

# Subgingival Utilization of a 1% Chlorhexidine Collagen Gel for the Treatment of Periodontal Pockets. A Clinical and Microbiological Study

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This study evaluates the effect of subgingival irrigation with a 1% chlorhexidine collagen gel in periodontal pockets as an adjunct procedure to scaling and root planing (SRP). Thirty-seven sites with probing depth (PD) of 5-7 mm and BANA positive in 6 patients with chronic periodontal disease were selected. Sites were assigned to different treatment groups consisting of SRP only (group 1), SRP + irrigation with collagen gel (group 2), or SRP + irrigation with collagen gel containing 1% chlorhexidine (group 3). Subgingival irrigation was performed after initial SRP and at 7, 14 and 21 days. Clinical measurements including PD, plaque index (PI), gingival index (GI), gingival recession (GI), bleeding on probing (BOP) and clinical attachment level (CAL) were performed at the selected sites at baseline, 60 and 90 days and the BANA test was performed on plaque samples from the same sites at baseline and 90 days. There was an improvement in clinical parameters in all groups with a significantly greater decrease in GI and bleeding in the chlorhexidine group. There was a greater reduction of BANA positive sites in groups 2 and 3. The authors concluded that 1% chlorhexidine collagen gel is a promising adjunct to SRP in the treatment of adult periodontitis.

Key Words: irrigation, periodontal pocket, chlorhexidine gel, periodontitis.

## INTRODUCTION

The treatment of chronic periodontitis focuses on stopping the destruction of periodontal support by the elimination of some pathogenic bacteria present in the periodontal pocket. This is routinely performed in the dentist's office by mechanical scaling and root planing (SRP), when subgingival calculus is removed together with the majority of the bacteria (1). Variation in the ability of the dentist to gain access in deep and tortuous pockets and bacterial invasion into gingival and dental tissues often results in substantial variation of the effectiveness of SRP (2). This has led to the associated use of antimicrobial agents, usually in the

form of local or systemic antibiotics (3). Recently, many local delivery systems containing antibiotics or antiseptic drugs have been introduced (4-8). These systems allow the therapeutic agents to be targeted to the disease site, thus the dose can be minimized reducing the systemic absorption and lessening the risk of adverse side effects. They can also improve patient compliance (9). Among the antimicrobial agents, chlorhexidine has been used in subgingival irrigation with gel or in a sustained-release local delivery system (7,8,10,11). However, studies on chlorhexidine gels are often contradictory in terms of improvement in clinical parameters (4,9-12).

The purpose of this study was to evaluate the

effect of subgingival irrigation with a 1% chlorhexidine collagen gel in periodontal pockets as an adjunct to SRP.

## MATERIAL AND METHODS

Thirty-seven sites of 6 patients (4 females and 2 males, aged 27 to 48 years), with moderate to severe adult periodontitis, were included in the present study. They presented no relevant medical history and they had not received periodontal therapy nor antibiotic treatment for a minimum of 6 months prior to the beginning of the study. This study was approved by the Periodontal Committee of Araraquara Dental School. An informed written consent was obtained from each patient. All patients had at least 3 sites in different single-rooted teeth with 5-7 mm probing depth and BANA-positive of different quadrants. One week after the selection of the patients, during the screening visit (baseline or  $T_0$ ), the microbiological and clinical analyses were registered. The clinical examination was carried out with a manual probe (Williams 14 W). The following clinical measurements were also recorded at 60 ( $T_1$ ), and 90 ( $T_2$ ) days: plaque index (PI), assessed according to Silness and Løe (13), gingival index (GI), according to Løe and Silness (14), gingival recession (GR), clinical attachment level (CAL), probing depth (PD), bleeding on probing (BOP), according to the presence or absence of bleeding within 30 s after probing. Microbiological examinations, according to the BANA test-card (Oral-B Laboratories, now available from Knowell Periodontal Technologies, Toronto, Canada) proposed by Loesche et al. (15), were also carried out at 90 days ( $T_2$ ).

At baseline, careful SRP was performed and the patients received oral hygiene instructions and motivation. The type of treatment of each site was chosen by simple distribution after scaling: group 1 – SRP (10 sites); group 2 – SRP + irrigation with collagen gel (12 sites) (Chemical Institute of São Carlos, SP, Brazil); group 3 – SRP + irrigation with 1% chlorhexidine collagen-hamsana gel (15 sites) (Chemical Institute of São Carlos) (16,17).

