Efficacy of 0.2% tempered chlorhexidine as a subgingival irrigant in chronic periodontitis: A randomized control trial

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Abstract

Introduction: Chlorhexidine (0.2%) has been considered to be clinic effective against supragingival plaque formation. It is considered as a gold standard for chemical plaque control and can reduce plaque scores effectively at different temperature, concentration and pH.

Aim: To investigate the efficacy of tempered chlorhexidine over conventional 0.2% chlorhexidine as a subgingival irrigant in reduction of periodontal parameters and bacterial count.

Materials and Methods: A randomized control clinical trial as conducted at I.T.S dental college, Muradnagar, Ghaziabad, India in which 20 systemically healthy patient's sites having chronic periodontitis with pocket depth of 4-6 mm were included. Group I(test group)- ultrasonic scaling and root planning followed by tempered 0.2% chlorhexidine irrigation (maintained at 47 degree centigrade) for 20 secs at 10 sites and Group II (control group)- ultrasonic scaling root planning followed by 0.2% chlorhexidine irrigation for 20 secs at 10 sites. Plaque index (PI), gingival index (GI), probing depth (PD) were recorded and plaque samples was taken for the count of colony forming units (CFU) on blood agar at baseline and after 21 days. The statistical analysis was done by indepentent t-test.

Result: The results showed that CFU& PI in group I were significantly reduced when compared to group I with, $p<0.005$ (Independent t - test).

Conclusion: Tempered chlorhexidine is a better alternative as an anti-plaque subgingival irrigant and can be preferred over cold chlorhexidine at 0.2% concentration.

Keywords: Anti- plaque agents, Biofilm, Chlorhexidine digluconate.

Introduction

Periodontitis is an opportunistic infection that leads to immune-inflammatory response. It is caused by an imbalance in the virulence factors of pathogenic micro-organisms and host defense mechanisms. It can bring deleterious changes in the supporting periodontal tissues of the teeth.[1] The micro-organisms in bacterial plaque comprises of a decisive etiological factor that aids to the origin and development of dental caries in inflammatory periodontal disease. The major role of the periodontal therapy has been to eliminate the dental plaque associated with the tooth surface consisting of the pathogenic micro-organisms. Mechanical therapy to remove the dental plaque associated with the tooth surface consists of "Scaling and Root Planning" (SRP).[2]

Scaling and Root Planning is considered as a standard procedure for the treatment of periodontal disease. It reduces the bacterial load and results in a delay in repopulation of pathogenic microorganisms by disrupting the subgingival biofilm.[3]Substantial variations in its effectiveness can be because of the inability of the dentist to gain access into deep and tortuous pocket and bacterial invasion into gingival and dental tissues. This drawback of SRP has led to associated use of antimicrobial agents usually in the form of local or systemic antibiotics. These systems allow the therapeutic agent to be targeted to the disease site. The dose can be minimized by reducing the systemic absorption and lessening the risk of adverse side effects.[4]Chlorhexidine is still recognized as the ''gold standard'' for chemical plaque control has a broad spectrum antibacterial effect against gram-positive as well as gramnegative bacteria, yeasts, dermaphytes, some lipophilic viruses and the prolonged substantivity.[5] Likewise, Bonesvoll et al investigated the influence of concentration, time, temperature, and pH of 0.2% chlohexidine rinse in the oral cavity. The investigation showed no significant increase in retention of the parent chemical in the oral cavity on altering the temperature from 22°C to 60°C. Though the rate of chemical reaction was said to have increased with increase in temperature it was shown that tempered chlohexidine has more antimicrobial effect than the non-tempered counterpart.[6] Hence, with the conflicting literature on the efficacy of tempered chlorhexidine, an attempt was made in the present study to compare and determine efficacy of 0.2% tempered chlorhexidine as a subgingival irrigant on patients with chronic periodontitis.

Materials and Method

The study was a simple randomized control clinical trial in vivo study conducted for a period of 21 days, on September 2016, in the department of periodontics, I.T.S Dental College, Hospital, Muradnagar, U.P, India, after getting ethical clearance from the Institutional Ethical Committee. The sample size was confirmed by pilot study on six patients (three case and three control). The Mean ± S.D, the reduction of PI between preoperative and postoperative procedure for control and case were (0.455 ± 0.201) and (0.76 ± 0.233) respectively. For 5% α- error and power 80%, confidence interval – 95% with the help of G-power analysis version 3.1.9.2 the effect size was 1.401 and the sample size for each group was 10.[7]

The patients were selected for this study on the basis of the following criteria:

1. Age range 18-60 years.
2. At least 8 surfaces per mouth with pocket depth 4-6 mm, bleeding on probing, but no unusual or severe forms of periodontitis.
3. No relevant medical history.
4. Female patients neither pregnant nor receiving oral contraceptives.
5. Patients with informed written consent.

