Original Article

The efficacy of antiseptic mouth rinses in comparison with dental floss in controlling interproximal gingivitis

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Abstract

Objectives: Maintaining good oral hygiene is important to combat periodontal diseases. The use of tooth brush alone does not serve the purpose, especially in inaccessible areas like proximal embrasures, which demand the use of some adjuncts like proximal cleaning aids. Hence, the objective of this study was to compare the clinical efficacy of two antimicrobial mouth rinses (Cool mint Listerine and 0.2% Chlorhexidine gluconate) with dental floss in reducing interproximal gingivitis and dental plaque in an unsupervised condition. **Materials and Methods:** A randomized, controlled, single-blind (observer), parallel-group clinical trial in accordance with the ADA guidelines was conducted for a period of 6 months. Four index age groups (12, 15, 35–44, and 65–74 years) were divided into four groups, i.e., brushing, brushing and flossing, brushing and rinsing with Listerine, and brushing and rinsing with Chlorhexidine, so that each group comprised 40 subjects. Interproximal gingivitis and dental plaque were assessed using Modified Gingival Index, Turesky–Gilmore–Glickman modified Quigley-Hein Plaque Index and Gingival Bleeding Index. Analysis of variance (ANOVA) was used for multiple group comparisons, followed by Tukey's *post hoc* for group-wise comparisons. **Results:** Chlorhexidine and Listerine showed significant reduction in plaque and gingivitis level compared to others, the activity of Chlorhexidine being more significant. **Conclusions:** The level of interproximal gingivitis control efficacy provided by the Listerine and Chlorhexidine was "at least as good as" that provided by the dental floss. Hence, they can be recommended for the patients with gingivitis as an adjunctive to the usual home care routine.

Key words: *Chlorhexidine, dental floss, interproximal gingivitis, listerine, mouth rinses*

INTRODUCTION

Periodontal diseases are ubiquitously present throughout the world.[1] Many epidemiological studies have demonstrated a direct correlation between severity of inflammatory periodontal diseases and dental plaque mass.[1,2] Hence, maintenance of oral hygiene is very essential.

Epidemiological surveys carried out in India show that 90–95% population is suffering from different types of periodontal diseases. There is not enough manpower to cope up with the needs of dental services in our population. So, the critical solution for prevention of periodontal disease is to implement preventive measures on the public health basis.[2]

The use of conventional tooth brush alone does not serve the purpose of perfect oral hygiene cleaning, especially in inaccessible areas like proximal embrasures, which require the use of some adjuncts like proximal cleaning aids. Although the efficacy of dental floss and mouth rinses is well established in reducing interproximal gingivitis, only a few studies have been conducted to compare both. Hence, this study was conducted to compare the clinical efficacy of two mouth rinses with dental floss in an unsupervised condition to reduce interproximal gingivitis.

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Objectives

- To compare the clinical efficacy of two mouth rinses (Cool mint Listerine and 0.2% Chlorhexidine gluconate) in reducing dental plaque and interproximal gingivitis.
- To compare the clinical efficacy of two antimicrobial mouth rinses (Cool mint Listerine and 0.2% Chlorhexidine gluconate) with Dental floss in reducing interproximal gingivitis and dental plaque in unsupervised condition.

MATERIALS AND METHODS

Four index age groups of 12, 15, 35–44, and 65–74 years were included in the study. A total of 160 subjects (40 subjects in each age group) fulfilling the inclusion criteria were selected from dental screening camps, patients attending OPD of a dental college (College of Dental Sciences), old age home (Hiriya Vanitheyara Vridhashrama – MCC "A" block) and a school (Durgambika School) of Davangere city, Karnataka. Subjects with at least 20 intact natural teeth, Mean Modified Gingival Index (MGI) score of ≥1.75 and Mean Plaque Index (PI) score of ≥1.95 were included.