SRP and irrigation were performed by a single examiner who was calibrated and different from the one who recorded the clinical and microbiological evaluations. During 4 weeks, the subjects in groups 2 and 3 were submitted to weekly subgingival irrigation which

began at the first visit after SRP (0, 7, 14, 21 days). The irrigated areas were isolated with cotton rolls and the tissues were air dried. The subgingival irrigation was performed with an insulin syringe and a 0.6 mm diameter hypodermic needle. The needle had a plastic cursor to determine the previous pocket depth and was placed 1 mm from the base of the pocket and was slowly withdrawn while the gel was injected. This procedure continued until the pocket was completely filled. During irrigation, the supragingival region was aspirated to prevent spillage of the chemical product onto the other areas of the mouth. The patients were then instructed not to rinse with or drink any liquid for at least 30 min.

### Statistical Analysis

For the clinical parameters (PD, PI, GI, CAL), parametric analysis of variance (ANOVA) with two fixed criteria (group and period) was used. The relevant alteration of the presence (+) to the absence (-) of bleeding on probing was evaluated among the periods of clinical evaluation, at each level of the group factor, which could not be statistically analyzed because of the small number of observations. The chi-square test was used to evaluate BANA. For the clinical and microbiological parameters, the significance level chosen was  $p < 0.05$ . Additional tests were performed from the equal mean groups (Duncan Test) using capital letters to determine the groups and small letters for the periods: if two or more groups were in the same set, they were considered statistically similar and if they were in different sets, they were considered statistically different.

## RESULTS

*Plaque Index.* A statistically significant reduction ( $p < 0.05$ ) within all groups from the initial period to  $T_1$  and  $T_2$  was observed. The reduction from  $T_1$  to  $T_2$  was not significant. There was no significant difference ( $p > 0.05$ ) between the groups (Table 1).

*Gingival Index.* In the associated analysis of the groups, a statistically significant reduction ( $p < 0.05$ ) from the initial period to  $T_1$  and a subsequent elevation to  $T_2$  was observed. This also occurred for each of the groups, but group 3 had a statistically lower mean ( $p < 0.05$ ) than groups 1 and 2 that had no statistically significant difference between each other (Table 2).

*Gingival Recession.* A steady result from the

Table 1. Frequency, mean and equal mean sets using group, period and interaction for plaque index.

| Group   | Period |          |     |         |     |         |     |
|---------|--------|----------|-----|---------|-----|---------|-----|
|         | N      | Baseline | Set | 60 days | Set | 90 days | Set |
| Group 1 | 10     | 2.40     | A   | 1.40    | A   | 1.20    | A   |
| Set     |        | a        |     | b       |     | b       |     |
| Group 2 | 12     | 2.25     | A   | 1.50    | A   | 1.25    | A   |
| Set     |        | a        |     | b       |     | b       |     |
| Group 3 | 15     | 2.20     | A   | 1.27    | A   | 0.93    | A   |
| Set     |        | a        |     | b       |     | b       |     |

Table 2. Frequency, mean and equal mean sets using group, period and interaction for gingival index.

| Group   | Period |          |     |         |     |         |     |
|---------|--------|----------|-----|---------|-----|---------|-----|
|         | N      | Baseline | Set | 60 days | Set | 90 days | Set |
| Group 1 | 10     | 2.00     | A   | 0.90    | A   | 1.10    | A   |
| Set     |        | a        |     | c       |     | b       |     |
| Group 2 | 12     | 1.75     | A   | 0.58    | A   | 1.25    | A   |
| Set     |        | a        |     | c       |     | b       |     |
| Group 3 | 15     | 1.67     | B   | 0.46    | B   | 0.90    | B   |
| Set     |        | a        |     | c       |     | b       |     |

Table 3. Frequency, mean and equal mean sets using group, period and interaction for gingival recession (mm).

| Group   | Period |          |     |         |     |         |     |
|---------|--------|----------|-----|---------|-----|---------|-----|
|         | N      | Baseline | Set | 60 days | Set | 90 days | Set |
| Group 1 | 10     | 0.50     | A   | 0.65    | A   | 0.75    | A   |
| Set     |        | a        |     | a       |     | a       |     |
| Group 2 | 12     | 0.62     | A   | 0.83    | A   | 0.83    | A   |
| Set     |        | a        |     | a       |     | a       |     |
| Group 3 | 15     | 0.60     | A   | 0.93    | A   | 0.93    | A   |
| Set     |        | a        |     | a       |     | a       |     |

