International Dental & Medical Journal of Advanced Research (2019), 5, 1–4

ORIGINAL ARTICLE

Efficacy of chlorhexidine chips as local drug delivery in non-surgical management of chronic periodontitis

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Keywords
Chlorhexidine chip, chronic periodontitis, local drug delivery, root planing, scaling

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Received 16 April 2019;
Accepted 14 June 2019

doi:10.15713/ins.idmjar.103

Abstract

Background: Periodontal disease is primarily caused by a specific group of microorganisms which colonizes tooth surfaces in the form of a biofilm called dental plaque. Periodontal diseases include conditions such as chronic periodontitis, aggressive periodontitis, and necrotizing periodontitis.
Aim: The aim of the study was to evaluate the efficacy of chlorhexidine chip (Col-CG) with scaling and root planing (SRP) in reducing the clinical signs of periodontitis**.**
Materials and Methods: The study consisted of 60 sites of periodontal pocket of the age group of 25–55 years with chronic periodontitis. The selected sites were randomly divided into two groups: Groups I and II, then clinical parameters such as plaque index, gingival index, sulcular bleeding index, probing depth, and relative attachment level were recorded.
Results: Group II shows greater improvement in periodontal pocket depth reduction, gain in clinical attachment level, reduced gingival and sulcular bleeding, and minimal plaque accumulation in respect to Group I.
Summary and Conclusion: The development of local delivery devices as Col-CG as an adjunct to SRP showed greater improvement in respect to SRP alone.
Clinical Significance: Col-CG as an adjunct to SRP proved to be efficient, safe, and cost-effective for maintenance of periodontal disease in comparison to SRP alone.

Introduction

Periodontal disease is primarily caused by a specific group of microorganisms which colonizes tooth surfaces in the form of a biofilm called dental plaque.[1] There are several clinical studies which indicated that scaling and root planing (SRP) in combination with oral hygiene maintenance results in an alteration of the subgingival plaque which is sufficient to stop periodontal destruction in most cases. Maintenance of oral hygiene has the utmost importance for the clinical outcome of non-surgical and also for surgical treatment.[2] Mechanical debridement destructs the subgingival flora and provides clean, smooth, and biologically compatible root surface. The use of locally delivered antimicrobials such as tetracycline, doxycycline, minocycline, chlorhexidine, metronidazole, enzymes, and quaternary ammonium compounds had been used to prevent further progression of periodontal disease either as monotherapy or as an adjunct to SRP procedure, which have been administered topically in pure forms by their incorporation in chewing gums, dentifrices, acrylic strips, hollow fibers, films, ointments, gel, etc. It is clear that for local antimicrobial therapy to be clinically effective, successful mechanisms to deliver sustained and adequate concentration of the active agent to the periodontal pocket are required.[3] Since there are a limited number of studies conducted with chlorhexidine chip (Col-CG) as local drug agent, in our study, an attempt has been made to evaluate and compare the efficacy of Col-CG with SRP in the treatment of chronic periodontitis. The rationale for adding such chip regimens, to SRP rests on its safety and non-invasiveness and relative ease with which it can be added to periodontal maintenance program.

Aims and objectives

The aims of the study were to evaluate the efficacy of Col-CG with SRP in reducing the clinical signs of periodontitis.

Materials and Methods

- Mouth mirror
- University of North Carolina (UNC)-15 periodontal probe (Hu-Friedy, USA)
- Straight probe
- Tweezer
- Scalers
- Gracey curettes (Hu-Friedy no. 1-18)
- Self-cured acrylic occlusal stent
- Periodontal dressing
- Cheek retractor
- Kidney tray
- Cotton rolls
- Dappen dish
- Col-CG.

Method

A total of 60 bleeding sites, with a probing depth (PD) 5–8 in mm, in 20 subjects comprising both the genders, aged between 25 and 55 years were selected. All the 20 subjects completed the 3-month follow-up study.

The selected sites were randomly divided into two groups:

- Group I SRP alone – included 20 sites treated with SRP alone
- Group II (SRP + Col-CG) – included 20 sites treated by SRP with Col-CG.

