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Original Article

Study on evaluation of different subgingival irrigating solutions in the management of periodontal disease

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***ABSTRACT*:**
Background: Periodontal diseases can be treated by mechanical removal of plaques followed by topical use of chemotherapeutic agents. Use of topical agents such as mouth wash is not very effective so local administration of antimicrobial agents by subgingival irrigation offers a "site-specific" approach for effective periodontal therapy. The present study was done in order to assess the clinical changes occurring in periodontitis patients after subgingival irrigation using different subgingival irrigants. **Materials and Methods:** Study was done on 20 individuals in whom full-mouth scaling and root planning was performed and sub gingival irrigation treatment was conducted for 30 days. Clinical parameters were evaluated using Gingival Index (Loe and Silness 1963) and assessment of pocket depth on the day 0 and 30 after the treatment. **Statistical Analysis**: Paired t-test, one-way ANOVA and Tamhane's T_2 test were used for data analysis. **Results:** Among the different subgingival irrigants used, 0.2% chlorhexidine gluconate is most effective followed by ozonated water, whereas saline was found to be ineffective. Subgingival irrigation using pulsated device may not have any additive effect in alteration of the subgingival microflora. **Conclusion:** Within the limitation of this study ozone along with chlorhexidine can be considered as a promising chemotherapeutic agent in periodontal therapy.
Key words: Periodontitis, subgingival irrigation, Chlorhexidine, ozone.

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INTRODUCTION:

Gingivitis is inflammation of the gums, or gingival which is caused by bacteria. A film of plaque, or bacteria, accumulates on the teeth. Gingivitis is mild and non-destructive type of periodontal disease, but when it remains untreated it progresses to more serious form periodontitis which can eventually lead to loss of teeth[1]. Mechanical removal of supragingival plaque is usually sufficient to prevent inflammation but for effective treatment of periodontitis it requires the control of reappearance of subgingival plaque. The control of plaque by mechanical removal become less effective when the pocket deepens as the plaque gets retained in inaccessible sites and can act as a site for reinfection, which allow return of pretreatment microflora and disease recurrence takes place. So in order to make effective treatment of periodontitis, systemic and topical chemotherapeutic agents are commonly used. Systemic antibiotics cannot be used for long-term because of its adverse effects and chances of development of resistance towards antibiotics in bacteria. Use of topical agents as mouth wash is not very effective as they cannot penetrate pockets that are deeper than 3 mm so local administration of antimicrobial agents by subgingival irrigation offers a "site-specific" approach for effective periodontal therapy since it is localized to infected sites at high concentrations so there is not any chances of adverse reactions which occurs due to the systemic use of antibiotics[2]. Different agents such as water, saline and antiseptics/antimicrobial agents are used for subgingival irrigation and in order to deliver these irrigants to the site there are many commercially available subgingival irrigation systems which have been developed to deliver the antiseptic/antimicrobial agents deep into the periodontal pocket. Among different irrigants used Chlorhexidine gluconate 0.2% has been reported to have potent bactericidal action in subgingival flora but it has certain side effects such as mucosal desquamation, impaired wound healing, fibroblast attachment to root surface, tooth staining, and altered taste sensation[3] . Ozone is also used as an alternative for subgingival irrigation. Hence this study was designed to compare the efficacy of 0.2% chlorhexidine gluconate and Ozone in treatment of periodontitis.

MATERIALS AND METHODS

This study was done on twenty patients in the age group of 20–65 years with severe periodontitis. The criteria of selection of patients was that the pocket depth should be of 5–8 mm in all quadrants and should have not undergone periodontal therapy in the last one year, the patients should have no history of use of antibiotics during the last 6 months and who could attend the hospital at frequent intervals.

The nature and design of the experiments were explained to the patients and written consent was obtained for their participation. Oral hygiene instruction for supragingival plaque control was given. Individuals were asked to brush twice daily using a soft toothbrush and paste according to Bass method. Among the samples, the treatments included was full mouth scaling and root planing along with subgingival irrigation using various irrigants and then they were divided into four groups.