Table 4. Frequency, mean and equal mean sets using group, period and interaction for probing depth (mm).

| Group   | Period |          |     |         |     |         |     |
|---------|--------|----------|-----|---------|-----|---------|-----|
|         | N      | Baseline | Set | 60 days | Set | 90 days | Set |
| Group 1 | 10     | 5.80     | A   | 3.00    | A   | 2.70    | A   |
| Set     |        | a        |     | b       |     | b       |     |
| Group 2 | 12     | 5.75     | A   | 2.29    | A   | 2.17    | A   |
| Set     |        | a        |     | b       |     | b       |     |
| Group 3 | 15     | 5.53     | A   | 2.50    | A   | 2.17    | A   |
| Set     |        | a        |     | b       |     | b       |     |

Table 5. Frequency, mean and equal mean sets using group, period and interaction for attachment level (mm).

| Group   | Period |          |     |         |     |         |     |
|---------|--------|----------|-----|---------|-----|---------|-----|
|         | N      | Baseline | Set | 60 days | Set | 90 days | Set |
| Group 1 | 10     | 6.30     | A   | 3.65    | A   | 3.45    | A   |
| Set     |        | a        |     | b       |     | b       |     |
| Group 2 | 12     | 6.45     | A   | 3.12    | A   | 3.00    | A   |
| Set     |        | a        |     | b       |     | b       |     |
| Group 3 | 15     | 6.07     | A   | 3.43    | A   | 3.10    | A   |
| Set     |        | a        |     | b       |     | b       |     |

initial period until the end of the study was observed. Group 3 showed a recession mean higher than the other groups at T<sub>1</sub> and T<sub>2</sub> (Table 3).

**Probing Depth.** A significant reduction ( $p < 0.05$ ) in all groups from T<sub>0</sub> to T<sub>1</sub> was observed, being steady between T<sub>1</sub> and T<sub>2</sub>. There was no significant difference ( $p > 0.05$ ) among the groups (Table 4).

**Attachment Level.** A clinical gain of attachment in all groups could be observed. It was statistically significant ( $p < 0.05$ ) in the periods T<sub>0</sub> and T<sub>1</sub> and was constant until T<sub>2</sub>. This also occurred for each of the groups with no statistically significant difference ( $p > 0.05$ ) among them (Table 5).

**Bleeding on Probing.** Ten sites of group 1 were analyzed in the initial period and nine of them were positive for bleeding on probing; among them, eight became negative at T<sub>1</sub>. From the two other sites that were positive for bleeding on probing at T<sub>1</sub>, one of them became negative at T<sub>2</sub>. Twelve sites were analyzed in group 2 and nine of them were positive for bleeding on probing and became negative at T<sub>1</sub>, and three became positive at T<sub>2</sub>. Fifteen sites of group 3 were analyzed in the initial period and ten were positive for bleeding on probing and became negative at T<sub>1</sub>. All sites were negative from T<sub>1</sub> to T<sub>2</sub>.

**BANA test.** From the ten sites of group 1, eight were BANA positive at T<sub>2</sub> (80%), five of the twelve sites (41%) of group 2 were BANA positive, and seven of fifteen sites (46%) of group 3 were BANA positive. Statistical analysis showed that the lower occurrence of BANA positive was significant only for groups 2 and 3, that were equivalent.

## DISCUSSION

In this study, the efficacy of local administra-

tion of gel, with or without chlorhexidine, as an adjunct to SRP was evaluated. Clinical improvement of PD, PI, GI, CAL, BOP in all test groups was different from baseline at a level of significance of 0.05.

