



ORIGINAL ARTICLE

A comparative study on the effect of 0.2% Chlorhexidine mouthwash and 0.2% Chlorhexidine gel on gingivitis and plaque Accumulation

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ABSTRACT

Gingivitis is the most common type of periodontal disease, established by local factors such as bacterial plaque; and is reversed by thorough mechanical and chemical plaque control. One of the chemical agents used to control plaque formation is Chlorhexidine (CHX), which has been used in mouthwash or gel forms, but the efficacy of these two application methods is still under debate. Thus, the aim of this study was to evaluate and compare the clinical efficacy of these two forms. This study was performed on 24 patients with gingival index(GI)=2. Patients were divided into two groups according to receive gel or mouthwash. At baseline, Scaling was performed on both groups, and then a two-week period was spent before measuring plaque indices (PI), Gingival Bleeding Indices(GBI) and gingival indices(GI). After this period, the groups received either gel or mouthwash, and after 4 weeks, indices were recorded again. Repeated measures and paired t-test was used to compare indices in one group in different sessions and between two groups respectively. Statistical package for the Social Science (SPSS V.16) was used and a $p < 0.05$ was considered statistically significant. Both gel and mouthwash groups showed an improvement in all indices during treatment compared to baseline ($p < 0.05$). No significant difference in GI, GBI or PI was observed between two groups ($p > 0.05$). This study showed that both methods of using chlorhexidine (gel or mouthwash) are effective in reducing plaque and gingival indices, but none of these two methods has any preference against the other one.

Key words: Bacterial disease, Chlorhexidine, Dental plaque, Gingivitis, Gel, Mouthwash.

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INTRODUCTION

Gingivitis is an irreversible inflammatory reaction in gingival tissue [1]. It's one of the most common type of known human diseases in the oral cavity, and epidemiologic studies indicated that more than 82% of U.S. adolescents have obvious gingivitis and symptoms of gingival bleeding, a similar or higher prevalence of gingivitis is reported for children and adolescents in other parts of the world, and other populations have shown even higher levels of gingival inflammation [2].

There are several systemic and local factors, that influencing health of periodontium, such as systemic disorders and dental plaque. Inadequate control of plaque leads to gingivitis within 1-2 weeks, which is reversible by regular mechanical and chemical plaque control methods such as tooth brushing and usage of CHX mouthwashes[3].

Microbial plaque has a key role in pathogenesis of periodontal diseases, and periodontal diseases are mainly plaque induced bacterial infections (4,5). Plaque control and removal of bacterial biofilm are essential component in the prevention and treatment of gingivitis and periodontal diseases (6,7).

Mechanical supragingival plaque control by toothbrush, along with interdental floss, are the most common mechanical methods for remove bacterial plaque and prevent periodontal diseases; for most people, however, removing total plaque with these methods have a some limitations, such as: most people remove less than half of the plaque with brushing once a day, leaving approximately 60% after brushing which is responsible for rapid re-growth of microbial plaque, thus, use antiseptics is strongly

recommended as a valuable adjunct to mechanical plaque control, and CHX is considered as one of the most effective agents, that used to prevent plaque formation(8-15).

CHX is present in the oral cavity several hours after application, which can makes it a useful agent for prevention of plaque regrowth and bacterial colonization(16,17).

CHX can be delivered in different methods, such as mouthwash, gel, dentifrice, and spray(18-24). Studies have shown various results about the efficacy of different methods of CHX administration, especially gel and mouthwash (8,11, 18-22, 25-27). Thus the purpose of this study was to compare and evaluate the efficacy of 0.2% chlorhexidine gel with 0.2% chlorhexidine mouthwash on gingivitis.

MATERIAL AND METHODS

In this study the subjects were, 24 dental students (18 males and 6 females) with aged 19- 25 years old (median age=21 years and 5 months). All procedures were approved by Ethics Committee of the School of Dentistry of Kerman Medical University, Kerman, Iran (Ethics code: K-A/90/230).

Inclusion criteria were adult patients with GI=2, older than 18 years old, systemically healthy, and having at least 20 teeth. The exclusion criteria were, patients with periodontal pockets larger than 3mm, activated caries, orthodontic appliances or removable prostheses, smoking, allergies to erythrosine or CHX, use of antibiotics in the past 3 months and use other drugs that might alter normal gingival health. The subjects did not receive any medication or periodontal treatment in the last 1 year.