A randomized, controlled, single–blind (observer), parallel-group clinical trial in accordance with the ADA guidelines[3] was used as the study design.

Before the commencement of the study, permission was taken from the Head Master of the concerned school and concerned authority of the old age home to examine the subjects. The study was explained in local language (Kannada) or English and subjects who were willing to participate were included in the study and a written consent was obtained. For children of 12 and 15 years age group, parental consent was obtained. Ethical clearance was obtained from Ethical Committee, College of Dental Sciences, Davangere.

Pilot study was conducted before the main study to check the feasibility and validity of the study. By standardizing all the materials and methods, the study was conducted by considering a total of 32 subjects, with 8 subjects in each group, so that 2 subjects from each age group were allocated to different study materials. The assessments were utilized for sample size determination, proper planning and execution of the main study protocol. The participants were not included in the main study.

In the first stage/phase, subjects were examined and selected as per the inclusion criteria of the study and demographic details recorded. Subjects were randomly divided into four study groups allocated by lottery method with 40 subjects in each group such that their mean ages were similar. Each of them was asked to take a slip from a box containing four slips with a code for the products and was allotted to that group. Subjects received the products according to the specified code.

The four study groups were:
1) Group I – Brushing only (control)
2) Group II – Brushing and flossing (Pick-n-floss dental floss holder)
3) Group III – Brushing and rinsing with essential oil mouth rinse (Cool mint Listerine, Pfizer Company Ltd,Mumbai, India)
4) Group IV– Brushing and rinsing with Chlorhexidine mouth rinse (0.2% Chlorhexidine gluconate)

Further clinical examinations were conducted in the Department of Preventive and Community Dentistry, College of Dental Sciences, Davangere. Examinations were done by a single examiner and scores of Modified Gingival Index (MGI),[4] Turesky–Gilmore–Glickman modified Quigley-Hein Plaque Index (PI),[5] and Gingival Bleeding Index (BI)[6] were recorded.

Examiner was blinded regarding the grouping of subjects according to the products, with a view of minimizing the selection bias. Codes were given for the products and this was done by a person not involved in the examination. Baseline examinations were followed by oral prophylaxis.

Participants received brief instructions for the procedure they had to perform, i.e., flossing and rinsing in addition to their routine tooth brushing. Subjects in the rinsing group were instructed to use 20 ml mouth rinse for 30 seconds twice daily, 30 minutes after tooth brushing. Subjects in the flossing group were given demonstration of flossing and instructed to floss once daily. To achieve standardized conditions, each subject used the same tooth paste and new tooth brush and was advised to brush in the usual manner. No instructions were given concerning brushing technique and duration. During the study period, the use of oral hygiene tools other than the attributed was strictly prohibited.

All the subjects were instructed to maintain a chart on daily product use and visit the clinical site monthly to take additional supplies. During their visit, compliance with their study regimen was assessed. The subjects were instructed not to brush their teeth for at least 1

hour prior and to refrain from using the products on the day of examination.

At 3 and 6 months, assessments were made by the same examiner. The 6-month study duration and unsupervised use of products was analogous to that of a typical dental office recall visit. Decoding was done after analysis of the data.

After the study, the subjects were given oral health education and emphasis was laid on the importance of simple preventive measures and periodic dental visits.

Statistical analysis was done by using Mean and Standard Deviation (SD). One-way analysis of variance (ANOVA) test was used for multiple group comparisons, followed by Tukey's *post hoc* for group-wise comparisons. *P* value <0.05 was considered statistically significant.

RESULTS

A total of 160 subjects (73 males and 87 females) were included in the study. At 3-month evaluation, two subjects dropped out due to problem in compliance with the test product and due to shifting to another place. By 6th month evaluation, one more subject was lost due to sudden death. The small rate of dropouts did not change the demographic distributions and baseline efficacy variables between the groups.

Table 1 depicts the primary efficacy variables such as mean interproximal PI, MGI and BI for four groups at 6 months interval. The result showed statistically highly significant values for groups III and IV.

