

## Efficacy of Intra Periodontal Pocket Application with Combined Chlorhexidine and Hydrogen Peroxide on the Bleeding on Probing and Anaerobic Bacterial Viable Count

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### ABSTRACT

**Introduction:** Periodontal pocket is a pathologically deepening of gingival sulcus along with subgingival contamination of hard and soft tissues. Scaling and root planning is an effective treatment in addition to supra gingival plaque managing. Many studies show that the adjunctive use of sub gingival antimicrobial agents with scaling and root planning resulted in improvement clinically and microbiologically.

**Aim:** To determine if scaling and root planning alone or in combination with 0.2% chlorhexidine and 3% hydrogen peroxide gel (Glucosite gel) have a significant effect on total viable count of anaerobic bacteria and bleeding on probing.

**Materials and methods:** A total 136 periodontal pockets of 20 patients of both sexes aged from 35 to 50 years which have at least two periodontal pockets ranged from 5-6 mm on each side participated in this study, treated with split mouth technique. One side treated via scaling and root planning only, while the other side combined with glucosite gel. Bleeding on probing and total viable anaerobic count was recorded at day zero and after 4 weeks. With exclusion patients who were pregnant, smokers, had systemic diseases or who on orthodontic or periodontal treatment. SPSS for windows was used for data analysis.

**Results:** Glucosite gel adjunctive to scaling and root planning reduced significantly bleeding on probing and subgingival viable anaerobic bacteria in comparison to scaling and root planning alone.

**Conclusion:** Applications of glucosite gel subgingivally in combination with scaling and root planning have additional effects on clinical and microbiological periodontal outcomes.

**Key words:** Impacted mandibular third molars, Surgical difficulty, Postoperative inflammatory response

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### INTRODUCTION

The primary treatment of chronic periodontitis involving supra and sub gingival plaques removing along with scaling and root planning (SRP) to reducing a load of periodontal pathogens [1], this local treatment has a considerable limitations, as that impossible to eradicate whole subgingival bacteria from an infected sites mechanically [2] and modification of subgingival microorganisms occur after scaling and root planning [3] and viable microorganisms which

survive after SRP re-colonize, resulting in new formation of biofilm [4]. So that, an antimicrobial agents have been developed as an adjunct to SRP to improve mechanical instrumentation effectiveness and prevent plaque regeneration which lead to minimizing clinical features of periodontal disease [5,6].

Chlorhexidine (CHX) is a potent anti-bacterial, anti-fungal and anti-viral agent which used broadly [5]. According to its concentration, it can be bacteriostatic or bactericidal. The CHX substantively is the main important special feature [7]. Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) is an oxygenating material has a wide range of anti-microbial activity [8] along with action of disturbing biofilm *via* intensifying the oxygen

saturation subgingivally [9], accordingly, effect on pro inflammatory cytokines fabrication within periodontal pockets. [10]. Oosterwaal, et al. concluded that the CHX gel can be diminished microbial load inside periodontal pockets by 99% during thirty minutes following application [11]. Paolantonio, et al. found that the SRP accompanied with CHX gel ending in a significant improvement in outcomes clinically [12]. On the other hand, some studies [13,14] showed that using localized anti-microbial releasing systems look to be advantageous more than SRP alone in managing periodontal pockets. In many studies [15-21], hydrogen peroxide and chlorhexidine were used separately and conflicting outcomes were found, therefore we have carried out this study to assess the effectiveness of glucosite gel which contains a combination of chlorhexidine 0.2% and hydrogen peroxide 3% as an adjunct to SRP, and to compare these treatment modalities with the results obtained by SRP alone.

#### AIM

To provide additional data on the clinical and microbiological effect of combined (CHX and H<sub>2</sub>O<sub>2</sub>) gel when used as adjunct to SRP.

#### MATERIAL AND METHODS

Glucosite gel from Cerkamed medical company containing chlorhexidine 0.2% and hydrogen peroxide 3%. The activity of the glucosite gel was assessed microbiologically by agar well diffusion method in comparison with chlorhexidine and hydrogen peroxide separately and larger inhibition zones for glucosite were recorded (Figures 1 and 2) [22].

