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EXPERIMENTAL EVALUATION OF THE EFFECTIVENESS OF RED DIODE RADIATION (630±10 nm) IN THE TREATMENT OF CHRONIC LOCALIZED PERIODONTITIS

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Summary : Elevation the effectiveness of treatment of patients with chronic localized periodontitis by expanding the indications for minimally invasive surgery to periodontal tissues by research antibacterial efficacy of photodynamic therapy with different duration of red diode laser exposure on pathogens. After photodynamic therapy the growth of colonies of studied microorganisms decreased in almost all patients. The maximum inhibitory effect of the red diode laser was observed at photosynsetiser exposure within 58 to 105 seconds. The best result of antibacterial effectiveness of photodynamic therapy was observed with at laser exposure with in 43 to 61 seconds. A high level of antibacterial efficacy of photodynamic therapy has a significant potential in trems of the modern practice of periodontics.

Key words : localized periodontitis, photodynamic therapy, red diode laser, antibiotic therapy.

Improving the efficiency of complex treatment of periodontal diseases remains an important and actual problem of modern periodontics. The prevalence of periodontal disease among the adult population in different regions of Ukraine, according to L. V. Dereyko ranging from 88 % to 96 % [1]. Important remains the problem of antibiotic resistance of individual strains of pathogenic microorganisms of the oral tissues, including periodontal pockets: Str.Pyogenes, Aureus, St etc. [4, 7, 9, 11, 12, 13].Irrational use of antibiotics leads to imbalance in associations of microorganisms, the emergence of resistant strains that are insensitive or subacutely to treatment and occurrence of side effects of drugs [5]. Method of photodynamic therapy (PDT) [3, 8, 9] is effectively used for the prevention of exacerbations of chronic inflammatory periodontal diseases, contributes to achieving long-term remission and avoid, in some cases, the need for the application of surgical treatment [2].

Objective. Elevation the effectiveness of treatment of patients with chronic localized periodontitis by expanding the indications for minimally invasive surgery to periodontal tissues by research antibacterial efficacy of photodynamic therapy with different duration of red diode laser exposure on pathogens.

Methods. 44 patients with chronic localized periodontitis I-II st. were examined. Comparative evaluation of antimicrobial effectiveness of the method of photodynamic therapy with toluidine blue and standard conservative treatment with antibiotic of cephalosporin group was conducted. In vivo efficacy of FotoSan red diode laser 630±10 nm against Str. Pyogenes and

Str. Pneumoniae at different exposure of toluidine blue and in vitro efficacy against Str. Pyogenes at different exposure of laser action was studied. Microorganisms were identified according to Bergey"s Manual of Systematic Bacteriology (1997) [10]. The elevation protocol similar to that used in our previous experience[6].

Results. Microbiological investigations revealed that found that most commonly chronic periodontitis of the 1-st degree was associated with Str. Pyogenes, of the 2-nd degree more rarely - St. Aureus and in some cases - Str. Pneumoniae (Figure 1). Pathological microflora isolated from periodontal pockets was sensitive to the antibiotic of cephalosporin group - "Tertsef" and "Cefpirome"(Table 1).

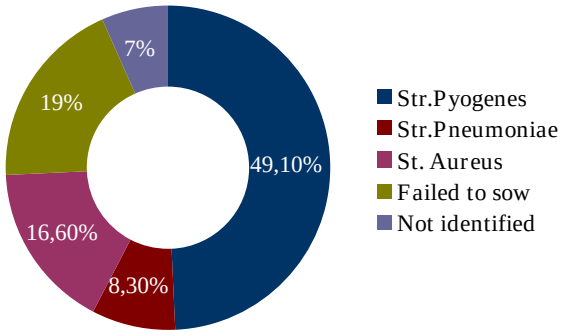


Figure 1. The results of microbiological research content of gingival pockets in chronic localized periodontitis.

After the course of antibiotics the values of lg CFU/mL for Str. Pyogenes in 41.7 % of cases decreased from 2,46±0,2 10^7 to 2,11±0,2 10^6(p<0,04), and in 58.3 % - from 2.27±0.05 10^7 to 0.29±0.06 10^5(p<0,04). This indicator for St. Aureus has changed from 2,44±0,06 10^7 to 2,1±0,04 10^6 (p<0.04), for Str. Pneumoniae - from 2,56±0,06 10^7 to 2,11±0,05 10^6(p<0.05).

