Evaluation of Topical Application of CHLO-SITE (Chlorhexidine gel) in Management of Chronic Periodontitis

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Abstract

Objective: The present study was designed to evaluate clinically and microbiologically the effects of topical application of CHLO-SITE (Chlorhexidine gel) in management of chronic periodontitis.

Subjects and Methods: This study was carried out on 15 patients (aged 25-55) with chronic periodontitis. They were received scaling and root planning (SRP) alone in one side and SRP plus CHLO-SITE (Chlorhexidine gel) in other side.

Each individual was subjected to the following measurements; (1) Evaluation of the clinical parameters pre and post treatment to detect the outcome of the treatment modality, (2) Dental plaque samples initially and at 3, 6, 9 and 12 months were obtained for microbiological evaluation.

Results showed that (1) CHLO-SITE (Chlorhexidine gel) delivered locally into periodontal diseased sites reduced all subgingival bacteria and (2) Both treatment and modality led to a highly statistically significant reduction in microbiological counts as well as clinical parameters applied. No clinical relevant side effects were observed.

Keywords: Local Delivery Antimicrobial Agents/Medical Periodontal Therapy/CHLO-SITE, Gel

Introduction

Periodontal disease can be considered as an infection that involves both inflammatory and immune responses which lead to breakdown of periodontal structures, with an increased pocket depth, clinical attachment loss, as well as destruction of alveolar bone. These changes eventually lead to tooth loss. The presence of bacterial plaque biofilm represents the principal etiologic factor involved in the initiation and progression of inflammatory periodontal diseases. Several studies also indicated that the presence of periodontopathogens (persisting or re-established after treatment) is associated with a sub-optimal clinical outcome of periodontal therapy.

Complete removal of plaque and calculus is more difficult in deep than in shallow pockets; hence failure of periodontal treatment may be the result of plaque and calculus at remains after therapy performed. Therefore, the use of drugs to treat plaque associated periodontal diseases has been attempted. Successful therapy of periodontitis essentially requires the reduction of microbial levels that are responsible for periodontal infection within the oral cavity. To eliminate bacterial infections, antibiotics are administered either locally or systemically.

More than 500 different microbial species have been isolated from the human oral cavity, but only a few of them are associated with the disease process. Two of the major pathogens in periodontal disease are, A. actinomycetemcomitans and P. gingivalis, as they secrete several potent bioactive virulence factors. A. actinomycetemcomitans produces leukotoxins, a large pore-forming protein of the repeat indotoxin (RTX) family, that specifically kills human leukocytes, neutrophils monocytes.

P. gingivalis is a gram-negative anaerobic bacterium involved in pathogenesis of chronic periodontitis and is frequently found in subgingival flora of diseased subjects. This organism possesses a variety of virulence factors, including lipopolysaccharides, capsular material and proteases. Treatment of periodontitis affected patients is based on measures for reduction/
eradication of periodontal pathogens and alteration of the systemic and local host susceptibility. In this context, antibiotic therapy aims at reinforcement of mechanical periodontal treatment and to support host defenses in overcoming the pathogenic role of subgingival microorganisms that persist after conventional mechanical therapy. Antibiotics can inhibit or kill periodontal pathogens at sites that are almost impossible to reach by mechanical instrumentation, such as the base of deep periodontal pockets, furcation areas and within gingival epithelial as well as connective tissues\(^{(6)}\).

A local route of sustained or controlled antimicrobial delivery, can achieve high gingival fluid concentrations compared to a systemic drag regimen which will lead to a significant suppression of subgingival microbiota\(^{(7,8)}\). In contrast; systemic antibiotics are effective against susceptible periodontal pathogens colonizing oral mucosa and other extra dental sites\(^{(1)}\).

Since the systemic route of antimicrobial drug administration is associated with an increased risk of adverse effects and, since a more effective concentration of the drug at the affected sites may be obtained by topical application, this system of drug delivery may seem more promising\(^{(9)}\). Antiseptics are employed extensively in hospitals and other health care centers, and constitute an important aspect of periodontal therapy. Chlorhexidine, Iodine and chlorine are examples of antiseptics used in periodontal therapy\(^{(10)}\). Local administration of chlorhexidine has been demonstrated to be effective as periodontal therapy. Its mechanism of action includes reduction pellicle formation, alteration of bacterial adherence to teeth, and alteration of bacterial cell walls which causes cell lysis\(^{(11)}\).

Chlorhexidine possesses most of the characteristics of ideal antimicrobial agent; it is safe clinically effective in reducing plaque and gingivitis, has substantivity, affect the pathogenic flora, and is acceptable in terms of taste and cost\(^{(12)}\). Chlorhexidine gluconate is active against a broad spectrum of microbes. The chlorhexidine molecule, due to its positive charge, reacts with the microbial cell surface, destroys the integrity of cell membrane, penetrates cell wall and precipitates the cytoplasm, leading to cell death\(^{(13)}\).

