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## A comparison of Chlorhexidine and Tetracycline local drug delivery systems in management of persistent periodontal pockets- A clinical study

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#### Abstract

**Aim:** The aim of the study was to evaluate the efficacy of two commercially available local drug delivery systems as adjunct to scaling and root planing in the treatment of sites with persistent periodontal pockets.

**Material and Methods:** This was a parallel arm design study. 48 patients with at least 2 non-adjacent teeth with persistent periodontal pockets of probing depth  $\geq 5$  mm with bleeding on probing or suppuration were selected. Patients were randomized into 3 treatment groups. One group received scaling and root planing only, whereas the other 2 groups received scaling and root planing plus one of 2 antimicrobial systems adjunctively. Clinical parameters were recorded at baseline, 1 month, 3 months, 6 months and 1 year after treatment.

**Result:** All the patients showed significantly improve plaque and gingival index scores at the end of 1 year. Probing depth and Clinical Attachment Level (CAL) significantly improved in all the groups. However administration of chlorhexidine provided the best results.

**Conclusion:** Even though meticulous scaling and root planing are effective methods in treatment of persistent pockets better results can be achieved by adjunctive use of locally delivered chlorhexidine and tetracycline.

**Keywords:** Chlorhexidine, Tetracycline, Persistent periodontal pocket, Local drug delivery

#### Introduction

Chronic periodontitis is a multifactorial disease and results in a progressive loss of attachment and formation of periodontal pocket. The process of periodontal pocket formation represents the pathologic sequela of microbial and inflammatory mediated degradation of collagenous connective tissue and alveolar bone [1].

Mechanical therapy can be clinically successful in many patients, however persistence or regrowth of certain micro-organisms in treated sites should be considered as a cause of unsatisfactory treatment outcome. It is thus important in managing such sites that adjunctive therapies should be considered [2-4].

Topical administration of antibacterial agents in the form of mouth washes, dentifrice or gels can be used effectively in controlling supragingival plaque. The shortcomings of rinsing, irrigating and similar forms of drug placement include rapid clearance which results in inadequate exposure to drug leading to lack of clinical results [5].

Subgingival antimicrobial delivery system is a widely used approach which apart from employing different antimicrobial agents, also use different delivery systems that influence the concentration and maintenance of the concentration of available drugs over time.

Many clinical studies have assessed the value of various locally delivered antimicrobial systems either as monotherapy or as adjuncts to scaling and root planing in management of chronic periodontitis [6, 7].

Thus the aim of the present study was to evaluate the efficacy of two commercially available local drug delivery systems as adjunct to scaling and root planing in the treatment of sites with persistent periodontal pockets.

## Materials and Method

### Study Design

This was a parallel arm design study. The patients were selected from Department of Periodontics at Dr. Syamala Reddy Dental College and Hospital. The study was conducted between November 2013 and July 2015.

A total number of 53 patients were included in the study based on the following inclusion and exclusion criterias:

Inclusion criteria for patients were good systemic health, at least 2 non-adjacent teeth with persistent periodontal pocket of probing depth  $\geq 5$  mm with bleeding on probing or suppuration.

Exclusion criteria were: Aggressive periodontitis, any tooth with furcation involvement, systemic antimicrobial therapy within 2 months prior to entry, history of allergy to chlorhexidine or tetracycline, smoking; history of periodontal surgery, periodontal treatment undertaken less than 3 months prior to the baseline visit.

Selected patients were randomized into 3 treatment groups. One group received scaling and root planing only, whereas the other 2 groups received scaling and root planing plus one of 2 antimicrobial systems adjunctively. Clinical parameters were recorded at baseline, 1 month, 3 months, 6 months and 1 year after treatment.

### Subjects and sites

48 subjects completed the full course of study. The participants had previously (at least 3 months before the screening visit) received quadrant scaling and root planing and despite mechanical treatment and good oral hygiene, still had deep pockets with bleeding on probing.

Patients were informed about the study and a written informed consent was taken.

### Clinical Measurements

At the baseline visit and at 1 month, 3 months, 6 months and 1 year after the treatment, the following clinical parameters were measured by a single examiner: the Plaque Index (PI); the Gingival Index (GI); probing depth (PD) using UNC-15 probe and clinical attachment level (CAL) using the UNC-15 probe.

