



Effect of Natural Water Floss Concentrate in Dental Plaque Induced Gingivitis — A Prospective Interventional Study

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ABSTRACT:

Background:

Electric dental flossers are recommended products for oral hygiene because they are easy to use at home. It destroys plaque through pulse and pressure, removes debris and delivers antibiotics to the gingival sulcus and interproximal areas. It can also be used as a carrier for many antibiotics or anti-inflammatory drugs. Therefore, an experimental study was planned to evaluate the effectiveness of natural water floss concentrate on dental plaque-induced gingivitis.

Materials and Methods:

The aim of the study was to evaluate the effect of water floss with natural water floss concentrate containing tea tree oil, peppermint oil and flavonoids on dental plaque formation and dental plaque induced gingivitis. A prospective interventional study was carried out on 66 age-matched (18-65 years) subjects of with plaque induced gingivitis. The subjects were advised to use a water floss with natural water floss concentrate in their oral hygiene routine. The study period was 30 days. Subjects were evaluated for plaque and gingival index on days 1, 7, 15 and 30. Data were analyzed by paired t test.

Results:

A statistically significant decline was observed in plaque and gingival indices scores from day 7 and the scores continued to decrease during the period of study.

Conclusion:

Water floss with natural water floss concentrate could be an effective adjuvant to routine toothbrushing in decreasing plaque formation and plaque induced gingivitis.

Introduction:

Periodontitis is a multifactorial disease that affects the tooth supporting structures. It is one of the most prevalent diseases of the oral cavity along with dental caries. The primary etiological factor for this disease is dental plaque.[1] Therefore, maintaining proper oral

hygiene is the most essential factor for preserving the periodontal tissue health and preventing its further progression.

Various plaque removal devices including toothbrush and toothpastes are widely available in the commercial market.[2] However, various studies have revealed the



inefficacy of toothbrushes for cleaning the interproximal areas. However, plaque eradication from the interdental spaces is essential as these areas are more prone to biofilm development and proliferation, also its removal from this area is difficult thus, making them the perfect site for the initiation and progression of periodontal diseases. [3]

Water flosser is a power-driven device which generates pulsating stream of water under controlled pressure. This stream of water can be directed towards gingival margin and interdental areas. Thus, causing removal of the bacterial biofilms along with food debris. It can also be used to deliver antimicrobial solutions into the sulcus and interproximal regions.[4]

Studies have demonstrated that various natural products have antibacterial, anti-inflammatory, and tissue regenerative properties.

Among these materials, tea tree (*Melaleuca alternifolia*) oil (TTO) is obtained from the bark of the tea tree. It has broad spectrum antibacterial, antifungal, antiviral, anti oxidant and anti-inflammatory effects.[5]

Flavonoids are plant-derived polyphenolic compounds said effects on cells and tissues, along with modulation of inflammatory responses in body tissues and the ability to counteract the effects of bacteria on the body and alveolar bone.[6]

It is well documented that peppermint essential oil and extracts have antibacterial, anti-inflammatory and antioxidant properties and have anti-inflammatory properties.[7] To the authors knowledge there is no published study on the use of water floss concentrated along with water floss device.

Therefore, the aim of this study was to compare the effectiveness of a pulsating water flosser with natural water floss concentrate on periodontal parameters post non-surgical periodontal therapy.

Materials and Methods

A prospective interventional study was carried out to evaluate the effectiveness of natural water floss concentrate on plaque formation, and plaque induced gingivitis post non-surgical periodontal therapy. A total of 66 subjects in the age-group of 18-65 years were selected from the out-patient department of the department of periodontology. The study was approved

by institutional ethical committee and informed consent was taken from all participants.

Before recruiting the subjects, a thorough medical and dental history was recorded. Patients who were on any systemic or topical antibiotics, pregnant or lactating women, with a history of substance abuse, drug allergy, or ongoing orthodontic treatment were excluded from the study. The study did not have any control group and all the participants were allotted to a single test group.