Group I: Scaling and root planning along with 0.2% chlorhexidine gluconate irrigation. The Water Pik Irrigator was used and set at 6 (on a pressure scale from 1 to 10) providing an impact of rigid surface of 0.595 at 350 kpa pressure.

Group II: Scaling and root planning along with ozonated water irrigation. The Kent Dental Jet Irrigator was used and set at 4 (on a pressure scale from 1 to 4) providing an impact of rigid surface of 0.595at 350 Kpa pressure.

Group III: Scaling and root planning along with 0.9N saline irrigation. The Water Pik Irrigator was used and set at 6 (on a pressure scale from 1 to 10) providing an impact of rigid surface of 0.595 at 350 kpa pressure.

Group IV: Only scaling and root planning was performed.

Subgingival irrigation was carried on 1st, 2nd, 3rd, and 4th week by all three irrigants. The subgingival irrigation tip was placed approximately 1-2 mm into the selected pocket to ensure proper placement. The tip was held adjacent to the tooth surface at an angle of approximately 45°. Each pocket was irrigated with irrigating solution using a subgingival irrigating tip for 20 s. Sites undergoing irrigation were isolated with cotton rolls and continuous aspiration was used to remove any irrigant that might flow from the pocket orifice to any other area during the irrigation procedure with care to cause minimal trauma and discomfort. Clinical parameters were evaluated using Gingival Index (Loe and Silness 1963) and assessment of pocket depth on the day 0 and 30 after the treatment.

RESULTS

Gingival index (Loe and Silness 1963) and probing pocket depth were recorded before treatment (on baseline) and 30th day of treatment. The baseline values in Group IV were considered as control, and these values were assessed against the experimental values in Group I, II, and III by paired sample *t*-test for significance in difference of means to reject the null hypothesis that the experimental groups do not have any significant difference than baseline.

Comparison of gingival index at baseline and day 30 showed a mean difference of 1.455 in Group I and 0.933, 0.588, and 0.455 in Group II, III, and IV respectively and differences were significant (Table1). The day 30 inter comparison showed a mean square value of 2.242 with F = 18.45 which was significant (P = 0.002) [Table 2].The day 30 intercomparison between Group IV to Group I showed mean difference of 1.245 which was significant (P = 0.002); Group IV and Group II showed mean difference of a 0.645 which was significant (P = 0.033) but comparison of Group IV and Group III showed mean difference of a 0.289 which was non significant (P = 0.985) [Table 3].

Table 1: Comparison of gingival index between baseline and day 30

Groups	Mean Difference (Day 0 versus day 30)	Significance*
I	1.455	0.001(s)
II	0.933	0.003(s)
III	0.588	0.002(s)
IV	0.455	0.007(s)

*The mean difference is significant at the 0.05 level. NS – Not significant; S – Significant

Table 2: Intergroup Comparison of gingival index at baseline and day 30

Days	Intergroup comparison	Mean square	F	Significance*
Day 0	Between groups	0.050	0.349	0.861 (NS)
Day 30	Between groups	2.764	18.45	0.002 (S)

*The mean difference is significant at the 0.05 level. NS – Not significant; S – Significant

Table 3: Multiple Comparison of gingival index at baseline and day 30

Dependent variable	Control group	Groups	Mean difference	Significance*
Day 0	IV	I	0.042	1.0 (NS)
		II	0.218	0.99(NS)
		III	-0.056	0.988(NS)
Day 30	IV	I	1.245	0.002(S)
		II	0.645	0.033(S)
		III	0.289	0.985(NS)

*The mean difference is significant at the 0.05 level. NS – Not significant; S – Significant

Probing pocket depth analysis at baseline and day 30 was compared using paired *t*-test. Group I showed a mean difference of 1.974. Similarly, Group II, III, and IV also showed mean difference of 1.571, 0.914, and 0.617, respectively and differences were significant (Table4). The intergroup comparison for the probing pocket depth was done by ANOVA on baseline and on day 30 (Table 5).Comparison of baseline data with day 30 data between control group (Group IV) and experimental groups (Group I, II, III), was done by Tamhane's *post hoc* test. The day 30 inter comparison between Group IV to Group I showed mean difference of 1.345 which was significant ($P = 0.003$); Group IV and Group II showed mean difference of 1.034 which was
significant ($P = 0.043$) but comprising Group IV and Group III showed mean difference of a 0.38900 which was non significant ($P = 0.845$) [table 6].