### Subjects and Methods

(A) **Patient Characteristics and grouping:**

Fifteen patients (6 females and 9 males) with moderate to severe chronic (adult) periodontitis were selected for this study applying the split mouth technique. None of the patients had any history of antimicrobial therapy for the last 6 months, and no periodontal treatment prior to initiation of the present study. They were subjected for scaling and root planning, and one side of the oral cavity, received topical application of Xanthano Gel (CHLO-SITE) which contains a mixture of chlorhexidine digluconate and dihydrochloride, in a ratio of 1 to 2, applied one time initially and at 3, 6, 9 and 12 months.

(B) **Clinical Examination:**

Five clinical parameters were recorded at baseline and at 3, 6, 9, and 12 months after treatments which are gingival index (GI)\(^{(14)}\), plaque index (PLI)\(^{(15)}\), probing pocket depth and level of attachment\(^{(16)}\), periodontal index (PI)\(^{(17)}\).

(C) **Microbiologic Investigations:**

a. Sampling: Bacterial samples were obtained using standardized method for microbiological evaluation one time before and then post-operatively at intervals of 3, 6, 9 and 12 months using sterile curettes which inserted gently into the pocket, then held in position for 10 seconds . The samples were transferred in sterile Broth media for proper and suitable culturing technique.

b. Culturing: Each specimen was cultured on 2 blood agar plates; one incubated aerobically at 37°C for 24 hours and the other anaerobically for 48 hours. Selective media used were blood agar with kanamycin and vancomycin for Bacterioids; and blood agar with neomycin for Fusobacteria, and placed in a candle jar containing 10% CO₂ for 48 hours. Colonies on anaerobic blood agar plates which showed Gram-negative short Fusiform to filamentous shapes were presumptively identified as Bacterioids or Fusobacteria.

**Statistical Analysis:** Data obtained from clinical, microbiologic evaluations were analyzed by one-way analysis of variance test (ANOVA) to draw the significance.
Fifteen subjects were included in the present study, and completed the 12 month study period. The age range of subjects was (25-55) years with mean age of 38.93±8.96. Following the completion of the designed treatment, measurements of clinical parameters were recorded at 3, 6, 9 and 12 months intervals in the side treated with scaling and root planning plus CHLO-SITE gel and the side treated with scaling and root planning alone. Gingival Index, Plaque index, Periodontal pocket depth, clinical attachment level and Periodontal index showed improvement in both treated sides after 3, 6, 9 and 12 months intervals, when compared to the baseline data. There were slight differences in all clinical parameters in the side treated with scaling and root planning plus CHLO-SITE gel after 12 months when compared to the side treated with scaling and root planning alone.

The results of bacteriologic cultures of the side treated with scaling and root planning plus CHLO-SITE gel and the side treated with scaling and root planning alone on blood agar were recorded in the table of microbiological evaluation. Apparent significant differences were detected in bacterial cultures counts of the side treated with scaling and root planning plus CHLO-SITE gel and the side treated with scaling and root planning alone. There were highly significant differences in counts of anaerobic bacterial cultured after 9 month compared to the pretreatment counts, as well as to that after 3 month (P<0.01).

Anaerobic bacterial counts at 9 and 12 month when compared to that of 6 month in the side treated with scaling and root planning plus CHLO-SITE gel showed significant difference (P<0.05). There were highly significant differences in anaerobic bacterial counts found at 9 month compared to the pretreatment counts (P<0.01).

In the same table there were found significant differences in aerobic bacterial counts on blood agar at 3 month compared to pretreatment counts (P<0.05), the counts at 6 and 9 month compared to pretreatment showed significant differences (P<0.01), and highly significant at 12 month compared to the pretreatment (P<0.001) in the side treated with scaling and root planning plus CHLO-SITE gel. In the side treated with scaling and root planning alone, there were significant differences in aerobic bacterial counts on blood agar at 3, 6 and 12 month compared to the pretreatment and at 6, 9 and 12 month compared to 3 month (P<0.05). There were highly significant differences in aerobic bacterial counts on blood agar at 9 month compared to the pretreatment (P<0.01). The comparison between anaerobic and aerobic bacterial counts on blood agar at 3, 6, 9 and 12 month intervals from the side treated with scaling and root planning plus CHLO-SITE gel compared to the side treated with scaling and root planning alone, a significant difference was found (P<0.05).

### Microbiological Evaluation

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BL = Baseline Chi-square test. C=CHLO-SITE
a,b,e (Anaerobes) P < 0.01 compared to baseline and 3 month findings
b,c,e (Aerobes), compared to baseline finding.
c,d,g (Anaerobes) P<0.05 compared to the baseline, 6 month and 12 month findings
a,d,f (Aerobes) compared to baseline and 3 months findings.
Discussion

The proper treatment of periodontal disease involves altering the periodontopathic bacteria situated deeply in the periodontal pockets, to remove the primary agents responsible for initiation of the disease process in an attempt to allow tissues to heal, and inflammation to resolve. Mechanical removal of agents, by scaling and root planning, is a vital step and effective, but some disease forms, however, continue to progress and may need adjunctive therapy with effective antibiotic therapy.\(^{20}\)

Chlorhexidine gluconate is an active agent against a broad spectrum of microbes. The chlorhexidine molecule, due to its positive change, reacts with the microbial cell surface, destroys the integrity of cell membrane, penetrates cell wall and precipitates the cytoplasm so it will lead to cell death.\(^5\). Chlorhexidine-gelatin (Perio Chip) when used as an adjunct to scaling and root planning resulted in greater percentage of pocket depth reduction of 2mm or more, compared to scaling and root planning alone. It was evident that 13.5% of patients had more than a 2mm reduction at the end of nine month study period with scaling and root planning only, but when Perio Chip was added the number was increased to 30.3%\(^{21}\).

