Effect of 0.2% Chlorhexidine's Use for Treatment of Localized Gingival Lesions in Patients with Type 2 Diabetes

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The aim of this study is to evaluate the bacteriostatic effect of chlorhexidine and the effectivenes of treatment in localized gingival lesions mot related to inflammatory periodontal disease by assessing the levels of IL 1-β in gingival cervicular fluid (GCF) in patients systemic healthy or with type 2 dibets.

Keywords: chlorhexidine, gingival, periodontal, IL1beta, gingival crevicular fluid, diabetes, hepatitis C

Localized gingival or periodontal lesions could be caused by the presence of foreign bodies in depth of periodontal tissues [1] .These lesions retain foreign bodies particles like prosthetic cement or impressive material, abrasive or restorative material [2] or cemental tear [3].

Such particles were highlighted even in cases of peri-implantitis [4]. Sometimes, inflammatory lesions extend deep into periodontal tissue, bone destruction requiring regenerative surgery techniques [3]. These injuries can also be caused by using toothpicks, breaking them and retaining their peak in deep periodontal tissues, or by fish bones, leading to complications like acute or chronic periodontal abscess not related to inflammatory periodontal disease [5].

Similar situations are found in other tissues, where the penetration of foreign bodies can cause gastric or liver abscesses [6].

Chlorhexidine is a cationic polybiguanide (bisbiguanide). It is an antibacterial, used as an antiseptic and for other applications. It is used as its salts (dihydrochloride, diacetate, and digluconate) (fig. 1) [7].Chlorhexidine is used in disinfectants (disinfection of the skin and hands), cosmetics (creams, toothpaste, deodorants, and antiperspirants), and pharmaceutical products (eye drops, active substance in wound dressings and antiseptic mouthwashes) [7-9]. At physiologic *p*H, chlorhexidine salts dissociate and release the positively charged chlorhexidine cation. The bactericidal effect is a result of the binding of this cationic molecule to negatively charged bacterial cell walls. At low concentrations of chlorhexidine, this result in a bacteriostatic effect; at high concentrations, membrane disruption results in cell death [10]. It is most effective against grampositive coccis and less active against gram-positive and gramnegative rods. Spore germination is inhibited by chlorhexidine [11].

For the dental plaque and inflammation control, the chlorhexidine is used for lavage, coolant solution or in mouthwashes in its digluconate form [12].

Due to its very high therapeutic index it is one of the most widely used antiseptics today [9].

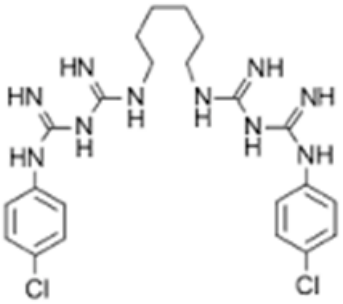

Fig. 1. Chemical structure of Chlorhexidine digluconate [7].

The aim of this study is to evaluate the effectiveness of Chlorhexidine treatment in localized gingival lesions not related to inflammatory periodontal disease, by assessing the levels of IL1-beta in gingival crevicular fluid (GCF) in patients systemic healthy or with type 2 diabetes.

Experimental part

Material and Methods

11 subjects were included in the study (table 1) which addressed to Periodontology Clinic from the University of Medicine and Pharmacy Craiova for the appearance of a tooth marginal gingiva localized swelling, pain of moderate intensity, deep red purple color of the lining that covers swelling, as a result of using wooden toothpicks for interdental cleaning, after prick with fishbone or solid food impaction. Patients signed an informed consent whose form was approved by the Ethics Committee of University of Medicine and Pharmacy of Craiova. Lesion exploration has revealed wood, fishbone chips, or food scraps. None of the patients did present a history of inflammatory periodontal disease. There have been registered probing depth (PD) which was <3mm, bleeding on probing (BOP) which did not show changes to other teeth except for the affected one. A radiographic examination was conducted which showed no injuries of periodontal bone. Patients were asked about the presence of diabetes mellitus and smoking.

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Systemic disease	H		D	
Gender	W	M	W	M
Number of patients	3	3	3	2
Age of patients (years)	45.8 ± 3.56		45.8 ± 2.77	
Time from diagnosis (years)	-		3.67 ± 1.21	

Table 1
DEMOGRAPHIC DATA OF PATIENTS AND TIME FROM DIAGNOSIS (MEAN ± SD), (H = GROUP OF SYSTEMIC HEALTHY PATIENTS D = GROUP OF DIABETIC, W = WOMEN, M = MEN)

Diabetic patients had a good control of their diabetes with blood glucose and HbA1c levels within the normal range.

Time from diagnosis was also noted. Patients were conducted ultrasonic scaling with CHX 0.2% as cooling solution and they were recommended rinses of the oral cavity twice a day with mouthwash with CHX 0.2% after dental brushing.

Using Periopaper strips, GCF from all patients was collected from the lesion area before treatment and 5 days later. GCF volume was measured with Periotron, diluted in 100 microl PBS and stored at -20°C.