Non-surgical periodontal therapy was performed on all the patients. Oral hygiene instructions were given and the patients were advised to use water flosser with natural water floss concentrate (Oradox Refresh, Prevest Denpro Ltd, Jammu, India) every day in the morning in addition to their oral hygiene routine for 30 days.

Periodontal parameters recorded were Gingival Index[8], Plaque Index [9]. Baseline values of all the parameters were compared to the post intervention values at 7 days, 15 days, 30 days. The parameters were recorded at by two independent examiners and the inter-observer agreement was measured using the kappa coefficient.

Statistical analysis

Data was entered into excel sheet and analysed using SPSS version 17 software (SPSS Inc., Chicago, IL, USA). Repeated measure analysis of variance, paired t-test, and sample t-test with the difference of $P < 0.05$ were used for statistical analysis.

Results

The mean age of the study subjects was 41.6 (± 12.4) years (Table 1). Out of the total 66 subjects, two subjects were further excluded from the study due to antibiotic usage during the study period. The test group showed uneventful healing with no signs of allergy, swelling, or inflammation. This ensures that the material is biocompatible and well tolerated by the patients. The Kappa coefficient scores for the inter-examiner reliability were in the range of 0.64-0.93, suggesting it to be between substantial to near perfect agreement.(Table 2) At the base line the mean gingival index was 1.39 (± 1.12) and the plaque index was 0.95 (± 0.79) at baseline. In comparison to the baseline values both the gingival and the plaque indices substantially



reduced during the period of assessment. There was a steady decline in both the plaque index and the gingival index values from day 7. The average gingival index score on day 30 was down to 0.53 (± 0.5) and the plaque index score was 0.46 (± 0.5). Statistical analysis using the paired t-test showed that the decrease was statistically significant. (Table 3)

Discussion

Dental plaque induced gingivitis results from an interaction between the host immune response and the microorganisms which are present in dental plaque. It results in inflammation of gingiva without loss of attachment beyond 3mm. Its management includes removal of the etiological factors mainly through effective plaque control methods.[10]

In the present study we have used water flosser along with natural water floss concentrate. Water flosser is proved to efficient in removal of dental plaque from the interdental areas which is otherwise difficult to remove through toothbrushes. It uses pulsating water stream at a pressure ranging from 50-90 psi.[11] This causes disruption of dental plaque and materia alba. The water flosser can also deliver antimicrobial solutions into the sulcus and interproximal regions.[12] Our study is aimed at checking the effectiveness of water floss with natural water floss concentrate, as an adjuvant to brushing, in decreasing the plaque accumulation and plaque induced gingivitis.

The use of natural products reduces the usage of chemicals thus posing lesser risk to human and our environment. Herbs and plant extracts have been used in oral hygiene products for many years. The present study was done using water flosser with natural water floss concentrate consisting of tea tree oil, Peppermint oil and Flavonoids.

Many studies have reported that tea tree oil exerts strong antibacterial, antifungal, antiviral and anti-inflammatory activities. TTO as an antimicrobial agent acts to disrupt the permeability barrier of microbial membrane structures.[13] Peppermint oil exerts antiseptic, anti-spasmodic effect, cooling and cleansing effect which helps in reducing inflammation, increases salivary production and provides a fresh feel to the mouth.[14] The antibacterial, anti-inflammatory and antiresorptive effects of flavonoids make them an

important factor in the treatment of periodontal disease.[6] Therefore, a combination of these agents was used in the water floss concentrate.

Our study reveals a significant reduction in plaque accumulation and gingival inflammation, thus confirming the effectiveness of natural products containing water floss concentrate, as an adjunct to toothbrushing. However, the lack of a control group with a proven chemotherapeutic agent used is the major the limitation of our study.

Conclusion

Water floss with natural water floss concentrate has been proven to be an effective method in reducing plaque formation and plaque induced gingivitis. The concentrate is an easily usable, safe and cost-effective agent with minimal side effects which can be used as an adjuvant in oral hygiene maintenance. However, further studies with a large number of subjects and comparative studies using various chemotherapeutic agents can improve the quality of evidence.

