

CLINICAL BENEFITS OF SUBGINGIVAL CHLORHEXIDINE VARNISH AND GEL APPLICATION AS AN ADJUNCT TO SCALING AND ROOT PLANING

Harmeeta Buddhiraja,* Vivek Govila,** Archana Singh,*** Himani Vashishth †

*Senior Lecturer, Department of Periodontics, K D Dental College & Hospital, Mathura, Uttar Pradesh, India

**Professor & Head, Department of Periodontics, Babu Banarasi Das College of Dental Sciences, Lucknow, Uttar Pradesh, India

***Post Graduate Student, Department of Prosthodontics, Sardar Patel Post Graduate Institute of Dental & Medical Science, Lucknow, Uttar Pradesh, India

†Post Graduate Student, Department of Periodontics, Sardar Patel Post Graduate Institute of Dental & Medical Science, Lucknow, Uttar Pradesh, India

ABSTRACT

Background: Chemo-mechanical treatment concepts have been developed to improve the outcome of non-surgical periodontal therapy. The aim of the study was to investigate the effects of chlorhexidine varnish along with gel application when used as an adjunct to staged scaling and root planing in chronic marginal gingivitis. **Method:** It was a split mouth study in which 45 patients suffering from in age group 20-24 years with ≥ 20 teeth, who had inflamed gingiva which bled on probing and had been diagnosed with chronic marginal gingivitis, were selected for the study. Patients were randomly divided into three groups using split mouth technique to either Group A – Scaling and root planing (SRP) only-Maxillary left quadrant, Group B – SRP + chlorhexidine varnish + gel (Maxillary right quadrant) or Group C – chlorhexidine varnish + gel (Mandibular right quadrant). Chlorhexidine varnish (cervitec plus) application was carried out at the cervical margin of the tooth followed by daily application of chlorhexidine gel for 6 days. Varnish and gel were reapplied again for another week in Group B and Group C whereas in Group A only SRP was done. The clinical parameters plaque index and gingival index were analyzed at baseline, 1 and 2 weeks follow up. **Results:** After 2 weeks there was statistically significant reduction in all clinical parameters in group B as compared to group A and group C. Group A also has significant reduction in all clinical parameters as compared to group C. **Conclusion:** Results indicate that a varnish-implemented strategy together with scaling and root planing is more effective for the treatment of chronic gingivitis in comparison with SRP alone.

KEYWORDS: Chlorhexidine; dental scaling; gingivitis; root planing; varnish

INTRODUCTION

Gingivitis is a mixed infection caused by the presence of microorganisms in a susceptible host. Pathologic changes in gingivitis are associated with the presence of microorganisms attached to the tooth and in the gingival sulcus. Chemical control of plaque and gingivitis is effective as a complement or alternative to mechanical removal.^[1] Chlorhexidine (CHX) has proven efficacious for controlling plaque accumulation and gingival inflammation,^[2] even in elderly^[3] and

special-needs^[4] populations. Chlorhexidine can be applied in varnish form at high concentrations, and this method has demonstrated its capacity to control *mutans Streptococci* and dental caries.^[5] Although CHX varnishes have been associated with favorable short-term effects on plaque accumulation and gingival inflammation,^[5] only a few studies have assessed their medium or long term effects, with contradictory results. On the other hand, a three monthly application of 10% CHX varnish improved the gingival health of

adolescents at three month, nine and six months after treatment.^[7] Root dentine has been proposed to act as a CHX depot, slowly releasing CHX for upto 6 months after one application of Cervitec.^[7] Moreover, Cervitec treatment reduced gingival inflammation indicators in orthodontic patients by reducing the levels of inflammatory mediators.^[8] With this background, it was considered of interest to determine whether CHX–thymol varnish could benefit patients with chronic gingival inflammation. The present study was undertaken to investigate the clinical effects of chlorhexidine varnish along with gel application (to increase the efficacy of varnish applied) in chronic marginal gingivitis.

MATERIALS AND METHOD

A split mouth clinical study was conducted at the Department of Periodontics at Babu Banarasi Das College of Dental Sciences. Ethical approval was obtained from institutional ethics committee.

