

Comparative Characteristics of the Methods of Treatment of Chronic Periodontitis Using Antibacterial Photodynamic Therapy (Per One Visit) and Calasept Preparation

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Abstract: Background: The article describes the results of research on efficiency of using antimicrobial photodynamic therapy in treatment of chronic periodontitis.

Methods: 88 root canals in 84 patients were examined and treated. The diagnosis of chronic apical periodontitis was made based on anamnesis, data of clinical and instrumental examination, assessment of X-ray images. Patients were randomly selected to comply with the purity of the experiment.

Results: It was found that the use of antimicrobial photodynamic therapy leads to a reduction of medical cases accompanied by pain reaction after a one-stage treatment of chronic periodontitis when compared with data of the patients treated with calcium hydroxide preparation. Laser radiation in the course of preparation of the root canal for obturation allows reducing the number of complications almost 1.5 times, speeding up the recovery process of bone destruction foci, allowing to conduct endodontic treatment per one visit.

Conclusion: The use of laser radiation in the course of preparation of the root canal for obturation when treating chronic periodontitis allows reducing the number of complications almost 1.5 times, accelerates recovery of bone destruction foci.

Keywords: Chronic periodontitis ■ Antimicrobial photodynamic therapy ■ Treatment of periodontitis per one visit

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INTRODUCTION

Apical periodontitis takes third place in the structure of dental diseases after dental caries and pulpitis.¹ Teeth deprived of pulp and with the elements of destruction at the root apex, are the foci of a chronic infection that can lead to systemic diseases. This causes close attention to this nosology. Currently, leading role in the etiology of apical periodontitis is taken by microbial factor. The microflora of the root canal is represented by microorganisms of various genera and families, among which staphylococci and streptococci are the most frequent. Bacteria are present in all parts of the root canals including lateral canals,

anastomoses and dentinal tubules to depths of up to 300 microns from the pulp.² Complex anatomy of the root canals provides a favorable environment for their growth and reproduction; the remains of pathogenic microflora may be present in the root canals even after endodontic treatment.³

The main purpose of the modern endodontic treatment is sterilization of endodontic system, its release from the remains of the inflamed pulp, removal of the smear layer of dentin.⁴ Instrumental treatment accompanied by copious irrigation with disinfectant solutions reduces the number of microorganisms hundreds of times. Some authors in their work suggest that even modern instrumental and mechanical treatment cannot fundamentally solve the problem of combating the root infection and believe that various types of formation of the root canals do not allow to fully clean up and adequately treat the canal.^{5,6}

Currently, most medical practitioners begin treatment measures with a temporary filling of the root canals with calcium hydroxide preparations. However, according to the literature, efficiency of this drug for various kinds of pathogenic microorganisms varies. Diffusion in the deep of the infected dentin is also limited.⁷ There are also a number of opinions in favor of one-stage treatment of chronic periodontitis.⁸ The authors explain this by the fact that microorganisms remaining in the root canal after the treatment are blocked by the root filling and die due to lack of nutrient substrate. It should also be noted that most of the materials used for final root canal obturation have antibacterial activity. Furthermore, according to A. Mitronin et al, endodontic treatment per two visits is accompanied by a certain risk of re-colonization of endodontic system with microorganisms.⁹

Up to date, the preparation is being under research providing a complete sterilization of the root dentin without side effects. The authors believe that existing preparations for medical treatment of the root canals do not allow to achieve complete sterilization of the root canal.¹⁰ Search for products and techniques with high antibacterial activity is very relevant.

