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Evaluation of the effect of a diode laser on the state of periodontal pathogenic microorganisms in patients with early manifestations of chronic inflammation of periodontic tissues

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Abstract

Relevance. Chronic inflammation of periodontal tissues in young people.

Purpose. The aim of the work was to study of the effectiveness of the influence of a diode laser on the state of the microbiome of various biotopes of the oral cavity in patients with early manifestations of chronic inflammation.

Materials and methods. 70 patients (66.7%) with chronic gingivitis and periodontitis of mild severity, aged 23–35 years, were examined. A control group was consisted of 35 patients (33.3%) with clinically intact periodontium (CIP). Researchers in this group have the goal of determining critical values (22.9%) and conducting the proposed range of treatment and preventive measures. Clinical and microbiological research methods were used to assess the effectiveness of the proposed treatment and prophylactic complex.

Results. Our results showed high efficiency of the treatment and prophylactic complex in the treatment of early manifestations of chronic inflammation of periodontal tissues. The use of the method of simultaneous processing of the studied biotopes of the oral cavity in the complex of treatment and prophylactic measures has a positive trend. Under the influence of this effect significant elimination of periodontal pathogens of the first order and a decrease in the degree of chronic inflammation ($p < 0.05$) from the initial data are observed in patients with early manifestations of chronic inflammation in periodontal tissues.

Conclusion. The data obtained on the basis of the study indicate that the developed treatment and oral care are an effective method for correcting the state of the microbiome of the studied biotopes.

Key words: clinically intact periodontium, chronic gingivitis, periodontitis, diode laser, Periopathogenic or periodontal pathogenic microflora.

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Inflammatory periodontal diseases in the modern aspect are an urgent problem, due to their high prevalence, the difficulty of diagnosing causal risk factors and, consequently, the low effectiveness of treatment and prevention measures [3, 5, 9, 11, 12, 14, 15, 18, 19].

According to the WHO data (2016) and data from the Russian Society of Periodontology and the European Federation of Periodontology in Russia and the world as a whole, signs of early inflammatory processes and chronic inflammation are detected in more than 95% of young people, while 16% of those who applied for a preventive examination have already taken place clinical signs of chronic inflammation with the presence of dental or periodontal pockets. In this regard, the problem of improving early diagnosis, conducting high-quality medical and preventive measures does not lose its relevance [1-3, 4, 6, 7, 12-19, 23].

Initial manifestations of inflammatory processes in the periodontium are caused by high reserve, immune and reparative features, periodontal tissues may correspond to the norm, or proceed without a pronounced clinical picture and subjective complaints of the patient [7, 20, 22, 24, 26].

The chronization of the inflammation process is not always accompanied by pronounced clinical manifestations, but the complaints of patients can be quite justified. Lesions of periodontal tissues in the presence or absence of clinically chronically expressed inflammation are often associated with the degree of resorption, the depth of the dental or periodontal pocket, changes in the microbiome of the oral cavity, and consequently pathological reactions occurring in the tissues [3, 8, 11, 21, 25, 27].

Thus, the implementation of modern therapeutic and preventive measures for early manifestations of chronic inflammation in periodontal tissues with the ability to fully reduce the microbial potential is relevant and promising, which caused the relevance and purpose of our study.

PURPOSE

To evaluate the effectiveness of local treatment of early manifestations of chronic periodontal tissue inflammation in young people using a diode laser.

MATERIAL AND METHODS

Our comprehensive survey program was conducted in 2 stages. The first stage of the study included a comprehensive clinical dental examination with an assessment of dental status data, assessment of the clinical condition of periodontal tissues, and determination of hygienic and periodontal indices. The second stage of PCR diagnostics allowed us to conduct a qualitative and quantitative analysis of the composition of the microbiome of the studied oral biotopes, and the ability to identify and determine the critical titers of periodontal pathogens of diagnostic significance. In individuals with clinically intact periodontal disease, this method allowed us to determine the risk of developing inflammatory diseases, in individuals with ear-

ly manifestations of chronic inflammation in periodontal tissues – to predict the dynamics and stabilization of the process, to justify the recommended algorithm of treatment and prevention measures with an assessment of their effectiveness.

We conducted a comprehensive clinical dental examination of 105 young people, who were divided into two main clinical groups and a comparison group.

The comparison group consisted of 35 patients (33.3%) with clinically intact periodontal disease (IP). The study was conducted to clarify the titer values of the studied periodontal pathogens, as well as an index assessment of the condition of periodontal tissues. In 22.9% of cases of PCR studies, the risks of developing chronic inflammation were identified in the form of high titers of periodontal pathogenic microflora, which was corrected using the proposed complex of therapeutic and preventive measures. The remaining 77.1 per cent of individuals with identified low thresholds titles parodontopathogenic microflora also conducted treatment and preventive measures according to the standard scheme is STAR, 2001.