Inclusion criteria for the patient selection

- Patients in the age group of 20-24 years
- The presence of ≥ 20 teeth
- Each patient having inflamed gingiva which bled on probing

Exclusion criteria for patient selection

- Patients with any systemic illness (hypertension, diabetes etc.)
- Pregnant and lactating females
- Subjects wearing removable partial dentures or undergoing orthodontic therapy
- Patients using antimicrobial mouthwash in the past two weeks and those requiring periodontal surgery.

A total number of 45 patients were selected for the study. The duration of the study is for two weeks. The patients are then randomly divided into three groups: (Split mouth technique was followed) and each group contained 15 patients.

Group A – Scaling only-Maxillary left quadrant

Group B – Scaling + chlorhexidine varnish + gel (Maxillary right quadrant) and Group C – Chlorhexidine varnish + gel (Mandibular right quadrant).

Application of Chlorhexidine varnish

Chlorhexidine varnish (cervitec plus) application is carried out at the cervical margin of the tooth, to be followed by daily application of chlorhexidine gel for six days. Varnish and gel are reapplied again for another week in Group B

and Group C whereas in Group A only Scaling is done.

Data collection

The plaque index of Silness and Loe was used to assess the dental plaque accumulation and the gingival index of Loe and Silness, to measure gingival inflammation at baseline and after one and two weeks.

Statistical analysis

Mean and standard deviation were estimated from samples in each study group. Mean values were compared using Student's independent t-test and paired t-test wherever appropriate. For between groups and within group comparisons one way ANOVA was used. p value was considered significant at <0.05 and highly significant at <0.01 .

RESULTS

Table 1: At baseline the mean gingival indices were 2.81 ± 0.10 , 2.79 ± 0.13 and 2.79 ± 0.11 in group A, Group B and Group C respectively. On comparing the data at baseline statistically no significant difference was seen among groups ($p=0.871$). None of the intergroup comparisons revealed a statistically significant difference ($p>0.05$). Thus the groups were matched as regards GI at the baseline. After one week, the mean gingival indices were 1.74 ± 0.10 , 1.42 ± 0.10 and 2.17 ± 0.05 in Group A, Group B and Group C respectively. On comparing the data after one week, statistically highly significant differences were seen among groups ($p<0.001$). It was seen that Group A and Group C had significantly higher GI after one week as compared to Group B ($p<0.001$) while Group C had significantly higher GI as compared to Group A ($p<0.001$). After two weeks, the mean gingival indices were 1.31 ± 0.11 , 0.93 ± 0.11 and 1.89 ± 0.06 in Group A, Group B and Group C respectively. On comparing the data after two week, statistically highly significant differences were seen among groups ($p<0.001$). It was seen that Group A and Group C had significantly higher GI after two week as compared to Group B ($p<0.001$) while Group C had significantly higher GI as compared to Group A ($p<0.001$).

Table 2: At baseline the mean plaque indices were 2.78 ± 0.15 , 2.76 ± 0.15 and 2.71 ± 0.13 in Group A, Group B and Group C respectively. On comparing the data at baseline statistically no

significant difference was seen among groups ($p=0.395$). None of the intergroup comparisons revealed a statistically significant difference ($p>0.05$). Thus the groups were matched as regards PI at the baseline. After one week, the mean plaque indices were 0.54 ± 0.15 , 0.43 ± 0.07 and 2.19 ± 0.08 in Group A, Group B and Group C respectively. On comparing the data after one week, statistically highly significant differences were seen among groups ($p<0.001$). It was seen that Group A and Group C had significantly higher PI after one week as compared to Group B ($p<0.001$) while Group C had significantly higher PI as compared to Group A ($p<0.001$). After two week, the mean plaque indices were 0.61 ± 0.15 , 0.58 ± 0.10 and 1.93 ± 0.17 in Group A, Group B and Group C respectively. On comparing the data after two week, statistically highly significant differences were seen among groups ($p<0.001$). It was seen that Group A and Group C had significantly higher PI after two week as compared to Group B ($p<0.001$) while no significant difference was seen between Group A and Group C ($p>0.05$).