The use of 1% chlorhexidine collagen-hamsana gel irrigation improved the outcome of SRP in terms of GI, BOP and BANA test parameters. This group also had the best means of gingival index associated with a reduction in the number of BANA-positive sites. These results could be related to the action of chlorhexidine on the microorganisms. In group 1, there was a lower reduction in the clinical parameters than in group 3 until the end of the study. Although SRP has been considered efficient in the treatment of periodontal disease, favorable results are not always obtained, especially if the pockets exceed 5 mm in depth, which means a difficult access to the most apical areas of these pockets and an invasive potential of some bacteria on the periodontal tissues (2). Group 1 showed an irrelevant percentage of reduction of BANA positive sites in the evaluated period ( $T_2$ ); however, in groups 2 and 3 there was a significant reduction ( $p < 0.05$ ) in the BANA-positive sites compared to baseline. In respect to the results of group 3, it can be concluded that this therapy produces benefits over the level of anaerobic periodontal bacterial species. Irrigation can contribute to bacterial elimination in deep pockets, thus increasing the SRP treatment effectiveness. The reduction of BANA positive sites, in group 2, has also been shown in other studies in which success was obtained with salty jet irrigation that can present a disorganization of the plaque, a reduction of its thickness and toxicity. The irrigation can also facilitate the exit of subgingival bacteria from the pockets (9).

The collagen-hamsana gel was chosen as the vehicle for the application of chlorhexidine because it possesses adhesive properties that promote a slow release of the drug (17).

Studies of subgingival irrigation with 1 or 2% chlorhexidine gel have been performed as an adjunctive procedure to SRP, and some did not observe benefits with its use (11,12). The explanation may be the low frequency of administration because only one application of gel was used (9,11). Another explanation could be low doses or concentrations in relation to the minimum inhibitory concentration (MIC) or minimum bactericide concentration (MBC), described in an *in vitro* study (18) or to the concentration (0.12%) gener-

ally used and recommended by the FDA or ADA. It means that the bactericidal and bacteriostatic effects on microorganisms of the subgingival plaque and the substantivity cannot be achieved in the subgingival environment. On the other hand, some authors reported an improvement in the clinical parameters with chlorhexidine gel irrigation (4,10), or a reduction in the percentage of bacteria after one subgingival application (9). In a study by Jolkovsky et al. (19), the importance of the periodicity of the irrigation as an adjunctive technique was demonstrated because the constant renovation of the fluid facilitates the exit of substances of the subgingival area after the irrigation (20). Although the observation period was short, the results encourage the use of chlorhexidine irrigation in combination with SRP. It can be expected that the use of irrigation becomes a valuable adjunctive therapy for the maintenance of periodontal-treated patients (19), or even in the active phase of the treatment, although SRP has been used as the main therapy for treating chronic periodontal disease.

## RESUMO

Vinholis AHC, Figueiredo LC, Marcantonio Junior E, Marcantonio RAC, Salvador SLS, Goissis G. Utilização subgingival de gel de colágeno com clorexidina 1% no tratamento de bolsas periodontais. Estudo clínico e microbiológico. *Braz Dent J* 2001;12(3):209-213.

Este estudo avaliou o efeito de irrigação subgingival de gel colágeno com clorexidina 1% em bolsas periodontais como adjunto à raspagem e alisamento radicular (RAR). Participaram do estudo em 6 pacientes com periodontite periodontal crônica (37 sítios) que apresentavam sítios com profundidade de sondagem entre 5-7 mm e BANA positivos. Foi realizado o tratamento de RAR em todos os sítios, sendo estes distribuídos em um dos 3 grupos: somente RAR (grupo I), RAR + irrigação com gel de colágeno (grupo II), RAR + irrigação com gel de colágeno com clorexidina 1% (grupo III). As irrigações subgingivais foram realizadas após a RAR e nos dias 7, 14 e 21. Os parâmetros clínicos de índice de placa, índice gengival, sangramento à sondagem, nível de inserção, recessão e profundidade de sondagem foram avaliados antes da raspagem, 60 e 90 dias após, e o Teste BANA (PERIOSCAN) foi realizado com as amostras de placa dos mesmos sítios, antes da raspagem e 90 dias após. Os resultados obtidos demonstraram uma redução dos parâmetros clínicos sem diferença significativa entre os 3 grupos, com exceção dos parâmetros de índice gengival e sangramento à sondagem onde os resultados foram estatisticamente melhores no grupo III que nos grupos I e II. Os grupos II e III apresentaram redução estatisticamente maior dos sítios BANA positivos quando comparados ao grupo I. Os resultados sugerem que a irrigação subgingival com gel colágeno com clorexidina 1% mostrou-se

promissora como coadjuvante ao tratamento de RAR em pacientes com doença periodontal crônica.

Unitermos: irrigação, bolsa periodontal, gel clorexidina, periodontite.

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