35 patients (33.3%) of the first clinical group with diagnosed chronic gingivitis (CG) and critical titles of periodontopathogenic microorganisms was subjected to complex treatment and preventive measures, which allowed at 42.9% of the cases to stabilize the inflammatory process in periodontal tissues.

In the second clinical group consisting of 35 people (33.3%) with chronic generalized periodontitis of mild severity and identified high titers of periodontopathogenic microorganisms, the proposed complex was performed in 65.7% of cases, and in 34.3% of cases with identified low threshold values of titers, therapeutic and preventive measures were performed according to the generally accepted scheme STAR, 2001.

All clinical groups are comparable in age and gender.

Clinical assessment of tissue included determination of the index bleeding SBI simplified hygiene index OHI-S popularno-marginal-alveolar index PMA, gingival index, PI, analysis of data obtained in a clinical dental examination, and analysis of data obtained by x-ray (radiography dental computer) and microbiological examination methods. All the parameters under study are based on the definition standards of who, the Russian Society of Periodontology and the European Federation of periodontics (EFP).

The criteria for inclusion in the studied clinical groups were the presence of informed consent of patients, male and female persons aged 20 to 35 years, without the presence of somatic diseases, and the absence of high-quality therapeutic and preventive measures in the oral cavity for the last 6 months. Criteria for exclusion to the study clinical groups: lack of informed consent of patients, men and women over 35 years of age, persons with the presence of somatic diseases and with high-quality medical and preventive measures carried out at the time of examination.

To study the spectrum and number of studied periodontopathogenic microorganisms of both the first and second order, all patients took biological material from the studied oral cavity biotopes – dental plaque, gingival and oral fluid, and the contents of the periodontal pocket (table 1).

Identification of isolated cultures was carried out based on the study of their biochemical properties using special test systems.

The process of DNA isolation takes about 20 minutes on average and consists of alternating three stages: moving a test tube with a DNA EXPRESS reagent containing the analyzed material for 10 seconds, warming the test tube in a solid-state thermostat at 98°C for 20 minutes and separating the supernatant containing DNA by centrifugation at 8,000-14,000 rpm for 20-30 seconds.

Microbiological experiments of the material were performed in dynamics before the complex of therapeutic measures and after 14 days, 3 months, 6 months, and 12 months.

Amplification of species – specific DNA fragments of the studied bacteria-porphyromonas of blood, Treponema denticola, Aggregatibacter actinomycetemcomitans, Tannerella forsythensis, P. endodentalis, Fusobacterium nucleatum, Prevotellum promezh was performed using the polymerase chain reaction (PCR) method using specific primers in the multichannel amplifier Terzik MS-2 (NPF "DNA technology", Russia).

To study the spectrum and number of studied periodontopathogenic microorganisms of both the first and second order, all patients took biological material from the studied oral cavity biotopes – dental plaque, gingival and oral fluid, and the contents of the dental pocket. Using the method of PCR diagnostics (test system "Dentoscreen "NPF" Litech") allowed to identify – Porphyromonas gingivalis, Treponema denticola, Aggregatibacter actinomycetemcomitans, Tannerella forsythensis, P. endodentalis, Fusobacterium nucleatum, Prevotella intermedia.

Local treatment of early manifestations of chronic inflammation in periodontal tissues due to the presence of high threshold values of periodontal pathogenic microflora titers was performed using PICSSO Lite diode laser in combination with laminaria containing gel in the form of gel and adhesive plates.

There were no contraindications for diagnostic and therapeutic measures in these patients.

All the obtained data were subjected to mathematical calculations – arithmetic mean series, their errors, standard deviations were calculated, and the student's confidence coefficient was determined Excel, Excel-2000. Quantitative characteristics were described using the arithmetic mean (M) and standard error of the mean (m). When describing qualitative characteristics, relative

Table 1. **Collection, delivery and storage of biological material**

Biotope	Taking a sample for analysis
Plaque	Taking dental plaque with a sterile universal probe of type A. place the Tip of the probe with plaque in a test tube with "DNA EXPRESS", make 5-10 rotational movements with the probe, then remove the probe and close the lid
Gingival liquid	Select with sterile paper strips of 0.3-0.8 mm or paper pins (endodontic paper pins) №20-40 for 10-20 seconds. Put in a test tube with "DNA EXPRESS"
Contents of the periodontal pocket	Sterile paper pins (endodontic paper pins) №20-40. Place in the periodontal pocket for 10-20 seconds. Remove the pins and place them in a test tube with "DNA EXPRESS"

shares and standard error of the share were calculated, and the reliability of the results was evaluated using the reliability criterion – T (student's criterion). Statistical hypotheses were tested by comparing the obtained significance level (p) with the threshold level of 0.001; 0.01; 0.05. At $p \leq 0.05$, the null hypothesis that there were no differences between the indicators was rejected and an alternative hypothesis was accepted. Statistically significant values were considered ($p < 0.05$).

