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COMPARISION OF RESULTS OF SUB GINGIVAL IRRIGATION WITH NON SURGICAL PERIODONTAL THERAPY IN CHRONIC PERIODONTITIS PATIENTS

Dental Science

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ABSTRACT

BACKGROUND AND OBJECTIVES: Gingivitis and periodontitis are primarily bacterial infections caused by diverse groups of microorganisms. The prevalence and severity of these diseases can be reduced by mechanical plaque removal or a variety of systemic and topically applied antimicrobial agents, aimed at selectively removing or inhibiting pathogenic bacteria. Hence, the present study is designed to evaluate the role of professional subgingival irrigation in chronic generalized periodontitis patients.

MATERIALS AND METHODS: Eight subjects were randomly selected between age groups 25 and 55 years, with a total of 160 active sites with chronic periodontitis. Each quadrant was required to have at least one site with a probing depth of >5 mm to <9 mm, with radiographic evidence of bone loss. For every patient, the first quadrant received no treatment, the second quadrant received scaling and root planning (SRP) only, the third & fourth quadrant received SRP plus professional subgingival 0.12% chlorhexidine gluconate irrigation with WaterPik® device. Treatment sites were irrigated on 0, 7th, and 15th days. Plaque index, bleeding index, gingival index, and clinical attachment levels were measured and recorded at 0, 15th, 30th, and 45th days.

RESULTS: With subgingival irrigation with 0.12% chlorhexidine gluconate, there was significant reduction in all clinical parameters: plaque index, bleeding index, and gingival index in all the groups.

INTERPRETATION AND CONCLUSION: Subgingival irrigation with 0.12% chlorhexidine gluconate along with scaling and root planing appeared to be effective in gaining clinical attachment levels and other parameters than scaling and root planing alone in the treatment of chronic adult periodontitis.

KEYWORDS

Subgingival irrigation, 0.12% chlorhexidine gluconate, chemotherapeutic agents

INTRODUCTION

Periodontal diseases are bacterial infections characterized by inflammation and destruction of the attachment apparatus, often leading to tooth loss. It is generally accepted that bacteria play a significant role in the pathogenesis of human periodontal diseases.[1] Almost all of the putative periodontal pathogens can be diagnosed and treated as anaerobic infections. From the early 1970s, the bacterial specificity in periodontal disease has become the prominent area of investigation.[2] Periodontal therapy aims at arresting further loss of periodontal attachment and to ensure an aesthetic outcome. Periodontal disease can be treated by either surgical or non-surgical therapy. Non-surgical therapy, i.e., scaling and root planning (SRP) may not always result in the complete elimination of the disease, because of poor access to the base of the deep periodontal pockets. However, scaling and root planing was found to be of limited efficacy, especially in deep pockets or furcations, because accretions can be easily left behind. Therefore, treatment strategies using antimicrobials in conjunction with SRP have been evolved, assuming that chemical aides would compensate for technical shortcomings, and furthermore prevent early microbial re-colonization to ultimately ensure the best chance for clinical improvements.

Elimination or adequate suppression of putative periodontopathic microorganisms in the subgingival microbiota is essential for periodontal healing. Antimicrobial treatments in periodontics range from mechanical debridement of tooth surfaces and home plaque removal to local and systemic delivery of chemical antimicrobial agents. The increased emphasis on the role of bacteria in the initiation and progression of periodontal disease has led to great interest in the use of antibiotics and antimicrobials in periodontal therapy.

Periodontal diseases are induced by a variety of organisms that colonize and proliferate supragingivally and subgingivally in susceptible individuals. Conceptually, supragingival and subgingival irrigation have the potential to be used by therapists and patients to help in suppressing bacterial etiologic agents. The biologic rationale for performing supragingival and subgingival irrigation is to nonspecifically reduce microbial deposits that may induce periodontal diseases. Subgingival irrigation attempts to directly reduce the pocket microflora to prevent initiation of periodontal diseases or to facilitate their reduction.