Results of two large multi-center clinical studies in the United States indicates that the adjunctive use of Perio Chip with scaling and root planning showed significantly greater reduction in periodontal pocket depth than does scaling and root planning alone at the end of the nine month study period.\(^{22}\). In the present study, CHLO-SITE gel was used as an adjunctive to scaling and root planning, resulting in greater reduction of periodontal pocket depth from 5.48mm at baseline to 2.49 mm at 12 month intervals in the side treated with scaling and root planning plus CHLO-SITE gel compared to from 5.44mm to 2.54mm in the side treated with scaling and root planning alone. These results can aid support to the previous findings.\(^{22,23}\). In this respect, CHLO-SITE group showed slightly higher clinical attachment level gains and periodontal pocket depth reduction than the scaling and root planning group, but these differences were not statistically significant due to the low number of cases.\(^{23}\).

In the present study the comparison between the side treated with scaling and root planning plus CHLO-SITE gel and the side treated with scaling and root planning alone a significant improvement in all clinical indices, after 3, 6, 9 and 12 month from treatment in both sides were noted. However, scaling and root planning plus CHLO-SITE gel treated side resulted in slightly higher improvements in Gingival Index, Plaque Index, Periodontal pocket depth reduction, Clinical attachment gains, and Periodontal Index than the side treated with scaling and root planning alone. These findings, again, are in agreement with that of Piccolomini et al, and Stratul et al,\(^{23,24}\), but not with others.\(^{25,26}\).

Previous studies have tested the efficacy of chlorhexidine at 1% concentration in the treatment of chronic periodontitis. Unsal et al have reported that clinical and microbiological benefits can be achieved when subgingival administration of chlorhexidine gluconate was used as an adjunct to scaling and root planning compared to scaling and root planning alone. Similar results were obtained by Fine et al upon applying subgingival irrigation of chlorhexidine in treatment of periodontal diseases. Piccolomini et al have reported clinical and microbiological benefits after subgingival administration of chlorhexidine gluconate as an alternative to scaling and root planning. In the present study microorganisms were reduced after application of CHLO-SITE gel and after scaling and root planning alone but the reduction of microorganisms was highly significant in scaling and root planning plus CHLO-SITE gel side when compared to the side treated with scaling and root planning alone.

References


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تقييم التطبيق الموضعي للمادة الكلوريسيلن (كلوروسيد الأدرين جل) في معالجة الانتهاب المزمن للأنسجة حول السنية

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تعتبر حالة الانتهاب المزمن للأنسجة حول السنية إحدى الأمراض المزمنة الخطيرة في منطقة اللثة (الطب البكتيري) والتي تتواجد عادة فوق وتحت اللثة مسببة لشلل الجيوب حول السنية وانتشار العظام وتداخل الدعام السنوي.

وقد اعتمدت هذه الدراسة على استخدام الجيوب حول السنية المفتوحة وتسوية الجيوب، ومن ثم تطبيق مادة الكلوريسيلن الموضعي على جانب واحد فقط من الفم ومقارنته بالطرف الآخر.

تم إجراء هذه الدراسة على (15) سمية عشر مريضاً من المرضى الذين يتراوح عمرهم من 30 إلى 50 سنة، حيث تم تقدير تعرضهم لأمراض مزمنة، وقد تم اختيارهم من خلال تقييم الفحص الإكلينيكي والبكتيري. تأثر التطبيق الموضعي للمادة الكلوريسيلن (كلوروسيد الأدرين جل) في حالة الانتهاب المزمن للأنسجة حول السنية، حيث وجدت الدراسة أن تأثير المنتج متفاوت حيث يتمتع بتأثير سلبي على الجيوب حول السنية في كل الجوانبين، وتحسن في حالة انخفاض في التهاب الأنسجة (البلجك) والتهاب اللثة وانخفاض في خلايا الجيوب حول السنية في كل الجوانبين.

وقد أظهرت النتائج المستخدمة من هذه الدراسة ممنيعية: هناك تحسن في النتائج الإكلينيكي بين الجانبين، ولكنها ضعيفة ونادرة، لتشكل النتائج التي تطبق فيها النتائج الموضعي.

أظهرت النتائج البكتيري أن هناك تأثير قياسي للدرء الموضعي على البكتريا المسببة للالتهابات حول السنية. أكثر من تأثير عملية إزالة الجيوب وتسوية الجيوب فقط.