Patients with the history of treatment for moderate to severe periodontitis in past six months, systemic diseases, and who were on systemic antibiotics were excluded from the study.

Hence, the study was conducted on 20 systemically healthy subjects who visited the department and were randomly allocated into two groups using coin toss method:

Group I (Test group)–ultrasonic scaling and root planning followed by tempered 0.2% chlorhexidine irrigation (maintained at 47 degree centigrade) for 20 sec at 10 sites.

Group II (Control group)–ultrasonic scaling root planning followed by 0.2% chlorhexidine irrigation for 20 sec at 10 sites.

Preparation of Tempered Chlorhexidine

The tempered chlorhexidine used in the study was made by placing of chlorhexidine solution in thermostatically regulated water bath whose temperature was kept constant at 47ºC.The temperature of 47º*C* was selected since this is the temperature where neither painful sensations nor permanent pulpal damage have been observed.[2]

Microbiological Procedure

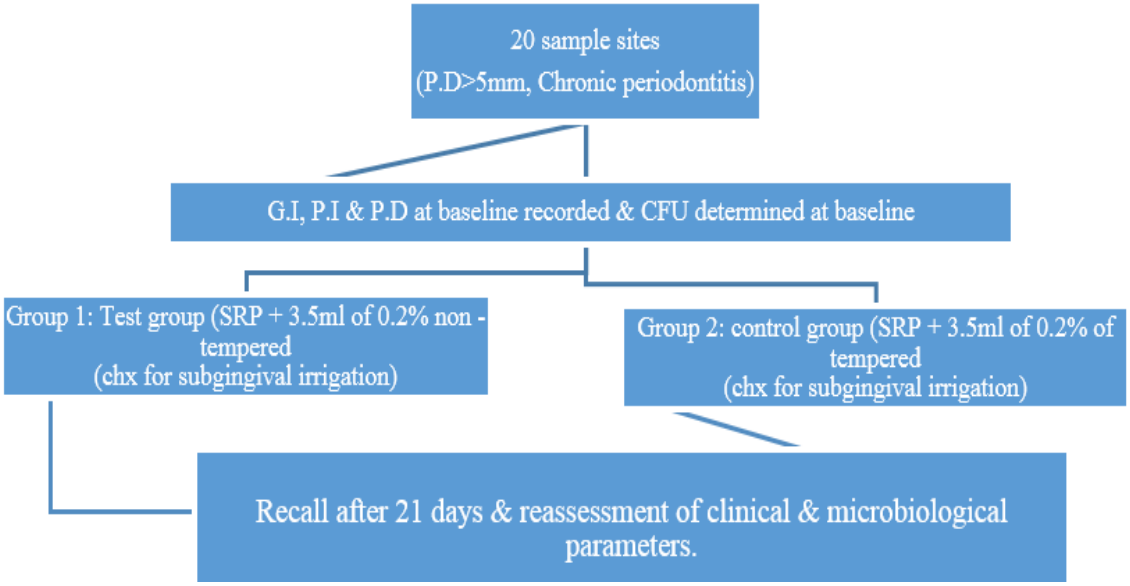
After superficial cleaning of the sites with cotton pellets and drying the supragingival area with stream of air, samples were taken with the help of curettes and each sample was aseptically transferred to 4.5 mL of Phosphate Buffer Saline (PBS) and immediately dispersed using a vortex mixer at maximal setting of 60 seconds. The dispersed sample was diluted in 0.2 mL portion of 10^{-3} dilution was spread on a solid blood agar medium using cotton bud and incubated for 24 hours and were inspected for the number of bacterial Colony forming units (CFUs). In the present study, we were only assessing the number of bacteria in the taken plaque sample and not the type of bacteria, and the collected data was statistically analyzed.[8]

Clinical Parameters

Clinical measurements were performed at the selected teeth that were assessed for microbiological variables. The measurements included Plaque index (PI) as described by Sillness and Loe H.(1964),[10] Gingival index (GI) as described by Loe H. and Sillness (1963)[9] and pocket probing depth using UNC 15 probe.

Plaque index, gingival index, probing depth were recorded and plaque samples were taken for the count of colony forming units on blood agar at baseline and after 21 days.

Flowchart 1: Study design (GI – Gingival index, PI – Plaque index, PD – Probing Depth, CFU – Colony Forming Unit)



Statistical Analysis

All the data was collected and analyzed. The statistical analysis was done by statistical software SPSS version 16.0. The descriptive statistic mean and SD of different parameters at different time interval of two groups were calculated, the significance of mean, mean difference of a parameter at 2 intervals was tested by t-test for two independent groups. Since CFU in two groups at pre and post have high standard deviation, so the data for CFU transformed in Logarithm base 10 and log transformed t test has been used. The confidence interval and level of significance were 5% and 95% respectively.