Clinical parameters recorded

1. Plaque index (Silness and Loe, 1964)[4]
2. Gingival index (Loe and Silness, I963)[4]
3. Sulcular bleeding index (Muhlemann and Son,1971)[4]
4. PD using UNC-15periodontal probe (Hu-Friedy, USA)
5. Relative attachment level (RAL) using acrylic stent and UNC-15 periodontal probe (Hu-Friedy, USA).

After recording the clinical parameters from each site at baseline, a thorough SRP was done, using hand instruments and ultrasonic scalers in all the three groups. The clinical parameters were assessed at baseline, at 1 month, and 3 months after receiving the treatment. Statistical analysis was done with "One-way ANOVA analysis."

Observation and Results

Following clinical parameters [Table 1-4] included were at baseline and 1st month and 3rd month.

Gingival index [Table 2]

One-way ANOVA was used to find out the significant difference in gain scores at 1 month in two study groups. The calculated F (df2, 57) = 0.10 and P = 0.902 are statistically not significant because calculated value is less than table value of F. The mean gain percentage of two groups, i.e. Col CG and SRP is not significantly different with each other. The difference in mean gain at 3 months between the study groups is statistically not significant with F (df2, 57) = 0.08 and P = 0.919. The mean gain percentage of two groups', i.e. Col CG and SRP is not significantly different with each other. The maximum percentage decrease was observed in Col CG followed by SRP group.

Plaque index [Table 2]

One-way ANOVA was used to find out the significant difference in gain scores at 1 month in two study groups. The calculated F (df2, 57) = 0.06 and P = 0.933 are statistically not significant. The difference in mean gain at 3 months between the study groups is statistically not significant with F (df2, 57) = 0.213 and P = 0.809.

PD [Table 3]

One-way ANOVA was used to find out the significant difference in gain scores at 1 month in two study groups. The calculated F (df2, 57) = 1.68 and P = 0.195 are statistically not significant. The difference in mean gain at 3 months between the study groups is statistically not significant with F (df2, 57) = 38.15 and P = 0.00. The mean gain percentage of two groups, i.e., Col CG and SRP is significantly different with each other. The maximum percentage decrease was observed in Col CG followed by SRP group and with statistical significance.

RAL [Table 4]

One-way ANOVA was used to find out the significant difference in gain scores on clinical attachment level at 1 month in two study groups. The calculated F (df 2, 57) = 2.42 and P = 0.096 are statistically not significant. The mean gain percentage of two groups, i.e., Col CG and SRP is not significantly different with each other. The difference in mean gain at 3 months between the study groups is statistically significant with F (df 2, 57) = 35.89 and P = 0.0. Since calculated F = 35.89 is more than the table value at F (df2, 57), P value is statistically significant at 0.01 level. The mean gain percentage of two groups, i.e., Col CG and SRP is significantly different with each other. The maximum percentage decrease was observed in Col CG group followed by Col CG and last SRP group.

Sulcular bleeding index [Table 5]

One-way ANOVA was used to find out the significant difference in gain scores at 1 month in two study groups. The calculated F (df2, 57) = 1.37 and P = 0.261 are statistically not significant. The mean gain percentage of Col CG and SRP is not significantly different with each other. The difference in mean gain at 3 months between the study groups is statistically not significant with F (df2, 57) = 38.15 and P = 0.0