References

1. Pihlstrom BL, Michalowicz BS, Johnson NW. Periodontal diseases. *Lancet*. 2005;366(9499):1809–1820. doi: 10.1016/S0140-6736(05)67728-8.
2. Claydon N.C. Current concepts in toothbrushing and interdental cleaning. *Periodontology*. 2008;48(1):10–22
3. Van der Weijden F, Slot DE. Oral hygiene in the prevention of periodontal diseases: the evidence. *Periodontol*. 2000;55(1):104–123. doi: 10.1111/j.1600-0757.2009.00337.x
4. Goyal CR, Lyle DM, 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.
5. Elgendy EA, Ali SA, Zineldeen DH. Effect of local application of tea tree (*Melaleuca alternifolia*) oil gel on long pentraxin level used as an adjunctive treatment of chronic periodontitis: A randomized controlled clinical study. *J Indian Soc Periodontol*. 2013 Jul;17(4):444-8. doi: 10.4103/0972-124X.118314. PMID: 24174722; PMCID: PMC3800405.
6. Fernández-Rojas B, Gutiérrez-Venegas G. Flavonoids exert multiple periodontic benefits including anti-inflammatory, periodontal ligament-



- supporting, and alveolar bone-preserving effects. *Life Sci.* 2018 Sep 15;209:435-454. doi: 10.1016/j.lfs.2018.08.029. Epub 2018 Aug 17. PMID: 30121198.
7. Thosar N, Basak S, Bahadure RN, Rajurkar M. Antimicrobial efficacy of five essential oils against oral pathogens: An in vitro study. *Eur J Dent.* 2013 Sep;7(Suppl 1):S071-S077. doi: 10.4103/1305-7456.119078. PMID: 24966732; PMCID: PMC4054083.
 8. Loe H, Silness J. Periodontal disease in pregnancy. I. Prevalence and severity. *Acta Odontol Scand.* 1963;21:533-51.
 9. Silness J, Loe H. Periodontal disease in pregnancy. II. Correlation between oral hygiene and periodontal condition. *Acta Odontol Scand.* 1964;22:121-35.
 10. Costa FO, Costa AA, Cota LOM. The use of interdental brushes or oral irrigators as adjuvants to conventional oral hygiene associated with recurrence of periodontitis in periodontal maintenance therapy: A 6-year prospective study. *J Periodontol.* 2020;91(1):26-36. doi: 10.1002/JPER.18-0637. [PubMed] [CrossRef] [Google Scholar]
 11. Cutler CW, Stanford TW, Abraham C, Cederberg RA, Boardman TJ, 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(2):134-143. doi: 10.1034/j.1600-051x.2000.027002134.x.
 12. Bowen D.M. Flossing or alternative interdental aids? *Am. Dent. Hygienists' Assoc.* 2012;86(2):58-62.
 13. Arweiler NB, Donos N, Netuschil L, Reich E, Sculean A. Clinical and antibacterial effect of tea tree oil – A pilot study. *Clin Oral Investig.* 2000;4:70-3.
 14. Rezaie, Elaheh & Bayani, Mojtaba & Arjomandzadegan, Mohammad. (2020). The Inhibitory and Antibacterial Effects of Peppermint Essential Oil on Periodontal Photogenes. *Journal of Arak University of Medical Sciences.* 172-183. 10.32598/JAMS.23.2.5710.3.

Table 1: Age distribution of study subjects

Age in years	Mean Age (SD)	41.6 (12.4)
	Range	18-65

Table 2: Table showing Kappa score for gingival index and plaque index

Days	Kappa Score - Gingival Index	p value	Kappa Score - Plaque Index	p value
Baseline	0.77	0.000	0.88	0.000
7 days	0.68	0.000	0.99	0.000
15 days	0.90	0.000	0.85	0.000
30 days	0.97	0.000	0.94	0.000

Table 3: Mean value of gingival index and plaque index

Duration	Gingival Index	Plaque Index
Baseline	1.39 ± 1.12	0.95 ± 0.69
7 days	1.13 ± 0.50	0.53 ± 0.20
15 days	0.53 ± 0.20	0.48 ± 0.18
30 days	0.51 ± 0.10	0.37 ± 0.11
P value	<0.05	<0.05