Fig. 1: 4 – 6 mm of probing depth

Fig. 2: Collection of plaque sample from the site

Result

The distribution of pre and post mean ± S.D, differences in the both and p-values in the case and control groups for PI,GI,PD and CFU is discussed in Table 1.

The distribution of pre PI, pre GI, pre PD, and pre CFU of mean ± S.D of control group and case group are 1.9500 ±.53748 and 2.3750±.58035, 1.8600 ±.42674 and 1.7250 ± .24861, 4.6250 ± .64818 and 4.5450 ± .63309, 2.1363±.35242 and 2.2655±.20063 respectively and by t-test we have found no significant difference between the means of pre PI, GI, PD and CFU of case and control.

The distribution of post PI, post GI, post PD, post CFU mean ± S.D of control group and case group are 1.4750 ± .41583 and 1.6250 ± .54327, 1.275 ±.21890 and 1.2250 ±.27513, 4.4000 ±.63683 and 4.0000 ±.63465, 2.0375 ±.30627 and 2.1263 ±.19023respectively by t- test we have found no significant difference between the means of post PI, GI, PD, CFU of case and control.

Discussion

Regular home care by patients in addition to professional removal of plaque generally ensures adequate plaque and gingivitis control in healthy adults. It has been estimated, however, that even in developed countries, only a minor part of population can be expected to practice adequate mechanical plaque removal.[11] Moreover, dental plaque reforms within hours and days after its removal. Therefore, the application of antimicrobial agents are useful adjuncts to mechanical oral hygiene procedure.

In the present study subgingival irrigation with tempered chlorhexidine mouth rinse resulted in significant reduction in gingival inflammation parameters. The moderate gingival inflammation parameter reduction in Group II showed a potentially positive effect of chlorhexidine as a subgingival irrigant. The effect, however was significantly lower than that with a tempered chlorhexidine subgingival irrigant.

The result of the present study showed a reduction in PI, GI, PPD and CFU for the two groups over a period of 21 days. The observed reduction in the PI score may be attributed to a subconscious motivation by the study participants to intensify their oral hygiene habits.

Perinetti et al,[12] applied a 1% CHX gel weekly resulting in significant reductions of PD and CAL by comparison with the baseline. These findings are in accordance with earlier studies dealing with repeated subgingival irrigation using CHX solutions.[13,14]

Fine et al observed both a significant reduction in plaque accumulation and in gingival inflammation following subgingival irrigation with an antimicrobial mouthrinse.[15]

Table 1: Comparison of means of different parameters at two intervals of case and control groups by t- test of two independent groups

Variable	N	Mean ± Std. Deviation (PRE)		Mean ± Std. Deviation(POST)		Mean difference of case and control groups		p-value difference
		Control	Case	Control	Case	Pre	Post	
PI		1.9500 ±.53748	2.3750±.58035	1.4750 ± .41583	1.6250 ± .54327	-.42500	-.15000	.021
GI		1.8600 ±.42674	1.7250 ± .24861	1.275 ±.21890	1.2250 ±.27513	.13500	.05000	.601
PD		4.6250 ± .64818	4.5450 ± .63309	4.4000 ±.63683	4.0000 ±.63465	.08000	.40000	.007
CFU		2.1363±.35242	2.2655±.20063	2.0375 ±.30627	2.1263 ±.19023	-30.200	-16.000	.148

Babay and AL- Jasser[16] and Asari et al[17] reported on a reduction in probing depth using subgingival irrigation with chlorhexidine. The tempered chlorhexidine as a subgingival irrigant influenced the assessed gingival inflammation parameters and the regime resulted in a significant reduction in probing depth.

Considering the results of the study the application of the tempered chlorhexidine investigated, in particular or in combination with mechanical plaque control can be recommended as an adjunct to daily oral hygiene procedures.

This study is not free of limitations. The study could have been undertaken for a longer duration of time and individual bacterial species have not been cultured or identified.

Conclusion

In the present study conducted, we found that 0.2% chlorhexidine had a significant effect as an antimicrobial subgingival irrigant in reducing the number of CFUs, probing depth, plaque index, gingival index. Though both tempered and non – tempered chlorhexidine were found to be effective irrigants in terms of reducing the bacterial load and other parameters the tempered chlorhexidine had a definite edge. Thus, it can be concluded from the above study that subgingival irrigant can significantly reduce the viable microbial content, probing depth, plaque index, gingival index in patients with chronic periodontitis and the tempered chlorhexidine is more effective when compared to non-tempered chlorhexidine.

Acknowledgement

This study was supported by Central Research Laboratory, I.T.S- C.D.S.R, Muradnagar, Ghaziabad.

Conflict of Interest: None.

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How to cite the article: Chowdhery T, Sharma B, Pal C, Gupta SJ, Sharma N, Dodwad VM. Efficacy of 0.2% tempered chlorhexidine as a subgingival irrigant in chronic periodontitis: A randomized control trial. *J Dent Specialities* 2019;7(1):19-22.