Oral irrigation was occasionally suggested as an alternative for those who don't floss, but now it should be considered a regular part of oral hygiene for everyone. Supragingival lavage with water or a placebo was employed in conjunction with tooth brushing, with mixed results regarding its ability to provide additional reduction of gingival inflammation beyond that attained with tooth brushing.[3]

Crumley and Sumner[4] showed that the use of an oral irrigator supragingivally in patients with deep periodontal pockets produced a slight decrease in gingival swelling and bleeding but had no effect on the deeper tissues. There has been little study of the subgingival effect of oral irrigators, expect for that of Selting et al. ,[5] who devised a model system with 7-mm pockets containing artificial debris. The value of the water-irrigating device as an oral hygiene aid and its role in reduction of gingival inflammation was reported by Lobene.[6] The WaterPik® was first introduced in 1966 as a plaque and debris removal device.

The purpose of this study was to assess the effect of professional subgingival irrigation with 0.12% chlorhexidine gluconate irrigation, combined with scaling and root planing, on clinical parameters of plaque index (PI), bleeding index (BI), gingival index (GI), and clinical attachment levels (CAL) as compared with a non-treatment control, SRP alone, and 0.12% chlorhexidine gluconate irrigation alone, over a period of 45 days, to evaluate positive clinical benefits of professional subgingival antimicrobial irrigation with WaterPik® device using 0.12% chlorhexidine gluconate antimicrobial solution, and to evaluate the additive effect of scaling, root planning, and antimicrobial professional subgingival irrigation with WaterPik® device.

MATERIALS AND METHODS:

The patients for this study were selected from the outpatient section, Department of Dentistry, Rajiv Gandhi Institute of Medical Sciences (RIMS), Ongole, Prakasam District. Eight periodontitis subjects between 25 and 55 years of age, based on presence of probing pocket depth of >5 mm on clinical examination and radiographic evidence of bone loss were selected randomly, and included into study after obtaining verbal and written informed consent from all subjects. This study was reviewed and approved by the board of ethical committee of the Medical College. Patients who were diagnosed as suffering from chronic generalized periodontitis, free from any acute or chronic systemic diseases, who had not received any surgical or non-surgical periodontal therapy for the past 6 months, were included, and patients with the history of taking anti-inflammatory, antibiotics, or immunosuppressive drugs in the last 6 months, with habit of smoking,

and female patients who were pregnant or receiving oral contraceptives were excluded from the study.

Eight subjects were selected randomly and categorized into four groups, and all the eight patients received treatment according to a predetermined four-quadrant design. A total number of 124 sites from eight patients, i.e., four sites from each quadrant were selected and divided into the following groups:

- Control Group: These were sites from the first quadrant in each patient, which included all the surfaces of the periodontally involved tooth with attachment loss, where no treatment was planned
- Experimental Group-A: These were the sites from the second quadrant in every patient who were treated by scaling and root planning (SRP).
- Experimental Group-B: These were the sites from the third & fourth quadrant in every patient who received both SRP and professional antimicrobial irrigation using 0.12% chlorhexidine gluconate solution with WaterPik® device.

Clinical parameters, i.e., PI, BI, GI, and CAL, were recorded for all the patients The relative CAL was measured using UNC-15 (Hu-freidy, USA) periodontal probe, graduated in 1-mm increments. Probing measurements was done at selected sites. The reading was recorded to the nearest millimeter.

Customized occlusal stents were fabricated from the patient models using bio-cryl sheets. The stent was made to cover the occlusal as well as the middle third of buccal and lingual surfaces of the teeth. Vertical grooves were made to guide the probe penetration vertically in the same plane every time it was inserted for recording the measurements. The lower/apical limit of the vertical groove was used as the fixed reference point for the clinical attachment level. Later the stents were preserved for the follow-up measurement. 0.12% chlorhexidine gluconate solution with WaterPik® irrigator was used in irrigating the periodontal pockets. Irrigation was done in experimental sites in group B. The recordings of all the clinical parameters was done on "0" day, 15th day, 30th and 45th day, except probing pocket depth, which was recorded on "0" day and 45th day. Finally, the complete data was statistically analyzed.

STATISTICALANALYSIS:

For each of the clinical parameters, post-treatment changes at different time intervals compared with baseline were analyzed by paired t-test. Post-treatment significance of difference observed between different groups was ascertained by one-way ANOVA F test followed by Mann-Whitney test for pair-wise comparisons.