Table 2 depicts the percentage reduction of clinical variables for study groups versus control group at baseline, 3 and 6 months interval. As dental floss was considered as a "gold standard" to reduce interproximal gingivitis and a benchmark to assess the efficacy of mouth rinses, two mouth rinses were compared to the flossing using "at least as good as" determination. For the therapeutic effect of product A to be "at least as good as" that of another product B, it must provide a level of benefit no less than would have been required for the two agents to be considered equivalent.[7]

That is, the mouth rinses would be considered to be "at least as good as" daily flossing if the upper limit of the 90% confidence interval for the ratio of the mouth rinse mean over the flossing mean was less than 110%.[7] A 90% confidence interval for the ratio of mean 6-month MGI scores (mouth rinse group mean over flossing mean) was constructed. This confidence interval (Listerine vs. floss – 74.40%, Chlorhexidine vs. floss – 73.93%) supported the conclusion that the level of interproximal gingivitis control efficacy provided by the Listerine and Chlorhexidine was "at least as good as" that provided by the use of dental floss.

DISCUSSION

The present study showed that rinsing with an antiseptic mouth rinse twice daily significantly reduced the clinical evidence of gingival inflammation compared to dental floss and control group.

Among the four groups, group I and group II showed reduction in PI, MGI and BI from baseline to 3- and 6-month evaluation, but it was not statistically significant. The reduction in control group may be due to Hawthorne effect as the individuals participating

Table 1: Mean Plaque Index, Modified Gingival Index and Bleeding Index scores of study groups after 6 months interval

Study groups	Indices		
	PI Mean ± SD	MGI Mean ± SD	BI Mean ± SD
Group I	2.15 ± 0.34	2.21 ± 0.37	8.97 ± 3.23
Group II	2.21 ± 0.49	2.11 ± 0.50	9.56 ± 4.00
Group III	2.05 ± 0.41	1.57 ± 0.36	4.43 ± 4.04
Group IV	1.81 ± 0.47	1.56 ± 0.43	2.80 ± 2.74
ANOVA			
F	6.648	26.332	35.527
P	0.000*	0.000*	0.000*
Tukey's post hoc	Significant difference between groups I and IV, and groups II and IV	Significant difference between groups I and III, groups II and III, groups I and IV, and groups II and IV	Significant difference between groups I and III, groups II and III, groups I and IV, groups II and IV

**Highly significant (P < 0.05)*

Table 2: Percentage reduction of clinical variables for study groups versus control group at baseline, 3 and 6 months interval

Clinical variables	Group I (control)	Group II (floss)		Group III (Listerine)		Group IV (Chlorhexidine)	
	Mean ± SD	Mean ± SD	% reduction versus control	Mean ± SD	% reduction versus control	Mean ± SD	% reduction versus control
MGI							
Baseline	2.24 ± 0.37	2.20 ± 0.52		2.18 ± 0.49		2.23 ± 0.49	
3 months	2.23 ± 0.37	2.15 ± 0.51	1.83	1.84 ± 0.39	15.15	1.82 ± 0.48	17.94
6 months	2.21 ± 0.37	2.11 ± 0.50	2.76	1.57 ± 0.36	26.65	1.56 ± 0.43	28.71
PI							
Baseline	2.25 ± 0.36	2.31 ± 0.5		2.33 ± 0.46		2.35. ± 0.48	
3 months	2.21 ± 0.35	2.24 ± 0.49	1.33	2.22 ± 0.43	3.02	1.89 ± 0.47	17.87
6 months	2.15 ± 0.34	2.21 ± 0.49	0.12	2.05 ± 0.41	7.63	1.81 ± 0.47	18.53
BI							
Baseline	16.87 ± 4.71	17.6 ± 4.87		18.67 ± 6.63		18.12 ± 4.83	
3 months	10.35 ± 3.49	11.23 ± 4.11	2.45	9.72 ± 3.54	9.29	9.07 ± 2.23	11.3
6 months	8.97 ± 3.23	9.56 ± 4.00	1.14	4.43 ± 4.04	29.45	2.80 ± 2.74	37.72