The name of the antibiotic	The selected microorganism, MIC* (Mg/ml)		
	Str. Pyogenes	St. Aureus	Str. Pneumoniae
Cefpirome (cephalosporin IV.)	23,63±0,19	27,64±0,09	27,77±0,08
Tercef (Ceftriaxone is the cephalosporin of the III.)	28,99±0,14	25,73±0,19	28,34±0,17

Table 1. The results of the evaluation of the sensitivity of isolated bacteria to some antibiotics
Note: *MIC - minimum inhibitory concentration (p<0.05).

Remoted results (1 month) after antibiotic therapy showed that at 34 of 44 patients the growth of colonies was unchanged, and at 31 of 44 even a slight growth of pathogenic organisms was observed. After photodynamic therapy the growth of colonies of studied microorganisms decreased in almost all patients (Figure 2,3,4,5). The maximum inhibitory effect of the red diode laser was observed at photosynsetiser

exposure within 60 to 100 seconds (Figure 6). The correlation of antimicrobial efficacy of

Conclusions. Comparative investigations of the method of photodynamic therapy with toluidine blue and traditional antibiotic therapy demonstrated a pronounced antibacterial effect of the first method against Str. Pyogenes, Str. Pneumoniae and St. Aureus. In the delayed period of study only a short-term antimicrobial effect of the antibiotic "Tertsef" of cephalosporin group was observed at 37 % of patients with chronic localized periodontitis I-II st. Maximum

the red diode laser at different exposure of its actions was also investigated.

antibacterial efficacy of photodynamic therapy was observed at photosynsetiser toluidine blue exposure into periodontal pockets with in 58 to 105 seconds. The best result of antibacterial effectiveness of photodynamic therapy was observed with at laser exposure with in 43 to 61 seconds (Figure 7). A high level of antibacterial efficacy of photodynamic therapy has a significant potential in terms of the modern practice of periodontics.

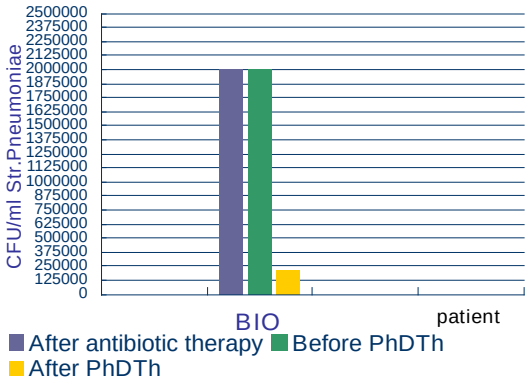


Figure 2.Comparison of the value of lg CFU/ml of Str.Pneumoniae after conservative antibiotic therapy and before and after PDT

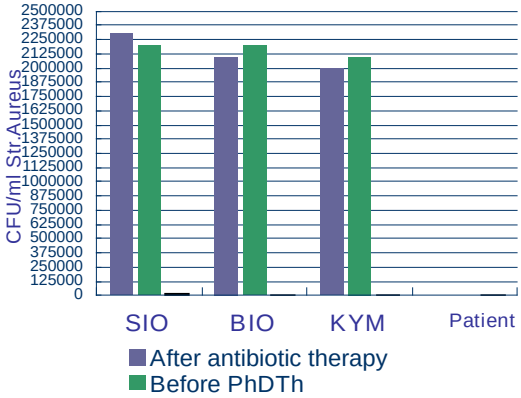
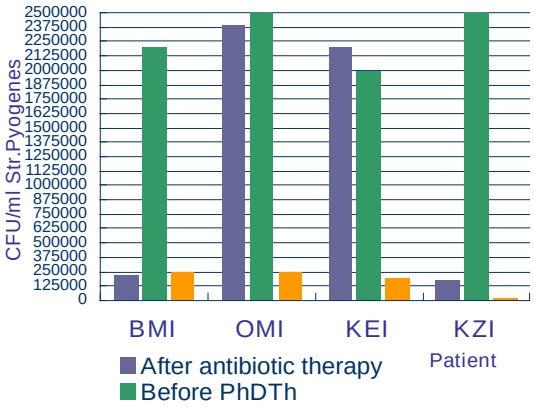


Figure 3. Comparison of the value of lg CFU/ml St. Aureus after conservative antibiotic therapy and before and after PDT