RESULTS:

The mean PI, BI, and GI scores and the mean CAL at 0, 15th, 30th and 45th day has been shown in Table 1.

TABLE 1: DESCRIPTIVE STATISTICS OF BASELINE PARAMETERS IN THE STUDY POPULATION (MEAN ± SD)

Group	Parameter	0 day	15th day	30th day	45th day
Control group	Plaque index	1.57 ± 0.59	1.40 ± 0.59	1.35 ± 0.53	1.32 ± 0.47
(mean ± SD)	Bleeding index	0.85 ± 0.36	0.72 ± 0.45	0.67 ± 0.47	0.67 ± 0.47
	Gingival index	1.90 ± 0.49	1.47 ± 0.50	1.60 ± 0.49	1.25 ± 0.43
	Clinical attachment level	8.37 ± 0.92			8.37 ± 0.92
Experimental group	Plaque index	1.52 ± 0.55	1.17 ± 0.38	1.37 ± 0.54	1.25 ±.43
A (mean ± SD)	Bleeding index	0.80 ± 0.40	0.33 ± 0.47	0.27 ± 0.45	0.27 ± 0.45
	Gingival index	1.60 ± 0.49	1.32 ± 0.47	1.25 ± 0.43	1.27 ± 0.45
	Clinical attachment level	8.62 ± 1.05			8.20 ± 1.09
Experimental group	Plaque index	1.35 ± 0.48	1.05 ± 0.22	1.05 ± 0.22	1.05 ± 0.22
B (mean ± SD)	Bleeding index	0.82 ± 0.38	0.30 ± 0.46	0.25 ± 0.43	0.20 ± 0.40
	Gingival index	1.70 ± 0.46	1.22 ± 0.42	1.35 ± 0.48	1.12 ± 0.33
	Clinical attachment level	8.37 ± 0.80			7.95 ± 0.90

When mean plaque scores within each group at different intervals were compared, in the control group the mean difference of plaque scores between 0 and 45th days was statistically non-significant (P = 0.06), and percentage reduction was 15.9%. In experimental group A, the mean difference of PI between 0 and 45th day was statistically significant (P = 0.03), and percentage reduction was 18.0%. In experimental group B, between 0 and 45th day, the mean difference was statistically highly significant (P = 0.001), and the percentage of reduction was 22.2%.

When mean BI within each group at different time intervals was compared in control group, the mean difference of BI between 0 and 45th days was statistically significant (P = 0.05), and percentage reduction was 20.6%. In experimental group A, the mean difference of plaque index between 0 and 45th day was statistically highly significant (P < 0.001), and percentage reduction was 64.6%. In experimental group B, between 0 and 45th day was statistically highly significant (P < 0.001), and the percentage of reduction was 75.8%.

When mean GI within each group at different time intervals, in control group, the mean difference of GI score between 0 and 45th day was statistically highly significant (P < 0.001), and percentage reduction was 34.2%. In experimental group A, the mean difference of GI between 0 and 45th day was statistically highly significant (P < 0.001) and percentage reduction was 20.3%. In experimental group B, between 0 and 45th day, the mean difference was statistically highly significant (P < 0.001) and the percentage of reduction was 33.8%.

When CAL within each group at different time intervals, in control group, the mean difference of CAL between 0 and 45th days was statistically nonsignificant (P = 1.00), and percentage reduction was 0%. In experimental group A, the mean difference of CAL between 0 and 45th day was statistically highly significant (P < 0.001), and percentage reduction was 4.9%. In experimental group B, between 0 and 45th day, the mean difference was statistically highly significant (P < 0.001), and the percentage of reduction was 5.1%. [Tables 2 and 3].