in an experiment may perform at higher than usual effects. This effect for other groups cannot be ruled out.[8] No differences were found between the floss group and the control group with respect to all indices. This was consistent with the results of Halla-Junior and Oppermann[9] where the inclusion of flossing into an oral hygiene regimen did not show any improvement versus the use of toothbrush alone. But it was in contrast with the studies conducted by Sharma *et al.*,[7] Sharma *et al.*,[10] and Bauroth *et al.*[11] where floss significantly reduced MGI, PI and BI scores compared to the control group. This may be due to the fact that the percentage of people using floss varies geographically and those studies were conducted among the people who use it regularly. So, its efficacy was more compared to the present study subjects who were not the regular users.

In contrast, when compared to groups I and II, subjects of the rinse groups III and IV showed statistically significant higher antiplaque and antigingivitis effect after 6 months.

Listerine, in the present study, showed statistically significant percentage reduction in plaque scores, which was similar to studies conducted by Sharma *et al.*,[7] De Paola *et al.*,[12] Gordon *et al.,* and Moran *et al*,[13] but in contrast to a study conducted by Charles *et al*.[14] Goodsen has pointed that phenolic compounds have anti-inflammatory and prostaglandin synthetase inhibitory activity which can occur at a concentration below that required for antibacterial activity. Hence, even in the absence of substantivity, Listerine possesses sufficient antibacterial and anti-inflammatory activities.[15]

Chlorhexidine demonstrated an ability to significantly decrease gingivitis. These findings were consistent with those of the studies by Lang *et al.*, Segreto *et al.* and Grossman *et al*.[16]

Comparisons of the two formulations indicate Chlorhexidine to be more effective than Listerine (Albert-Kiszely *et al.*, Brecx *et al.,* and Grossman *et al.*[16]), which was similar to the findings of Riep *et al.*,[17] Mankodi *et al.*,[18] Overhosler *et al.*,[19] and Charles *et al*.[20] Few people from both groups complained of stained teeth and metallic taste. From a medical viewpoint, staining of teeth and metallic taste is not a severe side effect. However, it is an esthetic impairment and may lead to reduced compliance. So, further studies are recommended to consider patient compliance along with checking the efficacy.

While the plaque reductions by the mouth rinses were consistent with those reported previously,[7,10] flossing was somewhat less effective in reducing interproximal plaque levels than might be expected. The reasons for this could not be determined from the study design. However, we might hypothesize that this could have resulted from either behavioral or technical causes. Inherent problems exist in all attempts to educate, train and motivate patients to achieve reduction of plaque solely by mechanical means.[21] As daily flossing, known to be a "gold standard" in reducing interproximal gingivitis, requires motivation, manual dexterity and

constant reinforcement oral health education programs should include the demonstration of flossing method along with brushing techniques. Hence, safe, effective chemotherapeutic agents as adjuncts to mechanical dental plaque removal are desirable.[10]

As the present study has shown that mouth rinses (Listerine and Chlorhexidine) were "at least as good as" dental floss in antigingival efficacy, they can be recommended for the patients with gingivitis as an adjunctive to usual home care routine.

