Efficacy of local treatment with chlorhexidine gluconate drugs on the clinical status of periodontium in chronic periodontitis patients

Pietruska M[1]*, Paniczko A[1], Waszkiel D[2], Pietruski J[3], Bernaczyk A[4]

[1] Department of Periodontal and Oral Mucosa Diseases, Medical University of Białystok, Poland
[2] Department of Paedodontics, Medical University of Białystok, Poland
[3] Dental Practice, Białystok, Poland
[4] NZOZ Non-public Centre of Health Care, Medical University of Białystok, Poland

Abstract

Purpose: Chlorhexidine gluconate is a relatively commonly used chemotherapeutic in the treatment of periodontitis (P), exhibiting antimicrobial capabilities against Gram-negative and Gram-positive bacteria, and fungi. This compound is a component of various preparations for topical use in the form of solutions for mouthrinsing or peri-irrigation, gels, varnishes, chips and even chewing gums. The aim of the study was the clinical evaluation of periodontium after treatment with one of the drugs containing chlorhexidine gluconate (Corsodyl) as compared to professional tooth cleaning in patients with chronic periodontitis.

Materal and methods: Forty subjects enrolled in the study were divided into four groups, 10 in each group, according to the mode of treatment (Corsodyl rinse, Corsodyl gel, Corsodyl gel + surgical dressing, scaling).

Results: The greatest differences between baseline and follow-up examinations were observed in the group where surgical dressing was applied in addition to Corsodyl gel and in the group treated with scaling.

Conclusions: Chlorhexidine gluconate should be more frequently used as a drug adjunct to classic periodontal therapy, especially in the forms allowing its direct application to the periodontal pockets.

Key words: chlorhexidine gluconate, chronic periodontitis.

* CORRESPONDING AUTHOR:
Department of Periodontal and Oral Mucosa Diseases
Medical University of Białystok
ul. M. Skłodowskiej-Curie 7A
15-276 Białystok, Poland
tel.: +48 085 748 55 27

Received 07.03.2006 Accepted 13.03.2006

Introduction

Chronic periodontitis (CP) is a common ailment affecting adult humans. Its main aetiological factor is the bacterial plaque accumulating on the tooth surface due to hygienic neglect. The effective methods, commonly used to eliminate dental plaque, include scaling with root planing and periodontal surgical procedures. Obviously, appropriate plaque control following professional mechanical cleaning of root surfaces is indispensable for the disease inhibition [1-3]. Such a control involving individual hygienic procedures is possible in many patients. However, there are a number of subjects who, for mental or manual reasons, are incapable to comply with the appropriate hygienic standards to maintain the effects of treatment and to prevent the disease recurrence. It is in these patients that the use of chemotherapeutics in combination with traditional therapy can help prevent the recolonization of pathogenic bacteria in periodontal pockets.

Chlorhexidine gluconate is a safe, recognized and more frequently used chemotherapeutic in the treatment of periodontitis (P), exhibiting an action against Gram-negative and Gram-positive bacteria, and fungi [4,5]. It is a component of various preparations for topical use, such as solutions for mouthrinsing or perio-irrigation, gels, varnishes, local delivery systems (PerioChip), and even chewing gums [2,5-9].

The aim of this study was the clinical assessment of the periodontium after treatment with a chlorhexidine digluconate preparation (Corsodyl) in comparison to the procedure of professional tooth cleaning in subjects with chronic periodontitis.

Material and methods

Forty patients with CP, aged 30-65 years (17 women and 23 men), were enrolled in the study. All the patients underwent scaling and root planing. Then, they were divided into four groups, 10 in each group, depending on the treatment applied. Group I included patients who rinsed the oral cavity with 0.2% solution of chlorhexidine digluconate for one minute (Corsodyl,

Table 1. **Assessment of clinical parameters after application of Corsodyl fluid with regard to periodontal pocket depth**