TABLE 2: COMPARISON OF VARIOUS CLINICAL PARAMETERS WITHIN EACH GROUP AT DIFFERENT TIME INTERVALS ("0" TO "45th" DAY, PAIRED t-TEST)

Clinical parameters		Control group					Experimental group A				
		Mean ± SD	Reduction from BL	% redu.	t value	P value	Mean ± SD	Reduction from BL	% redu.	t value	P value
Plaque index	0 day	1.57 ± 0.59	--	--	--	--	1.52 ± 0.55	--	--	–	--
	45 days	1.32 ± 0.47	0.25 ± 0.54	15.9	2.91	0.06 NS**	1.25 ± 0.43	0.28 ± 0.55	18.0	3.13	0.03 S*
Bleeding index	0 day	0.85 ± 0.36	--	--	--	--	0.80 ± 0.40	--	--	--	--
	45 days	0.67 ± 0.47	0.18 ± 0.55	20.6	2.01	0.05 S*	0.27 ± 0.45	0.52 ± 0.64	64.6	5.18	<0.001 S*
Gingival index	0 day	1.90 ± 0.49	--	--	--	--	1.60 ± 0.49	--	--	--	--
	45 days	1.25 ± 0.43	0.65 ± 0.53	34.2	7.71	<0.001 S	1.27 ± 0.45	0.32 ± 0.57	20.3	3.59	<0.001 S*
Clinical	0 day	8.37 ± 0.92	--	--	--	--	8.62 ± 1.05	--	--	--	--
attachment level	45 days	8.37 ± 0.92	0	0	0.00	1.00 NS**	8.20 ± 1.09	0.42 ± 0.55	4.9	4.89	<0.001 S*

* Statistically significant, ** Not statistically significant

TABLE 3: COMPARISON OF VARIOUS CLINICAL PARAMETERS WITHIN EACH GROUP AT DIFFERENT TIME INTERVALS ("0" TO "45th" DAY, PAIRED t-TEST)

Clinical parameters		Control group					Experimental group				
		Mean ± SD	Reduction from BL	% redu.	t value	P value	Mean ± SD	Reduction from BL	% redu.	t value	P value
Plaque index	0 day	1.35 ± 0.48	-	-	-	-	1.35 ± 0.53	-	-	-	-
	45 days	1.05 ± 0.22	0.30 ± 0.51	22.2	3.67	<0.001 S*	1.17 ± 0.38	0.17 ± 0.54	13.0	2.01	0.05 S*
Bleeding index	0 day	0.82 ± 0.38	-	-	-	-	0.77 ± 0.42	-	-	-	-
	45 days	0.20 ± 0.40	0.62 ± 0.49	75.8	8.06	<0.001 S*	0.30 ± 0.46	0.47 ± 0.59	61.3	5.01	<0.001 S*
Gingival index	0 day	1.70 ± 0.46	-	-	-	-	1.70 ± 0.46	-	-	-	-
	45 days	1.12 ± 0.33	0.57 ± 0.55	33.8	6.61	<0.001 S*	1.27 ± 0.45	0.42 ± 0.69	25.0	3.98	<0.001 S*
Clinical	0 day	8.37 ± 0.80	-	-	-	-	8.50 ± 0.93	-	-	-	-
attachment level	45 days	7.95 ± 0.90	0.42 ± 0.50	5.1	5.36	<0.001 S*	8.30 ± 1.06	0.20 ± 0.40	2.4	3.12	0.03 S*

* Statistically significant, ** Not statistically significant

In the present study, when the clinical parameters were compared between different groups, the mean difference of PI from 0 to 45th day was 0.25 ± 0.54 (15.9%) for the control group, 0.28 ± 0.55(18.0%) for experimental group A, 0.30 ± 0.51 (22.2%) for experimental group B, [Table 4]. On comparison of reduction of plaque score, between control group and experimental groups A and B, between experimental group A and B, were not statistically significant from baseline to 45th day.

TABLE 4: COMPARISON OF VARIOUS CLINICAL PARAMETERS BETWEEN DIFFERENT GROUPS AT DIFFERENT TIME PERIODS (ONE-WAY ANOVA F-TEST)

Clinical Parameters	Control Group		Exp Group A		Exp Group B	
	Mean Reduct.	%	Mean Reduct.	%	Mean Reduct.	%
Plaque index (0-45 days)	0.25	15.9	0.28	18.0	0.30	22.2
Bleeding index (0-45 days)	0.18	20.6	0.52	64.6	0.62	75.8
Gingival index (0-45 days)	0.65	34.2	0.32	20.3	0.57	33.8
Clinical attachment level (0-45 days)	0	0	0.42	4.9	0.42	5.1

The mean difference of BI scores from 0 to 45th day was 0.18 ± 0.55 (20.6%) for the control group, 0.52 ± 0.64 (64.6%) for experimental group A and 0.62 ± 0.49 (75.8%) for experimental group B. On comparison of reduction of bleeding scores between control group and experimental group A and B, the difference was statistically significant (P = 0.02, P < 0.001, respectively) and between experimental group A and B, were not statistically significant from baseline to 45th day.