Table 3: For the period starting from baseline to one week, maximum mean reduction in Gingival index was observed for Group B ($49.09\pm 3.56\%$) while minimum was observed for Group C ($22.26\pm 3.34\%$). For the period starting from baseline to two week, maximum mean reduction was observed for Group B ($66.53\pm 4.97\%$) while minimum was observed for Group C ($32.32\pm 2.75\%$). For the period starting from one week to two week, maximum mean reduction was observed for Group B ($34.08\pm 9.88\%$) while minimum was observed for Group C ($12.83\pm 4.25\%$). Significant differences among groups were seen for all the time durations ($p<0.001$) when one way ANOVA was applied.

Table 4: Group A and C showed significantly lower percentage reduction as compared to Group B whereas Group C showed significantly lower percentage reduction as compared to Group A.

Table 5: For the period starting from baseline to one week, maximum mean reduction in plaque index was observed for Group B ($84.31\pm 2.38\%$) while minimum was observed for Group C ($18.96\pm 4.93\%$). For the period starting from baseline to two week, maximum mean reduction was observed for Group B ($78.84\pm 3.55\%$) while minimum was observed for Group C

($28.53\pm 7.53\%$). For the period starting from one week to two week, maximum mean reduction was observed for Group C ($11.78\pm 7.77\%$) while minimum was observed for Group B ($-35.35\pm 17.28\%$). Significant differences among groups were seen for all the time durations ($p<0.001$).

Table 6: Group A and C showed significantly lower percentage reduction as compared to Group B whereas Group C showed significantly lower percentage reduction as compared to Group A.

DISCUSSION

The efficacy of scaling for treating chronic marginal gingivitis is well acknowledged.^[9-11] However, the time spent for the therapy, the number of sites that require instrumentation and the experience of the clinician may influence the success of scaling.^[12-13] These findings suggest that scaling is a gold standard technique for treating gingivitis. Furthermore some pathogenic microbiota cannot be mechanically eradicated effectively. Bacterial invasion of the hard tissues (cementum, dentin) and surrounding periodontium either physically or by the help of endo/exo toxin has led to the formation of smear layer which is very difficult to remove by mechanical means thus resulting in impaired healing. Chemo therapeutic agents can be an effective adjunct to the mechanical therapy thus overcoming its limitations. Although systemic antibiotics are beneficial as an adjunct to scaling, their use should be restricted to patients who respond poorly to conventional therapy.^[14] A significant reduction was obtained in gingival and plaque index in group B as compared to group A and C. On the other hand, comparison between the group A and C revealed significant differences between them in reduction of the gingival index but for plaque index after two weeks, it was insignificant. Long-term therapy with chlorhexidine mouth rinses and gels can lead to discoloration of teeth, the mucosa, tongue and composite restorations. These undesirable side effects can be avoided by using a chlorhexidine-containing varnish. Once Cervitec Plus has been applied to the tooth surface, the solvent (ethanol) evaporates and an invisible film remains on the treated surface. Internal tests have shown that around 200 mg of Cervitec Plus are required to coat the complete dentition. A freestand single-dose contains 250 mg of liquid. If the maximum

amount of 250 mg is applied, the patient is exposed to the following quantities: Ethanol/water ~220 mg, acrylate co-polymer(poly) vinyl acetate co-polymer ~20 mg, Thymol 2.50 mg and chlorhexidine acetate 2.50 mg. Apart from ethanol, which evaporates during the treatment, the entire quantity applied is orally absorbed over time. Thus toxicological considerations mainly focus on the oral toxicity and local tissue compatibility. Chlorhexidine has been classified as non-irritant. Thymol has been classified as etching.^[15] Skin irritation tests in the rabbit were conducted with the original Cervitec formula, which contains the same concentrations of chlorhexidine diacetate and thymol. No irritation potential was detected.^[16] These findings are also supported by long-term clinical experiences.