Discussion

In the present study, mean percentage reduction in plaque index from baseline to 1 month and 3 months is maximum in Group II which was 48.26% and 55.21% as shown in Table 2 as compared to Group I. Michele *et al.*[5] study shows benefit of SRP with Col-CG in the treatment of subgingival microflora of chronic periodontitis. Heasman *et al.*,[6] Goodson *et al.*,[7] and Addy *et al.*[8] also reported statistically significant changes in accumulation of plaque using local drug delivery. Values for mean percentage reduction in plaque index in our study are also similar with the study by Azmak *et al.*[9] and Divya *et al.*[10] In this study, overall sulcular bleeding index improves from baseline to 3 months in Group II as compared to Group I which is 48.51%and 58.33% similar to studies done by RituJain *et al.*,[11] Aimetti *et al.*,[12] and Kalsi *et al.*[13] Slow release of therapeutic effect in oral cavity of chlorhexidine gives an anti-inflammatory action using gingival inflammatory action by reducing gingival inflammation as shown in our study, there is marked reduction in gingival index score from baseline to 3 months in Group II as compared to Group I which is 45.96% and 58.85% similar to the study by Goodson *et al.*[7] The adjunctive use of biodegradable chip leads to significant improvement in PD reduction, additional benefits were even more evident when Col-CG was placed during periodontal therapy which was observed after 3 months of therapy, periodontal pocket depth reduction in Group II was 2.40 ± 0.59, whereas in Group I was 3.25 ± 0.44 and 4.05 ± 0.60, respectively. Thus, the mean percentage reduction was highly significant in Group II that was 48.26% as compared to Group I that was 25%. Gary[14] reported that sustained release of antimicrobial agent combined with SRP showed a statistically significant reduction in periodontal pocket depth as compared to SRP alone. Changes in level of attachment can be caused only by gain or loss of attachment and thus provide a better indication of the degree of periodontal destruction. In our study, it was observed that there was a highly significant gain in SRP, SRP + Col-CG at the end of 3 months from baseline. Thus, the mean percentage gain in Group II was 38.28% as compared to Group I that was 16.89%. Similarly, in studies by Goodson *et al.*,[7] Peter *et al.*,[15] and Rocha *et al.*[16] Local administration of drug directly into the base of pocket suggestively bypass all the systemic complication, some of the adverse effect seen in few patients were gingival pain and tenderness which occurred in the 1st week of placement of drug. Thus, the crux of the study is adjunctive topical subgingival application of Col-CG gave a statistically significant result in gain in clinical attachment level and periodontal pocket depth reduction than SRP alone.

Table 1: Mean percentage gain in gingival index

Groups	1 month (%)	3 months (%)
Group I		
SRP	−48.98	−54.03
Group II		
SRP+Chlorhexidine chip	−45.96	−58.85

SRP: Scaling and root planing

Table 2: Mean percentage gain in plaque index

Groups	1 month (%)	3 months (%)
Group I		
SRP	−51.33	−53.78
Group II		
SRP+Chlorhexidine chip	−48.26	−55.21

SRP: Scaling and root planing

Table 3: Mean percentage gain in probing depth

Groups	1 month (%)	3 months (%)
Group I		
SRP	−20.37	−25
Group II		
SRP+Chlorhexidine chip	−24.34	−48.26

SRP: Scaling and root planing

Table 4: Mean percentage gain in relative attachment level

Groups	1 month (%)	3 months (%)
Group I		
SRP	−15.40	−16.89
Group II		
SRP+Chlorhexidine chip	−18.28	−38.28

SRP: Scaling and root planing

Table 5: Mean percentage gain in sulcular bleeding index

Groups	1 month (%)	3 months (%)
Group I		
SRP	−56.81	−64.05
Group II		
SRP+Chlorhexidine chip	−48.51	−58.33

SRP: Scaling and root planing

Summary and Conclusion

The development of sustained release delivery devices has added a new dimension to the incorporation of adjunctive pharmacotherapy in the management of periodontal disease.

The conclusion which can be drawn from the study:

1. On clinical evaluation, data showed statistically significant result in periodontal pocket depth reduction and gain in clinical attachment level
2. There was a significant improvement with respect to reduced gingival bleeding, minimal plaque accumulation from baseline to 3 months
3. On comparison, Col-CG as an adjunct to SRP showed greater improvement in respect to decreased PD and gain in clinical attachment level followed by SRP alone.

Thus, Col-CG as an adjunct to SRP proved to be efficient, safe, and cost-effective for maintenance of periodontal disease than SRP alone.

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How to cite this article: Sahu B, Gathe B, Chandrakar J, Zade R, Khade A, Kamble RL. Efficacy of chlorhexidine chips as local drug delivery in non-surgical management of chronic periodontitis. Int Dent Med J Adv Res 2019;5:1-4.