The mean reduction of GI from 0 to 45th day was 0.65 ± 0.53 (34.2%) for the control group, 0.32 ± 0.57 (20.3%) for experimental group A, 0.57 ± 0.55 (33.8%)for experimental group B. On comparison of reduction of GI scores between control group and experimental group A, the difference was statistically significant (P < 0.01, P < 0.05, respectively) and between control group and experimental group B, between experimental group A and B, were not statistically significant from baseline to 45th day.

The mean difference of CAL from 0 to 45th day was 0 (0%) for the control group, 0.42 ± 0.55 (4.9%) for experimental group A, 0.42 ± 0.50 (5.1%) for experimental group B. On comparison of reduction of CAL between control group and experimental group A and B, the difference was statistically significant (P < 0.001, P < 0.001, respectively) and between experimental group A and B, were not statistically significant from baseline to 45th day [Table 5].

TABLE 5: MANN-WHITNEY U TEST FOR PAIR-WISE COMPARISON OF DIFFERENT CLINICAL PARAMETERS

F value	Control vs exp-A	Control vs exp-B	Exp-A vs exp-B
F = 0.39	NS**	NS**	NS**
P = 0.75; NS**			
F = 4.60	*P* = 0.02 S*	*P* < 0.001 S*	NS**
P = 0.04; S*			
F = 2.51	*P* < 0.01 S*	NS**	NS**
P = 0.06; NS**			
F = 9.40	P < 0.001 S*	P < 0.001 S*	NS**
P < 0001; S*			

*Statistically significant, **Not statistically significant

All the clinical parameters, i.e., PI, BI, GI, and CAL showed significant reduction on all days from the baseline.

DISCUSSION:

New knowledge about the microbial etiology of periodontal disease emerged between 1970 to 1980 and led to widespread interest in the use of antimicrobial agents to treat periodontitis. With the increasing awareness of bacterial etiology of the periodontal disease (Socransky and Haffejee[1] and Loesche et al.[2]), a more direct approach using antimicrobial agents has been an integral part of the therapeutic armamentarium.

In the present study, an attempt was made to evaluate effectiveness of professional subgingival irrigation with 0.12% chlorhexidine gluconate in the treatment of periodontal pockets, with or without scaling and root planing in periodontitis patients. The clinical parameters such as PI, BI, GI, and CAL were compared between baseline and 45th day. CAL measurement on each site selected for treatment was made from an acrylic stent (fixed reference point) to the base of the periodontal pocket (Van Steenberg et al.).[7]

In the present study, the mean reduction of plaque score from "0" to 45th day was 15.9% in control group, which was statistically non-significant. This was consistent with the findings of Eros S. Chaves et al.[8] This improvement observed from "0" to 45th day may be due to adequate maintenance of oral hygiene, which was instructed to each patient. In experimental group A, the mean reduction in plaque score from "0" to 45th day was 18.0%, which was significant (P = 0.03). This finding was similar to that of Badersten et al. ,[9] Hill et al. ,[10] Lindhe et al. ,[11] Lisgarten et al. ,[12] and Tseng PW et al.[13] In experimental group B, the mean reduction in plaque score from baseline to 45th day was 22.2%, which was highly significant (P < 0.001); this finding is similar to that of observation made by Robert MacAlpine et al. ,[14] Steven R. Southard et al. ,[15] and Thomas F. Flemmig et al.[16]

Mean reduction in plaque scores between control group and experimental group A and B, between experimental group A and B, were not statistically significant from baseline to 45th day. These observations were supported by Krust et al. ,[17] and Shiloah et al.[18]