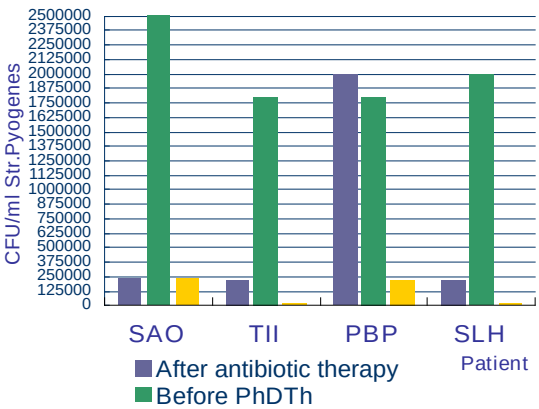
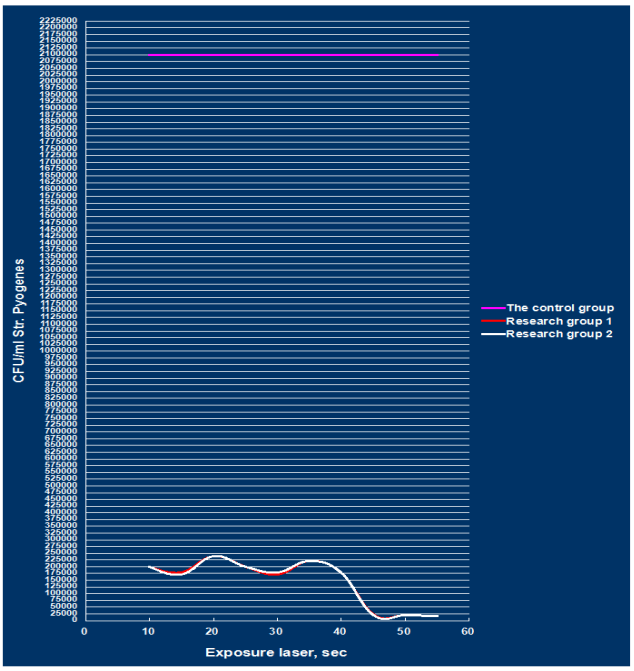


Figure 4. Comparison of the value of lg CFU/ml of Str. Pyogenes after conservative antibiotic therapy and before and after PDT (patients 1-14)

Figure 5. Comparison of the value of lg CFU/ml of Str. Pyogenes after conservative antibiotic therapy and before and after PDT (patients 15-23)



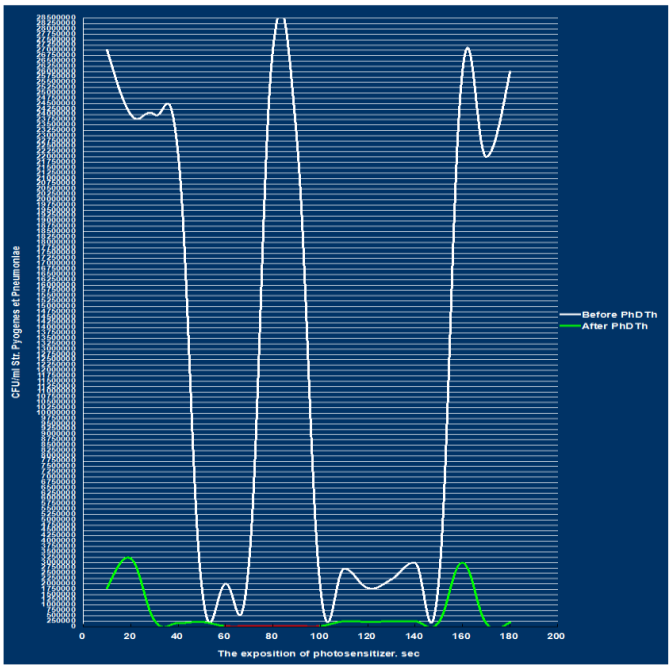


Figure 6. Correlation between antibacterial efficiency of the red laser diode against Str. Pyogenes, Str. Pneumoniae at different exposure photosensitiser (toluidine blue).
*Note. *Exposure of photosensitiser in which the antibacterial effect of PDT and reaches maximum values are marked in red.*

Figure 7. Correlation between antibacterial efficiency of the RED LASER DIODE FotoSan 630 with respect to Str. Pyogenes at different exposure his actions.

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