Table 1: Gingival Index in different groups at baseline, after 1 week, after 2 weeks

S. No.	Group	Mean±SD		Mean±SD		Mean±SD	
		Baseline		After 1 Week		After 2 Weeks	
1.	Group A	2.81	0.10	1.74	0.10	1.31	0.11
2.	Group B	2.79	0.13	1.42	0.10	0.93	0.11
3.	Group C	2.79	0.11	2.17	0.05	1.89	0.06

Table 2: Plaque Index in different groups at baseline, after 1 week, after 2 weeks

S. No.	Group	Mean±SD		Mean±SD		Mean±SD	
		Baseline		After 1 Week		After 2 Weeks	
1.	Group A	2.78	0.15	0.54	0.15	0.61	0.15
2.	Group B	2.76	0.15	0.43	0.07	0.58	0.10
3.	Group C	2.71	0.13	2.19	0.08	1.93	0.17

Compared to Cervitec, only the varnish base has been changed in Cervitec Plus, whereas the concentrations of chlorhexidine and thymol have remained unchanged. Therefore, only the cytotoxicity of the varnish component was examined. No cytotoxicity was observed.^[17] The use of a cervitec plus varnish system decisively promotes depot formation. Electrostatic bonds and interactions exist between chlorhexidine as the cation and the proteins, glycoproteins of the saliva, plaque and the enamel hydroxyapatite. Due to changes in the oral environment, the active substance is released over time. Long-term

therapy with chlorhexidine mouth rinses and gels can lead to discoloration of teeth, the mucosa, tongue and composite restorations. These undesirable side effects can be avoided by using a chlorhexidine-containing varnish.

Table 3: Reduction in Gingival Index in three groups (%)

S. No.	Group	Mean	SD
*Reduction in GI from baseline to 1 week			
1.	Group A	38.17	3.75
2.	Group B	49.09	3.56
3.	Group C	22.26	3.34
**Reduction in GI from baseline to 2 week			
1.	Group A	53.29	4.98
2.	Group B	66.53	4.97
3.	Group C	32.32	2.75
***Reduction in GI from 1 week to 2 week			
1.	Group A	24.23	8.69
2.	Group B	34.08	9.88
3.	Group C	12.83	4.25

*From baseline to 1 week: P <0.001, **From baseline to 2 weeks p<0.001, ***From 1 week to 2 weeks: p<0.001 (One way ANOVA between and within groups)*

Table 4: Intergroup Comparison

S. No.	Group	't'	"p"
Reduction in GI from baseline to 1 week			
1.	Group A vs Group B	-8.188	<0.001
2.	Group A vs Group C	12.279	<0.001
3.	Group B vs Group C	21.302	<0.001
Reduction in GI from baseline to 2 week			
1.	Group A vs Group B	-7.291	<0.001
2.	Group A vs Group C	14.278	<0.001
3.	Group B vs Group C	23.321	<0.001
Reduction in GI from 1 week to 2 week			
1.	Group A vs Group B	-2.897	0.007
2.	Group A vs Group C	4.563	<0.001
3.	Group B vs Group C	7.653	<0.001

Thymol is a component of the essential oil gained from thyme (*Thymus vulgaris*). It belongs to the family of phenols and displays an antimicrobial effect combined with pronounced fungistatic properties similar to those of chlorhexidine. Thymol has a denaturing effect on proteins and destroys the cell membranes. Therefore, thymol inhibits growth of a large number of microorganisms.

CONCLUSION

The application of chlorhexidine varnishes seems to have beneficial effects in patients with chronic gingivitis, improving their plaque accumulation and bleeding levels and reducing their gingival index. It is possible to maintain this beneficial effect for prolonged periods of time. Additionally, subgingival application of high-concentration chlorhexidine varnishes following scaling gives greater reductions in pocket depth than those obtained solely by mechanical treatment of the pockets. Further studies need to be conducted to assess these effects over the long term, in order to establish the number of applications and the interval between them that offer the best results over time.