Parameter	Group I (< 5 mm)			Group II (≥5 mm)		
	Examination			Examination		
	I	II	III	I	II	III
PI	2.0±0.58	1.0±.58* p=0.01	0.4±0.53** p=0.01	2.3±0.66	1.3±0.66* p=0.0000	0.6±0.49** p=0.0000
SBI	2.7±0.76	1.9±0.90* p=0.04	1.3±0.49** p=0.01	3.0±0.88	2.5±0.75* p=0.001	1.3±0.45** p=0.0000
GI	2.0±0.58	1.4±0.53	1.1±0.38** p=0.04	2.3±0.66	1.8±0.36* p=0.003	1.3±0.45** p=0.0003
Clinical attachment level	3.0±1.27	2.8±1.17	2.8±1.03	7.1±1.69	6.7±1.73* p=0.009	6.6±1.80** p=0.001
Pocket depth	3.0±0.36	2.9±0.5* p=0.04	2.8±0.54** p=0.03	5.8±1.14	5.3±1.29* p=0.007	5.3±1.24** p=0.001

* – statistically significant difference between examination I and II; ** – statistically significant difference between examination I and III

GlaxoSmithKline) twice a day for three weeks. Group II consisted of patients treated with 1% Corsodyl gel (GlaxoSmithKline) applied to periodontal pockets at one-week intervals. In group III, the treatment was the same as in group II, but in order to delimit drug leaking from periodontal pockets and its dissolving in the saliva, adhesive surgical dressing Reso-Pack (Meyer Haake) was used to seal the teeth and the surrounding soft tissues and was kept in the mouth for several hours subject to gradual dissolving. In group IV (control), no pharmacological treatment was instituted.

Clinical examinations were carried out three times by the same person with the use of a periodontal probe PCP 11 (LM Dental). The preliminary examination in the first three groups had place a week after scaling, directly before application of the drug. The other two took place one month and three months after the first. In the control group, the first examination was performed before scaling, the other two – one month and three months later. Clinical examinations were based on the assessment of the following parameters:

- PI (Plaque Index) accrding to Silness and Löe [10]
- SBI (Sulcus Bleeding Index) accrding to Mühlemann and Sonn [11]
- GI (Gingival Index) accrding to Löe and Silness [12]
- periodontal pocket depth (in mm)
- clinical attachment level (in mm).

Assuming that the efficacy of the therapy can be related to the disease advancement, the clinical parameters were assessed separately for the pocket depths <5 mm and ≥5 mm.

The results were subjected to statistical analysis using the SPSS 8.0 PL packet. The Wilcoxon pairs test was used to compare changes in the parameters at time intervals in the respective groups. Differences with $p \leq 0.05$ were considered statistically significant.

Results

In all the groups, PI was significantly reduced after 3 months as compared to the baseline. The most substantial differences in this parameter were noted in the Corsodyl group, being 1.6 for pocket depths <5 mm and 1.7 for those ≥5 mm. SBI and GI were also significantly reduced after treatment. The greatest difference in these parameters was observed in group III, where apart from Corsodyl gel surgical dressing was applied, and in the control group. Pocket depths after treatment were markedly reduced in groups I, III and IV. In group II, this parameter decreased significantly for the pockets ≥5 mm, but not for <5 mm. No significant changes were observed after three months in the attachment level in group I after Corsodyl fluid and in group II for the pockets <5 mm. However, this parameter changed markedly for the pockets deeper or equal to 5 mm in patients treated with gel. In groups III and IV, the attachment level was significaltly decreased on examination 3. The differences were more pronounced in group III and depended on the pocket depth (0.9 and 2, respectively). It should be emphasized that for most of the clinical parameters examined in the study, major differences between baseline and the follow-up examinations referred to the pockets deeper or equal to 5 mm. Numerical data (mean, standard deviation and p value) have been presented in *Tab. 1-4*.

Discussion

In the current study, we achieved a significant improvement in the clinical parameters in all the groups. PI was most reduced in group I, where the mean difference between the baseline and examination 3 (after three months) was 1.65, in the remaining groups being 1, 1.2 and 1.55, respectively. Other authors have shown a similar degree of PI reduction. Mouth rinsing with 0.2% chlorhexidine solution can reduce this parameter by 1.27, gel by 1, while scaling by 1.2 [13]. Chlorhexidine used for mouth rinsing by subjects who do not perform any other hygienic procedures causes a two-fold reduction in plaque accumulation as compared to the placebo-using subjects [14].