#### Subject selection

Twenty male and female subjects of 35-50 years old, from the department of Periodontology, in the specialized dental center in Missan, enrolled voluntarily and well explained about the aim and purposes of the study and given informed consent to participate in it, each patient treated with split mouth technique, the left side which included 68 periodontal pockets treated with SRP combined with glucosite gel application. While the right side which also included 68 periodontal pockets treated with SRP only. The method of split mouth had a benefit of variables removing among subjects. They were subjected to a questionnaire, including medical, dental and social history, followed by full examinations of clinical periodontal parameters of inflammation:

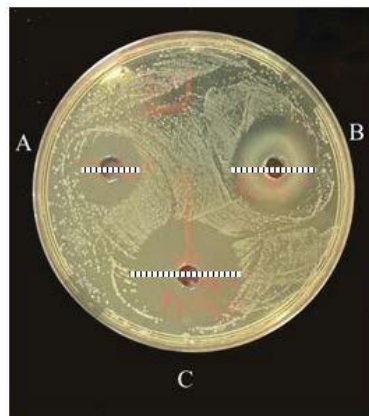


Figure 1: Susceptibility of total anaerobic subgingival bacteria to chlorhexidine, hydrogen peroxide and glucosite. A: H<sub>2</sub>O<sub>2</sub> alone, B: CHX alone, C: Glucosite.



Figure 2: Glucosite gel.

Plaque index (PLI) and bleeding on probing (BOP).

#### Exclusion criteria

- Patients that undertaken periodontal treating in three months just preceding the study, as well as patients has appliances of orthodontic.
- Patients suffering from systemic diseases, which may have an impact on the periodontium.
- Uncooperative patients who failed to preserve proper oral hygiene.
- Current pregnancy or lactation.
- Patients on antibiotics and/or anti-inflammatory drugs during the last 3 months.
- Patients allergic to CHX and/or H<sub>2</sub>O<sub>2</sub>.
- Smokers as well as alcohol drinkers.
- Teeth with fixed crowns or bridges and sites with furcation involvement.

#### A. Sequence of the study subject/ ite selection

Before baseline examination, full mouth supragingival scaling with ultrasonic scalar was done, motivation and oral hygiene instructions were given, concerning instruction in brushing

and the use of appropriate interdental cleaning aids until the oral hygiene status reached to mean PLI less than (0.8). All selected sites with periodontal pocket depth 5 to 6 mm.

#### B. Clinical periodontal parameters recordings

1. Assessment of (PLI): Löe 1964 [23].
2. Assessment of (BOP) [24].

#### C. Subgingival biofilm sampling

Isolation of treated sites with sterile cotton rolls and removing supragingival plaque using sterile curette, and dried with air. Sampling undertaken by sterile paper point (size F1 dents ply millefer) which pushed into deepest part of pocket for 15 seconds carefully to avoid mechanical injury (Figure 3) [12].

#### D. Microbiological procedure

The plaque sample (paper point) immersed in glass universal tubes containing 3 mm glass beads and 10 ml of phosphate buffer saline and vortexed by vortex mixer for 2-3 minutes. Afterward, serial dilution steps were prepared using sterile phosphate buffer saline; 0.1 ml was withdrawn from each dilution (10<sup>-3</sup>, 10<sup>-5</sup>) and spread into the petri dishes that contained brain heart infusion agar using sterile microbiological spreader on the plates. Followed by incubation



Figure 3: Subgingival plaque sampling.



Figure 4: Incubator for incubation anaerobic bacteria with gas pack in an anaerobic jar.

anaerobically with gas pack supplied in an anaerobic jar for 48 hrs at 37°C (Figure 4 ) [22].

**E. Intrapplication of glucosite**

After SRP performed under local anesthesia for the selected sites, glucosite gel applied gently subgingivally in left periodontal pockets until flowed out from the gingival margin, three times during ten minutes [25].

**STATISTICAL ANALYSIS**

Data were analyzed using SPSS software version 23 release in 2019. Shapiro-Wilk test was used to check the normality of the data. The statistics used were descriptive along with inferential (p<0.05) considered significant in the statistical evaluation.

**RESULTS**

Table 1 illustrates the mean percentage of bleeding on probing at zero time and after one month and statistical differences between them for each side. The mean percentage at baseline was (77.985), (73.48) while after one month became (47.975), (22.995) for right and left sides respectively and the results were found to be of highly significant difference for both sides (P<0.01).

Table 2 show the statistical difference of bleeding on probing among right side (SRP) and left side (SRP with glucosite) after one month of treatment. The means percentage were (47.975), (22.995) for right and left sides respectively and the results were found to be of significant difference (p<0.05).

Table 3 demonstrate mean, median, SD, minimum and maximum of anaerobic bacterial viable count (CFU\ml) X 10<sup>3</sup> for right side (SRP) and statistical difference between visits. The mean at baseline was (25.16) while it became (11.65) after one month of treatment and the results were found to be of highly significant difference (p<0.01).

Table 4 demonstrate mean, median, SD, minimum and maximum of anaerobic bacterial viable count (CFU\ml)×10<sup>3</sup> for left side (SRP with glucosite) and statistical difference between visits. The mean at baseline was (23.715) while it became (1.495) after one month of treatment and the results were found to be of highly significant difference (p<0.01).