Table 5: Reduction in Plaque Index in Three Groups (%)

S. No.	Group	Mean	SD
*Reduction in PI from baseline to 1 week			
1.	Group A	80.22	6.26
2.	Group B	84.31	2.38
3.	Group C	18.96	4.93
**Reduction in PI from baseline to 2 week			
1.	Group A	77.89	6.02
2.	Group B	78.84	3.55
3.	Group C	28.53	7.53
***Reduction in PI from 1 week to 2 week			
1.	Group A	-19.27	38.88
2.	Group B	-35.35	17.28
3.	Group C	11.78	7.77

*From baseline to 1 week: $P < 0.001$, **From baseline to 2 weeks $P < 0.001$, ***From 1 week to 2 weeks : $P < 0.001$ (One way ANOVA between and within groups)

Table 6: Intergroup Comparison for PI

S. No.	Group	"t"	"p"
Reduction in PI from baseline to 1 week			
1.	Group A vs Group B	-2.370	0.025
2.	Group A vs Group C	29.785	0.000
3.	Group B vs Group C	46.272	0.000
Reduction in PI from baseline to 2 week			
1.	Group A vs Group B	-0.526	0.603
2.	Group A vs Group C	19.838	0.000
3.	Group B vs Group C	23.411	0.000
Reduction in PI from 1 week to 2 week			
1.	Group A vs Group B	1.463	0.155
2.	Group A vs Group C	-3.033	0.005
3.	Group B vs Group C	-9.632	0.000

BIBLIOGRAPHY

- Mann J, Wolnerman JS, Lavie G. Periodontal treatment needs and oral hygiene for institutionalized individuals with handicapping conditions. *Spec Care Dentist*. 1984;4:173-6.
- Axelsson P, Lindhe J. Efficacy of mouthrinses in inhibiting dental plaque and gingivitis in man. *J Clin Periodontol*. 1987;14:205-12.
- Persson RE, Truelove EL, Le Resche L. Therapeutic effects of daily or weekly chlorhexidine rinses on oral health of geriatric population. *Oral Surg Oral Med Oral Pathol*. 1991;72:184-191.
- Al-Tannir MA, Goodman HS. A review of chlorhexidine and its use in special populations. *Spec Care Dentist*. 1994;14:116-22.
- Matthijs S, Adriaens PA. Chlorhexidine varnishes: a review. *J Clin Periodontol*. 2002;29:1-8.
- Bretz WA, Valente MI, Djahjah C. Chlorhexidine varnishes prevent gingivitis in adolescents. *J Dent Child*. 2000;67:3990-402.
- Arends J, Ruben JL. Chlorhexidine release by dentine after varnish treatment. *Caries Res*. 1993;27:231-2.
- Skold K, Twetman S, Hallgren A. Effect of a chlorhexidine/thymol-containing varnish on prostaglandin E2 levels in gingival crevicular fluid. *Eur J Oral Sci*. 1998;106:571-5.
- Badersten A. Effect of nonsurgical periodontal therapy. *J Clin Periodontol*. 1981;8:57-72.
- Hill RW, Ramfjord SP. Four types of periodontal treatment compared over two years. 1981;52:655-62,
- Isidor F. The effect of root planing as compared to that of surgical treatment. 1984;11:669-81.
- Brayer WK, Melloning JT. Scaling and root planing effectiveness: The effect of root surface access and operator experience. *J Periodontol*. 1989;60:67-72.
- Smart GJ. Comparison of clinical outcomes following treatment of chronic adult periodontitis with subgingival scaling or subgingival scaling plus metronidazole gel.

- J Clin Periodontol. 2000;27:910-7.
14. Van Winkelhoff. Antimicrobial resistance in the subgingival microflora in patients with adult periodontitis. A comparison between the Netherlands and Spain. J Clin Periodontol. 2003;27:79-86.
 15. Berufsgenossenschaft der chemischen Industrie. Thymol – Toxikologische Bewertung. No: 259. 2000.
 16. Ullmann L. Primary skin irritation study. RCC Report No. 295007. 1991.
 17. Meurer K. Cytotoxicity assay in vitro: Evaluation of test items in the XTT-Test. RCC-CCR Report No. 1023501. 2006.

Source of Support: Nil

Conflict of Interest: Nil