Table 4: Analysis of probing pocket depth between baseline and day 30

Groups	Mean Difference (Day 0 versus day 30)	Significance*
I	1.974	0.001(s)
II	1.571	0.002(s)
III	0.914	0.004(s)
IV	0.617	0.005(s)

*The mean difference is significant at the 0.05 level. NS – Not significant; S – Significant

Table 5: Intergroup comparison of probing pocket depth at baseline and day 30

Days	Intergroup comparison	Mean square	F	Significance*
Day 0	Between groups	0.219	0.538	0.827 (NS)
Day 30	Between groups	4.321	7.381	0.001 (S)

*The mean difference is significant at the 0.05 level. NS – Not significant; S – Significant

Table 6: Multiple comparisons of probing pocket depth at baseline and day 30

Dependent variable	Control group	Groups	Mean difference	Significance*
Day 0	IV	I	-0.0220	1.1 (NS)
		II	0.2780	1.0(NS)
		III	0.1890	0.987(NS)
Day 30	IV	I	1.3450	0.003(S)
		II	1.0340	0.043(S)
		III	0.3890	0.845(NS)

*The mean difference is significant at the 0.05 level. NS – Not significant; S – Significant

DISCUSSION

In our study 0.2% chlorhexidine gluconate is found to be most effective followed by ozonated water, whereas saline was found to be least effective. This result is in line of several reports where Chlorhexidine is reported as very effective oral antibacterial agent. It is a broad-spectrum antiseptic with pronounced antimicrobial effects on Gram-positive as well as Gram-negative bacteria, some viruses, and fungi [3].The use of chlorhexidine as irrigators appears to be more effective than when used as a mouthrinse at altering the subgingival microflora. Khoo and Newman noted reductions in motile organisms and spirochetes following daily irrigation with 0.2% chlorhexidine as compared with a single session of scaling, root planing and oral hygiene instruction. Ozonated water has also been shown to be effective against periodontopathic bacteria such as *Actinobacillus actinomycetemcomitans* and *Porphyromonas gingivalis in vitro*. Ozonated water has also been shown to be effective on root surfaces after extraoral rinsing for decontamination of avulsed tooth *in vitro*. Although there are studies related to the use of ozonated water [4-5]on oral microorganisms *in vitro*, no literature exists till date on the *in vivo* effect of ozonated water on oral and in particular, periodontopathic microorganisms. Ozone is a selective oxidant and affects only certain compounds, but when it dissolves in water, it becomes highly unstable and rapidly decomposes through a complex series of chain reactions. As a result, hydroxyl (OH) radicals are generated which are among the most reactive oxidizing species. Ozone reacts with various chemical compounds in aqueous systems in two different and coexisting modes; one involving direct reactions of molecular ozone and the other a free radical-mediated reaction. Both these mechanisms may be involved in the destruction of bacteria as shown by Kshitish and Laxman.[3] In this study it is shown that subgingival irrigation using pulsated device does not have any additive effect over mechanical debridement. Data were not consistent with results of Brownstein et. al who evaluated that subgingival irrigation of pockets 1-6 mm deep with a pulsated powered irrigator using a subgingival irrigating tip is effective in delivering a solution to 90% of pocket depth.[6]

CONCLUSION:

Within the limitation of this study ozone along with chlorhexidine can be considered as a promising chemotherapeutic agent in the periodontal therapy. It is required to determine the specific ozone concentration that is effective against anaerobic periodonto pathogens. It can be concluded that the local application of ozone can serve as a potential agent to treat periodontal disease nonsurgically, both, for home care and for professional practice. It may serve as a good tool during supportive periodontal therapy.

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