The selected sites were randomly divided by toss of a coin into 3 groups: Test Group 1 (TG 1)– Included 16 sites treated by SRP with chlorhexidine chip (PerioCol™- CG, Eucare Pharma). Test Group 2 (TG 2)– Included 16 sites treated by SRP with tetracycline fibers (PerioCol™- TC, Eucare Pharma). Control Group (CG)- Included 16 sites treated with SRP alone. Treatment was done at baseline.

### Administration

Supragingival ultrasonic scaling and a prophylaxis of all teeth were performed and all target sites were root planed under local anaesthesia. Following debridement, target sites were irrigated gently with normal saline and then left for some time to achieve hemostasis.

Subgingival administration of chlorhexidine chip was accomplished by inserting the round end of the chip directly into the base of the pocket. Chip was pressed apically so that it rest subgingivally at the base of the pocket. Whereas, soaked Tetracycline fibers were inserted into the base of the

periodontal pocket. Gentle force was used with straight probe, so that the material fills the depths and curves of the pocket.

The gingiva was subsequently and carefully adapted to close the entrance of the gingival margin and hand pressure was applied for a few minutes to encourage hemostasis and initial setting of the material inside the pocket.

Patients were instructed not to disturb the area with tongue, finger or toothpick, not to chew any hard, or sticky food for at least 1 week, postpone brushing and flossing on the treated site for 1 week. At the first postoperative visit, patients were examined for any adverse signs or symptoms related to these treatments.



**Fig 1:** Placement of chlorhexidine chip



**Fig 2:** Placement of tetracycline fibers

### Data and Statistical Analysis

The statistical analysis was done using SPSS version 15.0 statistical analysis software. The results were averaged out for each parameter. Values were depicted as mean  $\pm$  SD. For comparisons between different time intervals ANOVA test was used. For comparison between groups Post hoc test was applied. The confidence level of the study was kept at 95% and hence a 'p' value  $<0.05$  was considered as significant. All the clinical parameters were evaluated at baseline, 1 month, 3 months, 6 months and 1 year from the baseline.

### Results

A total of 48 patients were evaluated for different clinical parameters and compared with baseline values after 1 month, 3 months, 6 months and 1 year after the treatment. Subjects at baseline in all the groups did not show any significant differences in plaque index scores, gingival index scores, pocket depth and CAL. Plaque index scores and gingival index scores decreased significantly 1 month after the treatment and was maintained throughout the duration of the study.

**Table 1:** Comparison of Plaque and Gingival index among test and control groups

Group	Clinical Parameter	Baseline	1 Month	3 Months	6 Months	1 Year	p VALUE (baseline to 1 month comparison)
TG 1	PI	1.24	0.75	0.60	0.55	0.54	0.02
	GI	1.82	0.92	0.88	0.65	0.60	0.001
TG 2	PI	1.26	0.75	0.70	0.55	0.55	0.02
	GI	1.70	0.84	0.66	0.48	0.45	0.001
CG	PI	1.45	0.80	0.72	0.60	0.58	0.010
	GI	1.8	0.9	0.75	0.55	0.55	0.001

Plaque and gingival index scores (\*p< 0.05)

Probing depth and CAL values also showed improvement after treatment which varied among the groups. Mean CAL for TG 1 was 7.5 ± 1.033 mm at baseline and significant gain was achieved after 1 month (1.56 ± 0.28mm) and was maintained at the end of 1 year (2.12 ± 0.28mm) after treatment (p= 0.001).

Mean CAL for TG 2 was 7.19 ± 0.911 mm at baseline and it increased non-significantly after 1 month (0.75 ± 0.27mm)(p=0.63). However there was significant gain in CAL

at 3 months (1 ± 0.27mm) (p=0.005) and it further increased significantly at the end of 1 year (1.125 ± 0.27mm) (p= 0.001). Mean CAL for CG was 7.25 ± 0.856 mm at baseline and it increased non-significantly after 1 month (0.62 ± 0.26mm)(p=0.137) and 6 months (0.56 ± 0.26 mm) (p=0.219). However there was significant gain in CAL after 3 months (0.75 ± 0.26mm) (p=0.045) and at the end of 1 year (0.875 ± 0.26mm) (p= 0.012).