IL1beta as inflammatory marker was determined in GCF by ELISA technique using the kit from R&D Systems, USA.

Age of patients, time from diagnosis of systemic disease and levels of IL1beta were expressed as mean± SD. Differences between groups were calculated using Mann Whitney *U* test ($p < 0.05$ being considered statistically significant) and correlations among groups werecalculated with Pearson test.

Results and discussions

The 11 patients, 6 women and 5 men, had ages between 42-53 years. All patients had PD<3, without BOP (excepting the affected tooth). According to the presence of the systemic diseases, they were divided in 2 groups: H- 6 patients systemic healthy, D- 5 patients with diabetes (table 1). All patients were no smokers.

Before treatment, in the group D, the levels of IL1beta were higher 1.5 fold than in the group H. The differences were statistically significant ($p<0.05$). After treatment, in the group D, the levels of IL1-beta were higher than in the group H, the differences were statistically significant between D group and H ($p<0.05$). Levels of Il1- beta before and after treatment registered statistically significant differences in all groups (fig. 2).

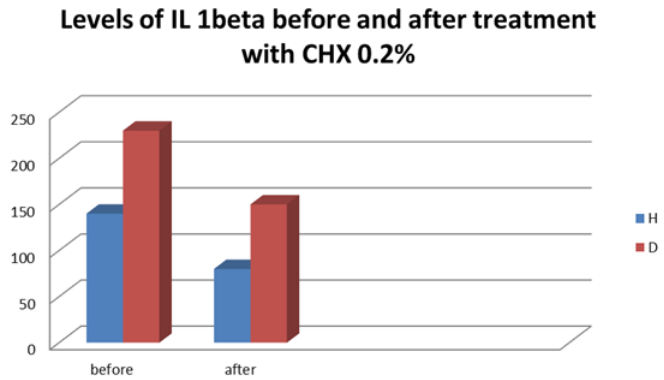

Fig. 2. Levels of IL1beta in all groups before and after treatment (H=group of systemic healthy patients D=group of diabetic patients)

There were found no correlations between the time from diagnosis and the levels of IL1beta.

Gingival and periodontal lesions followed by gingival or periodontal abscess can be caused by using toothpicks, breaking them and retaining their peak in deep periodontal tissues, or by fish bones or retention of impressive material or cementum, leading to complications like acute or chronic periodontal abscess not related to inflammatory periodontal disease [5].

Similar situations are found in other tissues, where penetration of foreign bodies can cause gastric or liver abscesses [6, 13, 14].

Treatment of these lesions involves reducing gum inflammation, scraps of foreign bodies removal and motivation for good oral hygiene [5]. In the review of Sluijs et al. for the use of CHX or essential oils, the added effect as coolant in ultrasonics can be considered *zero*. For povidone-iodine, a very small level of clinical attachment loss (CAL) gain may be expected [15]. One possible explanation could be the fact that the action of the coolant solution is too short to take effect. There are studies showing that the use of CHX chips leads to improved periodontal status and reduced levels of PGE2 in GCF [16].Thus, in the present study, it can be considered that the addition of CHX in cooling water of ultrasonics has not influenced the evolution of gum lesion, but patients used CHX mouthwash twice a day and the levels of IL1beta decreased. IL1beta is an inflammatory marker whose levels in GCF were determined both in patients with periodontal disease and in its association with type 2 diabetes [17].

Patients in the present study had no pre-existing periodontal disease but foreign bodies produced lesions cause a strong inflammation with IL1-beta levels higher than those in chronic periodontitis and type 2 diabetes association or chronic periodontitis alone determined in other studies [17]. Before treatment, the levels of IL1-beta were higher in group D, possibly due to the metabolic and inflammatory changes in diabetic condition. These levels remained elevated after achieving treatment with scaling and CHX 0.2% in group D, comparing with other studies for the association of diabetes with periodontitis or periodontal disease alone [17]. Other studies reported decreases of different biomarkers (e.g. C reactive protein, IL6, etc) serum levels after first steps of therapy in cases with periodontal disease associated to other systemic diseases like rheumatoid arthritis or atherosclerosis [18, 19]. It could be interesting, in further studies, to assess the levels of different cytokines in serum and GCF of gingival or periodontal lesions associared with other systemic diseases

lihe hepatitis C, while different serum cytokines levels are determined as elevated in patients with hepatitis C-related liver diseases, especially in HCC (hepatocellular carcinoma) patients. These levels reflect hepatic dysfunction better than liver inflammation parameters, which might explain the higher serum concentrations of cytokines in those patients [20,21]. It could be interesting, also, to compare the levels of different biomarkers in serum and GCF in periodontal or gingival lesions with those in chronic or aggressive periodontitis alone or associated with systemic diseases.

Conclusions

CHX use in the treatment of gingival lesions produced with foreign bodies leads to IL1beta decreased levels in GCF compared with initial ones and diabetes could negatively influence the evolution of these lesions.

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