Table 5 illustrates intergroup comparison of anaerobic bacterial viable count (CFU\ml) X 10<sup>3</sup> between right and left sides after one month of treatment. The means were (11.65), (1.495) for

**Table 1: Statistical difference of bleeding on probing among visits in both sides.**

Variable	Side	No. of sites	Visit	Percentage (BOP)	z test	p- value
BOP %	Right (SRP)	68	Baseline	77.985	1.739	0.005 (HS)
			After one month	47.975		
	Left (SRP + glucosite)	68	Baseline	73.48	2.214	0.000 (HS)
			After one month	22.995		

HS=highly significant at P<0.01

**Table 2: The statistical difference of bleeding on probing among sides after one month treatment.**

Variable	no. of sites	Sides	percentage	z test	p value
BOP %	136	Right	47.975	1.423	0.035 (S)
		Left	22.995		

**Table 3: Descriptive analysis and intra group comparison of anaerobic bacterial viable count (CFU\ml) × 10<sup>3</sup> for right side (SRP).**

	Median	Mean	± S.D.	Min.	Max.	t-test	p-value
Baseline	22.838	25.16	9.45	14.92	49.36	5.644	0.000 (HS)
After one month	10.838	11.65	5	4.27	26.29		

HS=highly significant at P<0.01

**Table 4: Descriptive analysis and intra group comparison of anaerobic bacterial viable count (CFU\ml) ×10<sup>3</sup> for left side (SRP combined with glucosite).**

	Median	Mean	± S.D.	Min.	Max.	t-test	p-value
Baseline	21.19	23.715	8.445	13.45	47.27	11.222	0.000 (HS)
After one month	0.1425	1.495	2.661	0.095	8.605		

HS=highly significant at P<0.01

Table 5: Intergroup comparison of anaerobic bacterial viable count (CFU/ml) × 10<sup>3</sup> between right and left sides after one month of treatment.

Variable	t-test	Df	p-value
CFU anaerobic	4.804	38	0.000 (HS)

HS=highly significant at P&lt;0.01

right and left sides respectively and the results were found to be of highly significant difference (p<0.01).

### DISCUSSION

Local delivery agents offer the advantages of high concentrations at the target site with reduced dosage, fewer applications, and high patient acceptability. Thus, adjunctive use of local drug delivery may provide a beneficial response, especially in specific areas where conventional forms of therapy might fail [26].

The result of the present study showed that the clinical parameter (BOP) in addition to microbial results were improved significantly on day 30 as compared to zero day and a positive therapeutic role was achieved for both sides in the split mouth study. This decreasing in BOP scores in sites treated with combined SRP and glucosite, also its obvious in intergroup and intragroup levels and this comes in agreement with many studies where they study the effect of either CHX alone or H<sub>2</sub>O<sub>2</sub> alone. These studies including Heasman et al., Cosyn et al., Sahebjam et al., Gottumukkala et al., Deas et al., Lecic 2016. [21, 27-31].

The different in protocol and formulation of CHX might explain the variation with Paolantonio, et al. who reported that no significant effect of adjunctive use of CHX treatment with SRP [20]. The inter comparison between both sides in the split mouth study revealed that there were significant differences in microbiological outcomes after one month of treatment. This finding matched well with Rosling, et al. Nandini, et al. [32,33]. While disagree with Wennstrom, et al. who reported that irrigation with chlorhexidine or hydrogen peroxide did not induce any changes in total viable counts in periodontal pockets. This difference in results could be caused by protocol of study, intervals and measurements [17].

Since the high viscosity of a gel, one would expect a lower clearance of the active ingredient from periodontal pockets, thereby further promoting pharmacotherapeutic effects.

The antimicrobial effects of hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) have been studied both *in vitro* and *in vivo* and resulted that it released oxygen which has some bactericidal [16,34] at low concentrations, which has long been used as an oral debriding agent and wound cleanser, also has an extensive history of topical application in mouth rinses and antiseptic gels, with long-term safety record[35] besides altering the biofilm that result in reduced host inflammatory response [10]. Chlorhexidine (CHX) it is a broad-spectrum bactericidal agent. Its propensity to bind to the surface of tissues offers a long-lasting antimicrobial effect causing reduction in pellicle formation, alteration of bacterial adherence to teeth [36]. Shahriari, et al. confirmed the synergistic effect between chlorhexidine and hydrogen peroxide [37].

### CONCLUSION

The results of the study indicated that SRP with glucosite or SRP alone improved clinical and microbiological outcomes. Glucosite gel as an adjunct to scaling and root planning significantly reduced bleeding on probing and total viable anaerobic bacteria when compared with scaling and root planning alone.

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