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REFERENCES

1. Pathak JN. Reliability of interdental cleaning aids available in India. J Indian Dent Assoc 1982;54:15-8.
2. Listgarten MA. The role of dental plaque in gingivitis and periodontitis. J Clin Periodontol 1988;15:485-7.
3. Guidelines for acceptance of chemotherapeutic products for the control of supragingival dental plaque and gingivitis. J Am Dent Assoc 1986;112:529-32.
4. Lobene RR, Weatherford T, Ross NM, Lamm RA, Menaker L. A Modified Gingival Index for use in clinical trials. Clin Prev Dent 1986;8:3-6.
5. Carranza FA. The epidemiology of gingival and periodontal disease in "Glickman's clinical periodontology". 7th ed, Philadelphia: WB Saunders company; 1990. p. 302-29.
6. Carter HG, Barnes GP. The gingival bleeding index. J Periodontal 1974;45:801-5.
7. Sharma NC, Charles CH, Qaqish JG, Galustians HJ, Zhao Q, Kumar LD. Comparative effectiveness of an essential oil mouthrinse and dental floss in controlling interproximal gingivitis and plaque. Am J Dent 2002;15:351-5.
8. Graves RC, Disney JA, Stamm JW. Comparative effectiveness of flossing and brushing in reducing interproximal bleeding. J Periodontol 1989;60:243-7.
9. Albert-Kiszely A, Pjetursson BE, Salvi GE, Witt J, Hamilton A, Persson GR, *et al.* Comparison of the effects of cetylpyriinum chlorie with an essential oil mouth rinse on dental plaque an gingivitis – A six month randomized controlled clinical trial. J Clin Perioontol 2007;34:658-67.
10. Sharma N, Charles CH, Lynch MC, Qaqish J, McGuire JA, Galustians JG, *et al.* Adjunctive benefit of an essential oil-containing mouthrinse in reducing plaque and gingivitis in patients who brush and floss regularly: a six-month study. J Am Dent Assoc 2004;135:496-504.
11. Bauroth K, Charles CH, Mankodi SM, Simmons K, Zhao Q, Kumar LD. The efficacy of an essential oil antiseptic mouthrinse vs. dental floss in controlling interproximal gingivitis. A comparative study. J Am Dent Assoc 2003;134:359-65.
12. De Paola LG, Overholser CD, Meiller TE, Minah GE, Niehaus C. Chemotherapeutic inhibition of supragingival dental plaque and gingivitis development. J Clin Periodontol 1989;16:311-5.
13. Moran J, Addy M, Newcombe R. A 4-day plaque regrowth study comparing an essential oil mouthrinse with a triclosan mouthrinse. J Clin Periodontol 1997;24:636-9.
14. Charles CH, Sharma NC, Galustians HJ, Qaqish J, McGuire JA, Vincent JW. Comparative efficacy of an antiseptic mouthrinse and an antiplaque/antigingivitis dentifrice. A six-month clinical trial. J Am Dent Assoc 2001;132:670-5.
15. Mandel ID. The mouthrinse wars (Guest editorial). J Periodontol 1989;??(2):478-80.
16. Walker CB. Microbiological effects of mouthrinses containing antimicrobials. J Clin Periodontol 1988;15:499-505.
17. Riep BG, Bernimoulin JP, Barnett ML. Comparative antiplaque effectiveness of an essential oil and an amine fluoride/stannous fluoride mouthrinse. J Clin Periodontol 1999;26:164-8.
18. Mankodi S, Mostler K, Charles CH, Bartels L, Ross NM. Comparative Antiplaque/Antigingivitis efficacies of two antiseptic mouthrinses. Periodontal Res 1999;246:1099.
19. Overhosler CD, Meiller TF, Depaola LG, Minah GE, Niehaus C. Comparative effects of 2 chemotherapeutic mouthrinses on the development of supragingival dental plaque and gingivitis. J Clin Periodontol 1990;17:575-9.
20. Charles CH, Mostler KM, Bartels LL, Mankodi SM. Comparative antiplaque and antigingivitis effectiveness of a chlorhexidine and an essential oil mouthrinse: 6-month clinical trial. J Clin Periodontol 2004;31:878-84.
21. Pastagia J, Nicoara P, Robertson PB. The effect of patient-centered plaque control and periodontal maintenance therapy on adverse outcomes of periodontitis. J Evid Based Dent Pract 2006;6:25-32.

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