At the first stage, 60 subjects were examined by a periodontist, to minimize heterogeneity, those with GI=2 were entered in the study and 24 of the students were eligible to participate in the study.

Before enrolment, all subjects were given oral and written instructions as well as the information about products and purpose, aim, reason, duration, and possible harm of study procedure, and all subjects signed an informed consent form prior to the study procedures. Protocol was designed as one-side blinded, so that three visits of each participant was made by a periodontist which was blind to methods of CHX administration, and following parameters were assessed at each visit: Gingival Index (GI) (Loe and Silness, 1967), Bleeding Point Index (BPI) (Lenox, 1973), Plaque Control Record (PCR) (O'Leary Index, 1972).

Measurements were performed under standardized conditions and at the same time of day in Department of Periodontics, Kerman Dental School, Kerman, Iran. At the baseline Visit (visit 1), 14 days before the first administration of the study products, subjects were examined using Gingival Index (GI), Bleeding Point Index (BPI), and Plaque Control Record (PCR). Participants received a professional full mouth scaling with using an ultrasonic scaler (VGE 3025 K). All subjects received similar oral hygiene instructions and then a 2-weeks period was spent before using CHX agents, in which participants were asked to practice a high standard of mechanical plaque control at home. They were instructed to maintain their regular oral hygiene habits and were supplied with the same tooth brush (royal expert, UK), toothpaste (crest 7, US) and dental floss (G.U.M, US). The technique for tooth brushing was bass with scrub on occlusal and buccal surface.

On day 14, after baseline (visit 2), subjects were clinically examined again, and Gingival Index (GI), Bleeding Point Index (BPI), and Plaque Control Record (PCR) were assessed by the same periodontist. Each subject received a unique trial number and was assigned by a simple randomization method to one of two regimens groups: One group received twice-daily applications of 0.2% CHX gel (Perio-Kin gel, Barcelona, Spain) and the other group received two-daily applications of 0.2% CHX mouthwash (Nazho, IRI). Gel was applied twice daily for 2 minutes, using tooth brush, and mouthwash were used twice daily, 10 ml each time for 1 minute (19). Instruction on how to use the study products was explained to participants by an individual who wasn't involved in examination procedure and subjects started using allocated study products on the same visiting day for next 6 weeks. At the final visit (visit 3), 6 weeks after administration of products, the subjects were examined again and assessment of three indices were performed again. In case of mucosal erosion or parotiditis, subject cut the usage of gel or mouthwash and was excluded from the study. If the subjects took any medications, especially antibiotics, which could influence gingival condition, they were excluded from the study. In addition, using any analogous concomitant medication was not allowed.

Repeated measures was used to compare indices in one group during different sessions, t-test was used to compare two groups in different sessions. $p < 0.05$ was considered statistically significant.

RESULTS

Table 1 shows the means of GI, GBI and PCR for each type of CHX regimens at baseline, visit 1 and 2. No statistically significant differences were found between groups at baseline (Visit 1) ($p < 0.05$).

At visit 2, there was a significant decrease in means of GI, GBI, and PCR in both groups, compared to baseline ($p < 0.05$). A significant decrease was also observed in the week 6 compared to baseline ($p < 0.05$).

No statistically significant differences were found between two groups at visit 2 and 3 in GI, GBI, and PCR means when we compared intergroup changes from baseline to the weeks 6, showing no significant differences between two methods of CHX administration ($p>0.05$).

No adverse reaction such as gingival irritation or other comments regarding the use of CHX mouth rinses and gel were reported by participant or investigators during the whole study.