**Table 2:** Comparison of CAL changes among test groups and control group.

Clinical Parameter	Group		Mean Reduction	Std Error	P Value	
Clinical Attachment Level	Tg 1	Base Line	1 Month	1.562*	.284	.001
			3 Months	2.000*	.284	.001
			6 Months	1.875*	.284	.001
			1 Year	2.125*	.284	.001
	Tg 2	Baseline	1 Month	.750	.277	.063
			3 Months	1.000*	.277	.005
			6 Months	1.000*	.277	.005
			1 Year	1.125*	.277	.001
	Cg	Baseline	1 Month	.625	.264	.137
			3 Months	.750*	.264	.045
			6 Months	.562	.264	.219
			1 Year	.875*	.264	.012

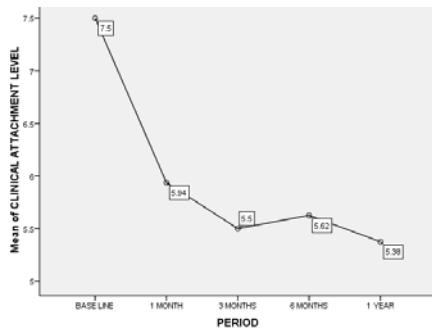
(\*p< 0.05)

Probing depth in TG1 at baseline was 7.06 ± 0.92 mm and decreased significantly by 2.87 ± 3.14mm (p=0.001) at the end of first month of treatment and by 3.5 ± 3.14 mm (p=0.001) at the end of one year after treatment. In TG2 the probing depth at baseline was 6.8 ± 0.88 mm and it decreased significantly

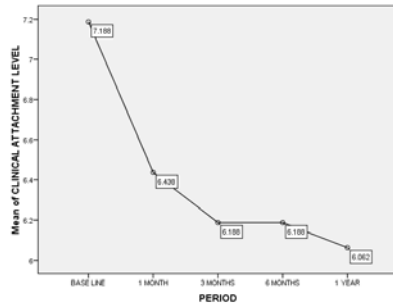
one month after treatment by 1.87 ± 0.28 mm (p=0.001) and by 3 ± 0.28 (p=0.001) mm after one year. In CG, the baseline probing depth was 6.8 ± 0.98 mm and it decreased significantly after treatment by 2.7 ± 0.25 mm at one month (p=0.001) and by 2.93 mm at one year (p=0.001).

**Table 3:** Comparison of Probing Depth changes among test groups and control group.

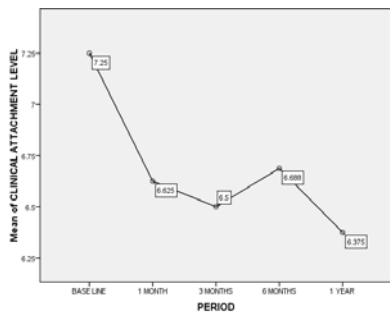
Clinical Parameter	Group		Mean Reduction	Std Error	P Value	
Probing Depth	Tg 1	Base Line	1 Month	2.875*	.314	.001
			3 Months	3.562*	.314	.001
			6 Months	3.938*	.314	.001
			1 Year	3.562*	.314	.001
	Tg 2	Baseline	1 Month	1.875*	.284	.001
			3 Months	2.938*	.284	.001
			6 Months	3.375*	.284	.001
			1 Year	3.000*	.284	.001
	Cg	Baseline	1 Month	2.750*	.253	.001
			3 Months	3.250*	.253	.001
			6 Months	3.500*	.253	.001
			1 Year	2.938*	.253	.001