According to Lang et al. [5], the use of chlorhexidine solution decreases GI by 18%. In our study, the GI reduction was more pronounced, being 44%-57% on average. Our results well correspond to those reported by Vinholis et al. [13], who showed a reduction in GI by 0.77 after mouth rinsing, by 0.5 after gel

Table 2. **Assessment of clinical parameters after application of Corsodyl gel with regard to periodontal pocket depth**

Parameter	Group I (<5 mm)			Group II (≥5 mm)		
	Examination			Examination		
	I	II	III	I	II	III
PI	1.7±0.95	0.8±0.79* p=0.007	0.7±0.67** p=0.01	2.0±0.53	1.0±0.53* p=0.0000	1.0±0.41** p=0.0000
SBI	2.2±1.23	1.5±0.97* p=0.01	0.8±0.79** p=0.007	2.8±0.90	1.9±0.58* p=0.0000	1.0±0.56** p=0.0000
GI	1.6±0.97	1.1±0.74* p=0.04	0.6±0.52** p=0.01	1.9±0.58	1.5±0.63* p=0.0015	0.9±0.31** p=0.0000
Clinical attachment level	3.4±1.11	3.5±1.26	3.4±1.33	7.2±1.72	6.3±1.83* p=0.0000	6.0±1.81** p=0.0000
Pocket depth	3.4±0.57	3.1±0.72* p=0.01	3.1±0.66	5.9±0.69	5.0±0.82* p=0.0000	4.6±0.81** p=0.0000

* – statistically significant difference between examination I and II; ** – statistically significant difference between examination I and III

Table 3. **Assessment of clinical parameters after application of Corsodyl gel + surgical dressing with regard to periodontal pocket depth**

Parameter	Group I (<5 mm)			Group II (≥5 mm)		
	Examination			Examination		
	I	II	III	I	II	III
PI	2.1±0.99	1.5±0.97* p=0.04	0.9±0.99** p=0.007	1.9±0.91	1.3±0.84* p=0.0000	0.7±0.74** p=0.0000
SBI	3.2±1.40	1.8±1.40* p=0.005	1.1±0.99** p=0.005	2.9±1.22	1.5±1.15* p=0.0000	1.0±0.87** p=0.0000
GI	2.2±0.92	1.5±0.85* p=0.01	1.1±0.99** p=0.007	2.0±0.88	1.4±0.76* p=0.0000	0.8±0.73** p=0.0000
Clinical attachment level	4.1±1.57	3.7±1.31* p=0.03	3.6±1.28** p=0.01	6.9±1.81	6.0±2.05* p=0.0000	5.0±1.72** p=0.0000
Pocket depth	3.8±0.58	3.3±0.47* p=0.006	2.9±0.48** p=0.005	6.1±1.59	5.1±1.79* p=0.0000	4.1±1.42** p=0.0000

* – statistically significant difference between examination I and II; ** – statistically significant difference between examination I and III

Table 4. **Assessment of clinical parameters in the control group with regard to periodontal pocket dept**

Parameter	Group I (<5 mm)			Group II (≥5 mm)		
	Examination			Examination		
	I	II	III	I	II	III
PI	2.4±0.52	1.4±0.52* p=0.007	0.9±0.74** p=0.005	2.4±0.50	1.3±0.47* p=0.0000	0.8±0.72** p=0.0000
SBI	3.6±0.97	2.2±0.79* p=0.005	1.5±0.85** p=0.005	3.6±1.02	2.2±0.78* p=0.0000	1.5±0.86** p=0.0000
GI	2.5±0.53	2.0±0.67* p=0.04	1.4±0.52** p=0.005	2.5±0.51	1.9±0.60* p=0.0001	1.4±0.50** p=0.0000
Clinical attachment level	4.4±1.48	4.0±1.41* p=0.01	3.7±1.17** p=0.008	6.9±0.17	6.4±1.18* p=0.0000	6.5±1.30** p=0.0002
Pocket depth	4.0±0.75	3.5±0.72* p=0.005	3.5±0.80** p=0.005	6.2±0.97	5.7±0.95* p=0.0000	5.8±1.00** p=0.0002