In recent years, the use of laser radiation in endodontics for therapeutic purposes is increasing. Photodynamic therapy may be used both in caries processes and in endodontics. One of the methods is photoactivatable disinfection (Helbo, Austria). Cell walls of the microorganisms are stained by photosensitive molecules HELBO Blue Photosensitizer which diffuse into the biofilms.¹¹ Then these molecules are activated using a laser light with a wavelength of 670 nm-690 nm and energy density of 75 mW/cm². Absorption of Photosensitizer molecule of light quanta in the presence of oxygen leads to a photochemical reaction, resulting in triplet molecular oxygen being transformed into singlet which kills microorganisms in the biofilm by lipid oxidation on membranes.¹²

The studies were conducted at the department of therapeutic dentistry of Stavropol State Medical University aimed at provision of a comparative assessment of methods of treatment of chronic periodontitis using temporary filling of the root canals with calcium hydroxide preparation and treatment of the root canal with antibacterial photodynamic system (treatment per one visit), based on data of clinical and radiographic studies.

MATERIALS AND METHODS

We have examined and treated 88 root canals in 84 patients with a diagnosis of chronic apical periodontitis. Age features and gender identity of the patients are given in Table 1.

The diagnosis of chronic apical periodontitis was made based on anamnesis, data of clinical and instrumental examination, assessment of X-ray images. Patients were randomly selected to comply with the purity of the experiment. All patients were aged between 18 and 73 years old and were in good health. Pregnant and lactating women as well as patients undergoing phototherapy were excluded from the study. In each clinical case, enlargement X-ray film was made before treatment to

determine the approximate length of the root canal and its morphology. Working length of the canals was determined with the apex locator. The canals were processed by crowdown method. Copious rinsing of the canals (over 20 ml) of 2.5% sodium hypochlorite solution at room temperature in between the steps of mechanical treatment was conducted with a syringe with an endodontic needle. Then the canal was washed thoroughly with sterile water to remove residual irrigative solutions. Patients were divided into two equal groups. Patients of group 1 were subject to disinfection of the root canal using photodynamic therapy. Helbo Endo Blue solution was injected in the root canal using a sterile endodontic needle to the working length. The liquid in each canal was stirred for 60 s using a nickel-titanium manual file, two sizes smaller than apical master file. Then, endodontic emitter was injected in the canal and activation with laser beam was performed for 120 s. Each canal was obturated according to standard techniques guttapercha point, the tooth was recovered. After chemomechanical treatment, the canals in patients in group 2 were channels temporarily filled with Calasept (Sweden) preparation on the basis of calcium hydroxide, and a tooth was filled with a temporary filling of Vitremer (3M ESPE) glass ionomer cement. After 2 weeks, temporary filling was removed, the root canals were tightly obturated, and the tooth was recovered.

RESULTS AND DISCUSSION

Treatment results were evaluated in the period from 1 to 14 days, 6 months and 12 months after final root canal obturation. Parameters of clinical well-being of the treatment of chronic periodontitis using laser photodynamic system and Calasept preparation containing calcium are shown in Figure 1.

It should be noted that clinical well-being in the nearest terms was observed in 95.5% of patients of group 1 and in 76% of patients in group 2. Complications occurred in patients of group 1 in 4.5% of cases. In group 2, complications were found in 24% of cases, which is almost five times higher than in group 1. When comparing 2 methods of treatment of chronic periodontitis after 6 months, clinical well-being was found in patients of group 1 in 97.3% and in 85.5% of cases — of group 2. The percentage of complications in patients of group 1 was 2.7% and in the 2nd group — 4.5%. Thus, complications in patients of group 2 were observed almost 2 times more often than in the 1st group. When comparing two methods of treatment of chronic periodontitis after 12 months, clinical well-being was observed in patients of group 1 in 100% of patients, of group 2 — in 94.7% of cases. Complications in patients of group 2 amounted to 5.3%.

Table 1. Distribution of patients by age and sex.

Age (years)	Gender			
	Male		Female	
	Absolute	%	Absolute	%
18-29	9	10,7	6	7,1
30-39	7	8,3	8	9,5
40-49	16	19,1	5	6
50-59	17	20,2	2	2,4
60-75	10	11,9	4	4,8
Total	59	70,2	25	29,8

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