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ANALYSIS OF ORAL FLUID ENZYMES ACTIVITY IN PATIENTS WITH PERIODONTITIS UNDERGOING COMPLEX ANTIBIOTIC THERAPY

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ABSTRACT — Antibacterial therapy is the fundamental point in comprehensive treatment of patients with generalized periodontitis. The choice of an antibacterial drug, in view of its maximum effectiveness, is the key to successful pre-surgical preparation of patients with periodontitis to rapid post-surgery rehabilitation and remission maintenance. Our clinical study aims to analyze the activity of oral fluid enzymes (lactate dehydrogenase (LDH), alkaline phosphatase (ALP)) in patients treated with fluoroquinolones. 60 patients were allocated to groups. Each group had a 7-day course of one from four antibiotics: ciprofloxacin (250 mg; 2 times a day); ofloxacin (200 mg; 2 times a day); pefloxacin (400 mg; 2 times a day) and lincomycin hydrochloride (500 mg; 2 times a day). Ciprofloxacin was found to have the highest effect on the LDH and ALP suppression.

KEYWORDS — Antibacterial drugs, periodontitis, lactate dehydrogenase (LDH), alkaline phosphatase (ALP), fluoroquinolones, saliva enzymes.

INTRODUCTION

The pathogenesis, diagnosis and treatment of inflammatory periodontal diseases are an urgent issue faced by dentistry [1–6]. Antibacterial therapy is an integral part of comprehensive treatment offered to patients with generalized periodontitis [7]. Antibiotics of the fluoroquinolone class display a pronounced antimicrobial activity against the major periodontal pathogens, while numerous studies have revealed high activity of these drugs and their potential use when treating periodontitis [8, 9]. In 2002, Yang Q.S. et al. carried out a study showing that fibroblasts of the gum's own layer can accumulate ciprofloxacin, thus functioning as a container that ensures a high extracellular concentration of the antibiotic [10]. Of lincosamides group, the antibacterial drug lincomycin, which has the ability to accumulate in the bone tissue in therapeutic doses and have its effect on flora that is resistant to other antibiotics, has come to be employed widely in periodontics [11].

Most researchers nowadays believe that indicators of mixed saliva are closely related to dental system pathologies. Lactate, for one, is a product of anaerobic microflora metabolism, which is activated through inflammatory processes. In view of this, the activity of lactate dehydrogenase in mixed saliva may be a marker for tissue inflammation in the oral cavity. In case of periodontitis, the proteins of the inflamed tissues undergo proteolysis; an increase in free amino acids leads to an enhanced activity of aminotransferases, which allows making conclusions concerning the severity of the inflammatory process in the oral cavity. Lactate dehydrogenase enzymes and alkaline phosphatase are important indicators in terms of diagnosing destructive processes in case of periodontal disease. This means that studying the composition and properties of mixed saliva is of great diagnostic value, since it allows, in some cases, identifying not just the body status as a whole, yet also that of the oral cavity tissues [12, 13]. Besides, mixed saliva is of interest for diagnostic purposes, since the method of obtaining it is simple, non-invasive, has a minimal cost, and requires minimal processing [14–17].

Aim of study:
to analyze the activity of oral fluid enzymes (lactate dehydrogenase and alkaline phosphatase) in patients with periodontitis while employing various antibacterial drugs within comprehensive therapy.

MATERIALS AND METHODS

The study involved 60 patients (29 males and 31 females) with generalized periodontitis, aged 18 to 50, a mean age of 34 years. The patients were divided into groups (15 persons in each) depending on the antibacterial drug used for the treatment: ciprofloxacin (250 mg; 2 times a day); ofloxacin (200 mg; 2 times a day); pefloxacin (400 mg; 2 times a day) and lincomycin hydrochloride (500 mg; 2 times a day), for 7 days. The control group included 20 people with intact periodontium of the same age.