When BI was compared, the mean reduction in gingival score from "0" to 45th day was 20.6% for control group. The reduction in gingival scores was significant (P = 0.05) in control group, maybe due to adequate maintenance of oral hygiene, which was instructed to each patient. The mean reduction in gingival score from "0" to 45th day was 64.6% for experimental group A. This was consistent with the studies by Badersten et al. ,[9] Hill et al. ,[10] Lindhe et al. ,[11] and Lisgarten et al.[12] The mean reduction in gingival score from "0" to 45th day was 75.8% for experimental group B, which was in accordance with the studies by David L. Jolkovsky et al.,[16] Robert MacAlpine et al. ,[14] Steven R. Southard et al. ,[15] and Flemmig et al.[19]

On comparison of reduction of bleeding scores, the difference between control group and experimental group A and B were significant. These findings were similar to those of David L. Jolkovsky et al.[16] and Lander PE et al.[20]

For GI, the mean reduction in gingival score from "0" to 45th day was 34.2% for control group and 20.3% for experimental group A. The reduction in gingival scores was highly significant (P < 0.001) in all the groups, which was consistent with the findings of Steven R. Southard et al.[15] The mean reduction in gingival score from "0" to 45th day was

33.8% in experimental group B, which was significant and was in accordance with the findings of David L. Jolkovsky et al.[16] and Steven R. Southard et al.[15]

On comparison between groups, the reduction of the gingival scores was significant ($P < 0.01$) and ($P < 0.05$) between control group and experimental group A, but the reduction of gingival score was not significant between control and experimental group B.

When CAL was compared, the mean gain in probing attachment levels from "0" to 45th day was 0% for control group and 4.9% for experimental group A, which is in accordance with the studies done by Badersten et al.,[9] Hill et al.,[10] Lindhe et al.,[11] and Lisgarten et al.[12] The mean gain in CAL from "0" to 45th day was 5.1% for experimental group B, which was statistically significant ($P < 0.001$) and is similar to the findings of Robert MacAlpine et al.[14] and Steven R. Southard et al.[15] The mean gain in CAL between experimental group B was not significant. However, between control group and experimental group A and B, the mean gain in attachment level was significant. These findings strongly support that of Mazza et al.,[22] Steven R. Southard et al. ,[15] and Soh et al.[21]

No adverse reaction was observed with administration of 0.12% chlorhexidine gluconate through professional subgingival irrigation. In another study, investigators reported that a single subgingival irrigation with 0.12% chlorhexidine gluconate or sterile water can result in incidence of bacteremia as with other dental manipulations.[23]

Subgingival irrigation with 0.12% chlorhexidine gluconate along with scaling and root planing appeared to be effective in gaining clinical attachment levels than scaling and root planing alone or subgingival irrigation with 0.12% chlorhexidine gluconate alone in the treatment of chronic adult periodontitis. This finding supports the observations made by Jolkovsky et al.[16]

In the present study, taking into consideration parameters describing clinical features of periodontitis, the results suggest that scaling and root planing in conjunction with subgingival irrigation with 0.12% chlorhexidine gluconate provided a more favorable approach in the treatment of chronic periodontitis patients. This finding was similar to the observation made by Steven R. Southard et al.[15]

CONCLUSION:

With subgingival irrigation with 0.12% chlorhexidine gluconate, there was significant reduction in all clinical parameters, i.e., PI, BI, and GI, in all the groups. When compared between the groups, there was no significant reduction in PI, although SRP, SRP with subgingival irrigation, and subgingival irrigation only groups showed the maximum reduction in plaque index at the end of the study. BI and GI showed significant reduction in SRP and SRP with subgingival irrigation and subgingival irrigation only groups. There was significant gain in CAL in SRP, SRP with subgingival irrigation, and subgingival irrigation only groups.

This study has demonstrated that subgingival irrigation with 0.12% chlorhexidine gluconate in its specially designed formulation can be well tolerated by patients, safe, easy to deliver, and effective in reducing the clinical signs of periodontitis, along with scaling and root planing. However, further studies should be directed towards microbiologic evaluation and determination of long-term efficacy of subgingival irrigation with 0.12% chlorhexidine gluconate on clinical parameters with a lager sample.

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