* – statistically significant difference between examination I and II; ** – statistically significant difference between examination I and III

application and by 0.9 after scaling. We found this parameter to change by 0.95 and 1.05 on average in the fluid and gel groups, and by 1.1 in the scaling group. We observed the most pronounced drop in GI (mean 1.15) in the group where Corsodyl gel application was followed by the use of surgical dressing onto the marginal gingiva to prevent the gel leaking from the pockets. This group had also markedly reduced SBI. As demonstrated in human and animal studies, at the analogous PI levels, bleeding was considerably reduced in chlorhexidine-treated subjects as compared to the control without pharmacotherapy [5,15-17].

Moreover, mouth rinsing with chlorhexidine solution allows pocket depth reduction by approximately 0.4-0.5 mm, [17] which

is consistent with our own data. Other reports provide evidence that both after scaling and application of fluid or gel with chlorhexidine the pockets diminish their depth by approximately 3.1-3.5 mm, which indicates that chlorhexidine and scaling have similar effects on the attachment level. Mouth rinsing with chlorhexidine solution and scaling caused a 3 mm decrease in the attachment level, while application of gel with chlorhexidine resulted in a 3.4 mm reduction [13]. In our study, the attachment level was most markedly changed in the surgical dressing group. Both pocket depth reduction and attachment level gain may depend on the baseline values of the above parameters [16].

Concluding our results, the most pronounced differences between the baseline and follow-up examinations occurred in the Corsodyl gel + surgical dressing group and in the scaling group. Considerable improvement in the parameters in subjects who did not receive pharmacological treatment is not surprising and confirms that in many cases scaling and root planing are so effective in the treatment of periodontitis that pharmacology is unnecessary. Large differences in the values of the study parameters between the preliminary and the follow-up examinations could be the result of the lowest baseline values of these parameters in the control group. Patients were randomly selected to the respective groups and thus the baseline values were accidental as well. Undoubtedly, the use of surgical dressing influenced the action of gel with chlorhexidine on periodontium status in patients with P. Our results would thus confirm the thesis that the efficacy of the treatment of periodontitis by means of gel application to the pockets depends on both the possibility of achieving biologically significant concentration of the drug and on the adequately long drug maintenance in the periodontal pocket [18].

According to some authors, the mode of drug administration can exert an effect not only on the clinical parameters but also on subjective sensations patients experience during treatment. Chlorhexidine has many side effects, especially when administered as mouthwash, such as brown discolouration of teeth, fillings and oral soft tissues, mainly the tongue. Patients complain of bitter and difficult to hide taste of chlorhexidine-based preparations and have taste disorders [19]. However, these unpleasant sensations are compensated by beneficial effects of chlorhexidine therapy. Additionally, chlorhexidine compounds attenuate the adhesion of *Porphyromonas gingivalis* to epithelial cells and inhibit the activity of metaloproteinases 2, 8 and 9, which is another antibacterial mechanism [20,21].

Therefore, this compound should be more frequently used as a drug adjunct to classic periodontal therapy, especially in the forms allowing its direct application to the periodontal pockets.

References

1. Greenstein G, Polson A. The role of local drug delivery in the management of periodontal diseases: a comprehensive review. J Clin Periodontol, 1998; 69: 507-20.

2. Norkiewicz DS, Breault LG, Wonderlich ST, Malone KH. The use of chemotherapeutic agents in localized periodontal pockets. Military Med, 2001; 166: 940-6.

3. Ramberg P, Furuichi Y, Volpe AR, Gaffar A, Lindhe J. The effects of antymicrobial mouthrinses on the novo plaque formation on sites with healthy and inflamed gingivae. J Clin Periodontol, 1996; 23: 7-11.

4. Jenkins S, Addy M, Newcombe R. Evaluation of a mouthrinse containing chlorhexidine and fluoride as an adjunct to oral hygiene. J Clin Periodontol, 1993; 20: 20-5.