1a. TG 1

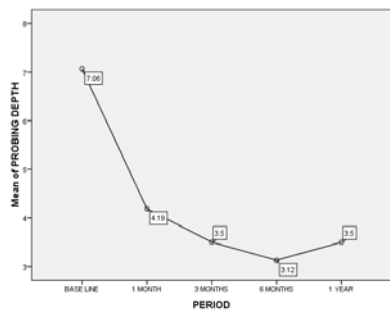


1b. TG 2

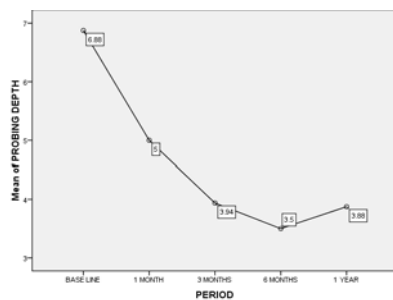


1c. CG

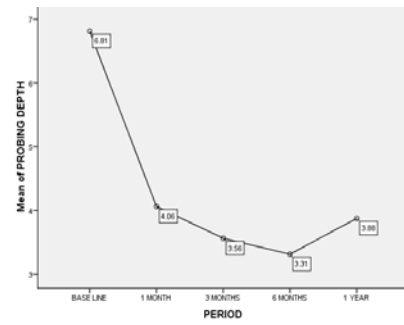
Graph 1: Mean CAL recorded at baseline and follow up visits.



2a. TG 1



2b. TG 2



2c. CG

**Discussion**

It is well established that meticulous scaling and root planing in conjunction with a patient’s proper plaque control can arrest periodontitis, but occasionally this therapy fails due to recolonization of the pockets by certain micro-organisms or inadequate mechanical therapy and at times certain adjunctive treatments are warranted [3, 4]. Many authors have suggested that there is a slight advantage of adjunctive use of locally delivered antimicrobials over scaling and root planing alone, although this difference has often been clinically minimal or statistically insignificant [8, 9].

The present study was done to evaluate the efficacy of chlorhexidine and tetracycline local drug delivery systems as adjunct to scaling and root planing in the treatment of sites with persistent periodontal pockets. Various clinical parameters like plaque and gingival index, probing depth and clinical attachment loss were measured in 48 patients at baseline, 3 months, 6 months and 1 year from baseline.

The present study supports the findings that many sites that do not respond positively to initial mechanical periodontal therapy may still benefit from further scaling and root planing. Our results are consistent with previous studies by Listgarten *et al.* [10] and Magnusson *et al.* [11].

All patients showed a significantly improved plaque and gingival index after treatment and the results were maintained throughout the study. The improvement in plaque and gingival index were similar in all the groups. All the patients were included in the study on an intent to treat basis and scaling and root planing were performed at the baseline visit for entire dentition. All patients were given extensive oral hygiene instructions which were repeated at every recall visit. These findings are in accordance with Heasman *et al.* [9], Stabholz *et al.* [12], Soskolne *et al.* [13] and Jeffcoat *et al.* [14].

There was a significant gain in CAL in all the patients irrespective of the treatment modality. However, the group with chlorhexidine local delivery showed the best results with a gain of 2.12 mm at the end of one year. Scaling and root planing are the mainstay of the nonsurgical therapy and whenever done meticulously provide the best of the results. In certain case when periodontal pockets are unresponsive to initial non-surgical therapy, antibiotics are prescribed. The present study has demonstrated that both tetracycline and chlorhexidine provide significant improvements in clinical parameters but the latter is better although not significantly.

Similarly significant reduction in probing depth was achieved by all the three treatment modalities which is in accordance with the review by Cobb *et al.* in 1996 [15]. In cases where scaling and root planing were combined with locally delivered antibiotics in persistent pockets, greater reduction in probing depth were obtained. However the improved results were not significantly more than scaling and root planing alone at the end of the one year of the study. Our results were in agreement with several authors who have shown that adjunctive use of

chlorhexidine and tetracycline provides significant improvement in probing depth and CAL in chronic periodontitis [12, 16, 17].

There are limited evidence for the use of anti-infective therapy in persistent pockets. Heasman *et al* have shown that adjunctive use of chlorhexidine provided significantly improved results over SRP alone in their 6 month follow up study [9]. The difference between our results could be explained on the longer follow up period we had which provided us with regular reinforcement of oral hygiene instructions for a longer duration of time.

### Conclusion

Few studies have evaluated the effects of local drug delivery systems on sites that responded poorly or showed recurrence of disease after scaling and root planing. Such sites pose a challenge in their management and scaling and root planing alone have often given unsatisfactory results. It is thus important in managing such sites that additional techniques must be used.

From our study, we can conclude that even though meticulous scaling and root planing are effective methods in treatment of persistent pockets better results can be achieved by adjunctive use of locally delivered chlorhexidine and tetracycline. However, the results of the present study should be followed up with a larger sample size and other newly developed locally delivered anti-infective agents should be included.

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