The object of the study was unstimulated oral fluid (2 ml) obtained through spitting. The activity of the enzymes – lactate dehydrogenase (D. Weissar, 1975) and alkaline phosphatase (W. Kubier, 1973) was identified using a set of chemical reagents and a biochemical analyzer Hospitex (Switzerland).

RESULTS AND DISCUSSION

To obtain control values, data were obtained on changes in the LD enzymes activity (u/l) in patients with intact periodontium in vitro: intact periodontium 305±7.8; ciprofloxacin 265±7.5; ofloxacin 274±6.7; pefloxacin 281±4.2; lincomycin 280±8.3. Changes in the alkaline phosphatase activity (u/l): intact periodontium 22.6±4.5; ciprofloxacin 14±1.1; ofloxacin 16±3.3; pefloxacin 18±3.1; lincomycin 19±2.1. An analysis of the outcomes revealed a decrease in the lactate dehydrogenase and alkaline phosphatase activity after using the antibiotics in vitro, and the following pattern could be observed: ciprofloxacin demonstrated the highest degree of suppression, whereas the same index was the lowest in lincomycin.

Prior to the treatment, patients with generalized periodontitis had an LDH activity (u/l) of 378±12.4, which exceeds significantly that of intact periodontitis; after a course of treatment with an antibacterial drug (Day 7) the following values were obtained: for ciprofloxacin 298±5.2; ofloxacin 301±7.3; pefloxacin 318±4.2; lincomycin, 323±6.2.

A similar trend was observed when studying the alkaline phosphatase activity (u/l): before treatment, 75±8.3; Day 7 into the treatment with ciprofloxacin 23.2±3.6; ofloxacin 24.1±4.2; pefloxacin 26.2± 3.3; lincomycin 38±5.3.

The antibacterial drugs, therefore, could be arranged as follows in the order of a decreased inhibitory capacity (with respect to the oral fluid enzymes activity): ciprofloxacin, ofloxacin, pefloxacin, lincomycin.

The studies also revealed a change in the Michaelis constant (Km) of biochemical responses catalyzed by LDH and AP in patients with generalized periodontitis. LDH Km (M) before the treatment was 1.37 ± 0.1, while after the treatment (Day 7 of the study) for ciprofloxacin it was 2.51±0.1; for ofloxacin, 2.38±0.11; pefloxacin, 2.12±0.18 and for lincomycin, 1.94± 0.16. AP Km (M): before the treatment, 2.01±0.13; 7 days into the treatment: for ciprofloxacin, 3.5±0.13; for ofloxacin, 3.38±0.14; pefloxacin, 3.24±0.11; lincomycin, 3.11±0.09.

Given the above, there has been an increase in Km for LDH and AP observed after treatment with antibacterial agents, which points at a decrease in the enzyme activity, which can be regarded as a direct inhibitory effect that antibacterial drugs have on LDH and ALP (this effect was detected in vitro). As far as the degree of effect on Km is concerned, the drugs can be arranged in the following sequence: ciprofloxacin, ofloxacin, pefloxacin, lincomycin.

The obtained data indicated that ciprofloxacin containing cyclopropyl in the quinolone cycle has a more pronounced inhibitory effect on the bacterial flora, which, respectively, led to a decreased LDH and alkaline phosphatase activity in the oral fluid. This can be accounted for by suppressed bacterial growth against fluoroquinolone agents due to their lipophilicity, i.e. the capacity to dissolve in the bacterial cell membranes, and, consequently, to better penetrate into the cells of microorganisms. Pefloxacin, which contains only one ethyl group, revealed the lowest inhibitory effect on the oral fluid enzyme activity.

CONCLUSION

The clinical and laboratory studies have demonstrated that ciprofloxacin offers the highest effect on the LDH and alkaline phosphatase suppression in the oral fluid of patients with generalized periodontitis. Therefore, this finding can be employed when selecting a medicine for antibacterial treatment.

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