

The goal of this study was to evaluate the effectiveness of a Water flosser against string floss in removing plaque. For the proximal, marginal, lingual, and buccal sides of the teeth, the Rastogi Modification of Navy Plaque Index is utilized. The RMNPI allows us to analyze different sections and sides of the tooth, giving us a clearer picture of how effective each product is at eliminating plaque.[13,14]

It was recently discovered that varied brushing times and brushing techniques used by different patients had different effects on the brushing outcome. The average brushing duration in the modified bass technique was 50 seconds, and the technique

employed did not adequately clean the angles of teeth and borders.[15,16] Plaque left on the tooth surfaces, particularly the marginal area, causes the creation and growth of subgingival biofilm, which increases the risk of gingivitis and periodontitis.[17,18] Brushing two times a day for two minutes was developed empirically rather than scientifically, thus encouraging people to brush their teeth more regularly and for longer periods of time may be futile.[4]

In 1962, the first water flosser, also known as an oral irrigator, was introduced to dentistry for the first time. There are now 50 studies on one type that employ a mix of pulsation and pressure to reduce plaque and inflammation. Water flossers have been evaluated in a variety of clinical trials, including implants, orthodontics, diabetics, gingivitis, and mild to moderate periodontitis.[20-24] When compared to traditional oral hygiene techniques that involve string floss, the usage of a water flosser demonstrated substantial health improvement in all of these particular disorders.

The mean % plaque reduction on proximal, buccal, and lingual surfaces was seen in this study, which was consistent with the findings of Lyle et al[25], who indicated that using a water flosser is more successful in plaque removal in difficult-to-reach regions. A study published in the Journal of Clinical Dentistry compared the efficiency of plaque removal by water flossers and string flossers and found that those who used water flossers had a 74.4% reduction in plaque score compared to 57.7% reduction in plaque score for those who used string floss.

Another study found that using a waterpik for interproximal cleaning reduced gingivitis, bleeding from the gums, and plaque score when compared to using dental floss.[26] Another research found that individuals with periodontal disease who were given water irrigation had a random distribution of various bacterial species such as short rods and cocci inside the interfibrillar matrix. Untreated teeth, on the other hand, are covered in a dense woven matrix of biofilm and bacteria.[5]

Berchier et al[7] suggested a comprehensive review that found that using dental floss as an addition to teeth brushing reduced several aspects of gingival inflammation. Kuru et al[23] found that combining tooth brushing with the use of a water pik or other interdental cleaning tool improves oral hygiene and periodontal health.

CONCLUSION

A water flosser coupled with hand brushing is more effective in eliminating plaque than string floss. Plaque removal was 20-30% higher in the group that used a water flosser.

REFERENCES

1. aqish J, Walters P, Grender J, Biesbrock A. A clinical evaluation of the plaque removal efficacy of five manual toothbrushes. Int J. Clin. Dent 2010;21(1):8.
2. Batchelor P. Is periodontal disease a public health problem? Br Dent J 2014;217(8):405.
3. Slot D, Wiggelinkhuizen L, Rosema N, Van der Weijden G. The efficacy of manual toothbrushes following a brushing exercise: a systematic review. Int J Dent Hyg 2012; 10(3):187-97.
4. Lamont RJ, Jenkinson HF. Oral microbiology at a glance: John Wiley & Sons; 2010;52(6):105-11.
5. Sharma NC, Lyle DM, Qaqish JG, Schuller R. Comparison of two power interdental cleaning devices on plaque removal. J Clin Dent 2012; 23(1):17-20.
6. Davidovich E, Ccahuana-Vasquez RA, Timm H, Grender J, Cunningham P, Zini A. Randomised clinical study of plaque removal efficacy of a power toothbrush in a paediatric population. Int J Paed Dent 2017;27(6):558-67.
7. Arora V, Tangade P, Ravishankar T, Tirth A, Pal S, Tandon V. Efficacy of dental floss and chlorhexidine mouth rinse as an adjunct to toothbrushing in removing plaque and gingival inflammation - a three way cross over trial. J Clin Diagn Res 2014;8(10):45-67.
8. Jackson MA, Kellett M, Worthington HV, Clerehugh V. Comparison of interdental cleaning methods: a randomized controlled trial. J Periodontol 2006;77(8):1421-9.
9. Hansson GK, Libby P, Tabas I. Inflammation and plaque vulnerability. J Int Med 2015; 278(5):483-93.
10. Nguyen ATM, Phan NDD, editors. Povidone-Iodine as Subgingival Irrigation in Chronic Periodontitis Treatment. 11th International Dentistry Scientific Meeting (IDSM 2017); 2018: Atlantis Press.
11. Shewele A, Gattani D, Bhasin MT, Bhatia N, Agarwal A, Dadasaheb S. Adjunctive Role of Supra and Subgingival Irrigation in Periodontal Therapy. Int J Pharm Sci Res 2016;7(3):152-9.
12. Lyle DM, Qaqish JG, Schuller R. Evaluation of the plaque removal efficacy of a water flosser compared to string floss in adults after a single use. J Clin Dent 2013;24:37-42.
13. Claydon N. Current concepts in tooth brushing and interdental cleaning. Periodontol 2008; 48:10-22.
14. Ximenez-Fyvie LA, D. Haffajee A, Som S, Thompson M, Torresyap G, S. Socransky S. The effect of repeated supragingival plaque removal on the composition of the supra- and subgingival microbiota. J Clin Periodontol 2000; 27:637-47.
15. Mandal A, Singh D, Siddiqui H, Das D, Dey A. New dimensions in mechanical plaque control: An overview. Ind J Dent Sci 2017;9(2):133-9.
16. Wang Y, Zhang Y, Miron RJ. Health, Maintenance, and Recovery of Soft Tissues around Implants. Clin Implant Dent Related Res 2016;18(3):618-34.
17. Sharma NC, Lyle DM, Qaqish JG, Galustians J, Schuller R. Effect of a dental water jet with orthodontic tip on plaque and bleeding in adolescent patients with fixed orthodontic appliances. Am J Orthod Dentofacial Orthop 2008; 133(4):565-71.
18. Al-Mubarak S, Ciancio S, Aljada A, Mohanty P, Mohanty P, Ross C, et al. Comparative evaluation of adjunctive oral irrigation in diabetics. J Clin Periodontol 2002;29(4):295-300.
19. Goyal CR, Lyle D, Qaqish JG, Schuller R. The addition of a water flosser to power tooth brushing: effect on bleeding, gingivitis, and plaque. J Clin Dent 2012;23(2):57-63.
20. Kuru B, Kuka GI, Tunar OL. Role of the mechanical interdental plaque control in the management of periodontal health: how many options do we have? gingival disease-a comprehensive and professional approach for treatment and prevention. Intech Open 2018.
21. Goyal CR, Lyle DM, Qaqish JG, Schuller R. Evaluation of the plaque removal efficacy of a water flosser compared to string floss in adults after a single use. J Clin Dent 2013;24(2):37-42.
22. Cutler C, W. Stanford T, Abraham C, A. Cederberg R, J. Boardman T, Ross C. Clinical benefits of oral irrigation for periodontitis are related to reduction of pro-inflammatory cytokine levels and plaque. J Clin Periodontol 2000; 27:134-43.