RESULTS AND DISCUSSION

A comprehensive dental examination was performed in 105 young people without severe somatic pathology. The patients under observation, depending on the clinical condition of periodontal tissues, were distributed as follows: 35 (33.3%) patients showed slight pronounced inflammation of periodontal tissues in intact periodontal disease (IP), and 8 (7.62%) of them had risk factors in the form of the presence of periodontal pathogenic microflora, 35 (33.3%) had chronic gingivitis (By 05.1), and 35 (33.3%) patients had chronic periodontitis (by 05.31). Patients with intact periodontal disease in 7.62% of cases complained of itching and spontaneous bleeding when brushing their teeth and eating hard food. All patients with chronic gingivitis and periodontitis of mild severity most often complained of bleeding when brushing their teeth and eating hard food, periodically appearing aching pain in the gums and discomfort in the gums. Upon objective examination, these individuals have gingival papillae that are swollen, enlarged, loose, hyperemic, with a bluish tinge; the gingival margin is edematous, enlarged in volume, roller-like thickened, the marginal part of the gum is edematous, cyanotic.

The hygienic state of the oral cavity on average turned out to be poor in all clinical groups, as evidenced by the values of the green-Vermillion index-more than 2 points (with a norm of 0.0-0.6), the prevalence of symptoms such as bleeding gums and the presence of hard dental deposits, according to who criteria, was low and average, respectively, of the norm, as a result of which the indices of PMA, GI and SBI ($p \leq 0.05$) (Fig. 1).

The student's test, with the null hypothesis that there were no differences in the mean values in the two samples, showed at a significance level of $p < 0.001$ that all samples of CG and CGPLS differed statistically significantly from the comparison group for all the considered indices, and the groups also differed statistically significantly ($p < 0.001$).

The analysis of 3D CT in 7.62%±1.75% of individuals with intact periodontal disease revealed changes in the external and internal cortical plate in the form of its thinning in the area of individual teeth, small foci of osteoporosis at the tops of the alveolar ridges, which corresponds to the initial radiological signs of chronic inflammation. Densitometric studies in these individuals showed that in the area of the middle of the vertexes of the interdental partitions in the Central teeth of the lower jaw, the average bone density was 1398.00 ± 53.42 y. e., in the area of the chewing group of teeth of the lower jaw – 1567.00 ± 49.64 y. e., in the upper jaw in the area of the Central teeth 1166.00 ± 46.58 y. e., in the area of the chewing group of teeth 1585.00 ± 51.31 y.e.

The study subjects with chronic gingivitis and periodontitis of mild severity revealed the expansion of the periodontal gap and thinning of the dental partitions in the area of individual teeth. Densitometry in the middle of the vertexes of the interdental septum in the Central teeth of the lower jaw averaged 1458.00 ± 46.35 y.e., in the area of the chewing group of the lower jaw – 1597.00 ± 51.22 y.e., in the upper jaw in the area of the Central teeth 1256.00 ± 33.54 y.e., in the area of the chewing group of teeth 1599.00 ± 47.34 y.e.

Microbiological research of various oral cavity biotopes (dental plaque, gingival and oral fluid, periodontal pocket contents) in all groups, regardless of the clinical state of periodontal tissues, allowed to identify periodontal pathogenic microorganisms of various complexes.

Among the representatives of the red complex, the most common subspecies were Treponema denticola from 20.0% to 28.6% of cases, Tannerella forsythia from 11.4% to 20.0% and P. gingivalis from 22.9% to 71.4% of cases (Fig. 2).

The orange complex was a representative of aerobic gram-negative microorganisms-Fusobacterium nucleatum detected on average from 34.3% to 54.3% of research cases. Among the representatives of the green complex in the studied biotopes, Aggregatibacter actinomycetemcomitans serotype a was most often detected (Fig. 3).