Legends:

Table 1- Mean values (\pm standard deviation) of GI, GBI, and PCR at baseline, visit 1 and 2

	Index	Baseline (visit 1)	Visit 2	Visit 3
Gel	GI	2 (0.00)	1.58 (0.1)*	1.15 (0.07)*
	GBI	0.7 (0.05)	0.42 (0.04)*	0.15 (0.05)*
	PCR	0.52 (0.09)	0.29 (0.05)*	0.15 (0.04)*
Mouthwash	GI	2 (0.00)	1.59 (0.07)*	1.14 (0.05)*
	GBI	0.61 (0.12)	0.37 (0.06)*	0.12 (0.03)*
	PCR	0.54 (0.06)	0.32 (0.03)*	0.16 (0.04)*

GI (Gingival Index), GBI (Gingival Bleeding Index), PCR (Plaque Control Record)
(* $p<0.05$, compared to baseline)

DISCUSSION

This study was performed to compare the effect of 0.2% CHX gel VS 0.2% CHX mouthwash on gingivitis. We have shown that gel and mouthwash decrease gingivitis significantly. To evaluate plaque and gingival inflammation, following indices have used: GI, GBI and PCR. CHX gel reduced GI, GBI and PCR by 27%, 64% and 48% respectively; mouthwash showed the same effect on these indices (28%, 68% and 50% reduction in 3 indices).

Several studies have been done on the effect of mouthwash on gingivitis and dental plaque, and efficacy of this agent in reducing gingivitis and plaque has been well established (11-15). Furthermore, there are other methods for usage of CHX such as gel, and several studies have been performed to evaluate the efficacy of this method in decreasing gingivitis and dental plaque (18-24).

In a study performed by Pannuti (2003), he showed that 0.5% CHX gel has prominent impact on decreasing gingival bleeding. Our study is different from his results, since he assayed mental disabled patients who have problems with their oral health, and applying gel was performed by an oral hygienist (25).

Slot, *et al.* (2007) in a study about the effect of 0.12% chlorhexidine dentifrice gel on plaque accumulation in a 3-day non-brushing model showed that 0.12% CHX gel can reduce dental plaque, which is consistent with our findings (18). We showed a robust effect of CHX gel on plaque reduction, which might be due to the confounding effect of tooth brushing, which has been mentioned before by Slot and *et al.* (18).

CHX gel was effective in reducing gingivitis, which is consistent with Jamilian's, *et al.* (2008). Jamilian used consensus 2% gel, which is 10 times stronger than 0.2% perio-kin, which was used in our study. He used first molars, which were being treated for orthodontics problem, and SRP was not performed. He administrated CHX gel to the patients for 12 weeks, and a significant decrease was observed in gingival inflammation (26).

Our results are consistent with Yvenes's study (2009); he showed that gel and mouthwash of CHX can decrease dental plaque, but none of usage methods has a prominent advantage over the other one. He used Colutori gel in his study, which is a combination of 0.1% CHX with 2.5% hydroxy methyl cellulose with no alcohol and showed that effectiveness of this gel is as much as 0.12% CHX on dental plaque formation, and it was better than 0.05% CHX in avoiding plaque formation. CHX concentration and formulation were different between our study and Yvenes's, but both showed a decrease in dental plaque and gingival bleeding after usage (27).

Our study unlike previous ones, evaluated dental plaque simultaneous with gingival inflammation, and we showed that both forms of CHX have profound effect on dental plaque formation in a 6 week period (gel: 48%, mouthwash: 50%; decrease in PCR).

This study is consistent with previous ones (8, 11, 18-22, 25-27), and besides showing the effect of gel and mouthwash of CHX on gingival inflammation and plaque formation, we showed that both forms of CHX are effective and no significant difference exists between these two forms.

CONCLUSION

Within the limits of this study, we showed that usage of CHX mouthwash and gel reduce PCR, GI and GBI significantly, but no significant difference exists between gel and mouthwash. Thus, this study showed that CHX usage can reduce gingival inflammation and dental plaque, but this effect is not depended upon the method of usage, and Perio-kin gel is as much effective as CHX mouthwash in diminishing gingival inflammation.

CLINICAL RELEVANCE

Chlorhexidine is an agent used to control gingivitis and plaque formation, it can be used in different forms such as mouthwash and gel.

Efficacy of CHX to control gingivitis have been studied before, but various results have been demonstrated, therefore, we compared the efficacy of 0.2% CHX mouthwash with 0.2% CHX gel on gingivitis and plaque accumulation in a single blind RCT.

Results showed that both of these forms provide significant reductions in gingival indices and plaque accumulation, but no significant difference found between mouthwash and gel. The clinically detectable difference in performance of these two products was probably negligible.

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Conflict of interest

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