5. Lang NP, Hase JC, Grassi M, Hammerle CHF, Weigel C, Kelty E, Frutig F. Plaque formation and gingivitis after supervised mouthrinsing with 0.2% delmopinol hydrochloride, 0.2% chlorhexidine digluconate and placebo for 6 months. Oral Dis, 1998; 4: 105-13.

6. Dudic VB, Lang NP, Mombelli A. Microbiological and clinical effects of an antiseptic dental varnish after mechanical periodontal therapy. J Clin Periodontol, 1999; 26: 341-6.

7. Francetti L, del Fabbro M, Testori T, Weinstein RL. Chlorhexidine spray versus chlorhexidine mouthwash in the control of dental plaque after periodontal surgery. J Clin Periodontol, 2000; 27: 425-30.

8. Simons D, Brailsford S, Kidd EAM, Beighton D. The effect of chlorhexidine acetate/xylitol chewing gum on the plaque and gingival indices of elderly occupants in residential homes. J Clin Periodontol, 2001; 28, 1010-5.

9. Smith AJ, Moran J, Dangler LV, Leight RS, Addy M. The efficacy of an anti-gingivitis chewing gum. J Clin Periodontol, 1996; 23: 19-23.

10. Silness J, & Löe H. Periodontal disease in pregnancy. II. Correlation between oral hygiene and periodontal condition. Act Odontol Scand, 1964; 22: 121-35.

11. Mühlemann HR, Sonn S. Gingival sulcus bleeding – a leading symptom in initial gingivitis. Helv Odont Acta, 1971; 15: 107-13.

12. Löe H, & Silness J. Periodontal disease in pregnancy. I. Prevalence and severity. Act Odontol Scand, 1963; 21: 533-51.

13. Vinholis AHC, de Figueiredo LC, Marcantonio Junior E, Marcantonio RAC, Salvador SLS, Goissis G. Subgingival utilization of a 1% chlorhexidine collagen gel for the treatment of periodontal pockets. A clinical and microbiological study. Braz Dent J, 2001; 12: 209-13.

14. Richter S, Bruhn G, Brunel G, Hoffmann T, Netuschil L, Brecx M. Etude in vivo de l'efficacité d'un bain de bouche contenant 0.10% de digluconate chlorhexidine. J Paradontol Implantol Oral, 2002; 21: 253-9.

15. Cappelli D, Holt SC, Singer RE, Pickrum HM, Ebersole JL. Effects of 0.12% chlorhexidine gluconate on experimental gingivitis in non-human primates: clinica and microbiological alterations. Oral Dis, 2000; 6: 124-31.

16. Christie P, Claffey N, Renvert S. The use of 0.2% chlorhexidine in the absence of a structured mechanical regimen of oral hygiene following the non-surgical treatment of periodontitis. J Clin Periodontol, 1998; 25: 15-23.

17. Soh LL, Newman HN, Strahan D. Effects of subgingival chlorhexidine irrigation on periodontal inflammation. J Clin Periodontol, 1982; 9: 66-74.

18. Jeffcoat MK, Bray KS, Ciancio SG, Dentino AR, Fine DH, Gordon JM, Gunsolley JC, Killoy WJ, Lowenguth RA, Magnusson NI, Offenbacher S, Palcanis KG, Proskin HM, Finkelman RD, Flashner M. Adjunctive use of subgingival controlled-release chlorhexidine chip reduces probing depth and improves attachment level compared with scaling and root planing alone. J Periodontol, 1998; 69: 989-97.

19. Lang NP, Catalanotto FA, Knöpfli RU, Antczak AAA. Quality-specific taste impairment following the application of chlorhexidine digluconate mouthrinses. J Clin Periodontol, 1988; 15: 43-8.

20. Gendron R, Grenier D, Sorsa T, Mayrand D. Inhibition of the activities of matrix metalloproteinases 2, 8, and 9 by chlorhexidine. Clin Diagn Lab Immunol, 1999; 6: 437-9.

21. Grenier D. Effect of chlorhexidine on the adherence properties of Porphyromonas gingivalis. J Clin Periodontol, 1996; 23: 140-2.