In patients with clinically intact periodontal disease (TRC) in the studied biotopes, Fusobacterium

Table 2. **The proportion of positive samples for the identification of conditionally pathogenic and obligate-anaerobic microorganisms in the biotopes of the oral cavity in young people**

Types of microorganisms	IP (n = 35) plaque, gingival fluid		Chronic gingivitis (n = 35) gingival fluid, oral fluid		Chronic periodontitis (n = 35) periodontal pocket contents, oral fluid	
	абс.	%	абс.	%	абс.	%
Laktobatsilly	17	48,57	31	88,57*	23	65,71**
Candida spp. (C. albicans)	8	22,85	23	65,71*	22	62,86**
p. Neisseria	29	83%	19	54,7%	20	57,4%
Str. mitis, Str. sangius	35	100%	29	82,85%	32	91,4%
Treponema denticola	7	20	8	22,86%	10	28,57**
Porphyromonas gingivalis	8	22,85	17	48,57*	25	71,42**
Porphyromonas endodentalis	4	11,43	8	22,86*	13	37,14**
Aggregatibacter actinomycetemcomitans	5	14,29	13	37,14*	16	45,71**
Fusobacterium nucleatum	12	34,28	17	48,57*	19	54,28**
Tannerella forsythia	4	11,43	6	17,14*	7	20**

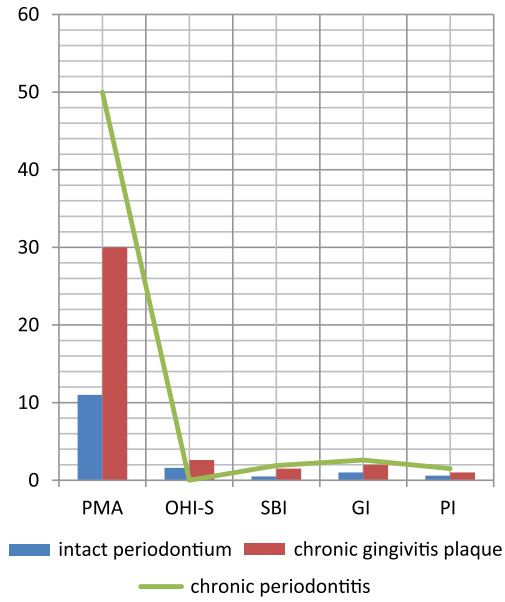

Fig. 1. **Values of index assessment of periodontal tissue state depending on the clinical condition**

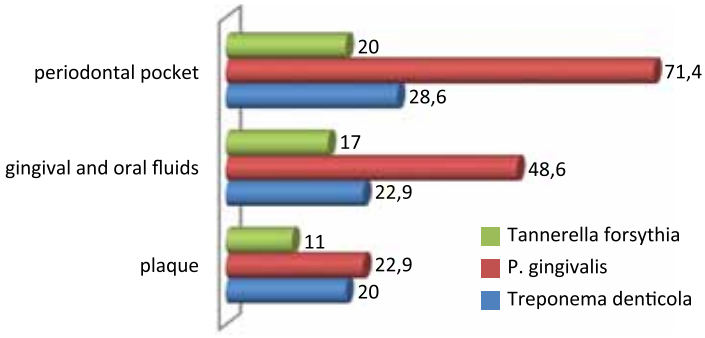

Fig. 2. **Quantitative ratio of periodontopathogenic microorganisms belonging to the red complex in the studied biotopes in percent**

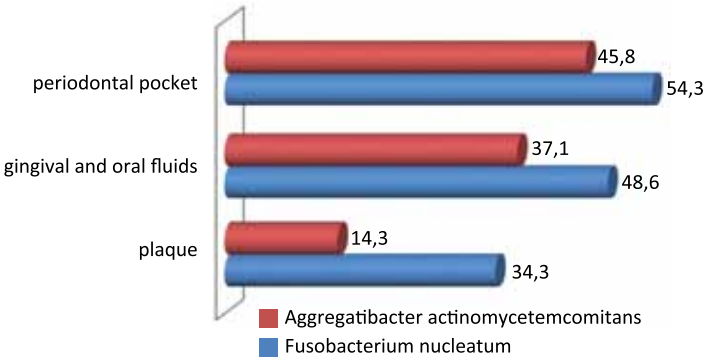

Fig. 3. **Quantitative ratio of periodontopathogenic microorganisms belonging to the orange and green complex in the studied biotopes in percent**

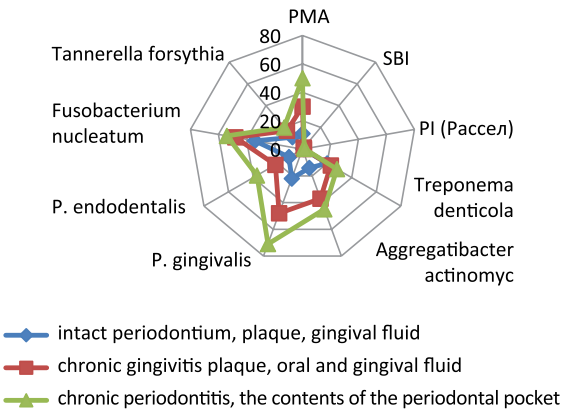

Fig. 4. **The qualitative ratio of the identified representatives of periodontopathogenic microflora depending on the clinical condition of periodontal tissues and on their degree of pathogenicity**

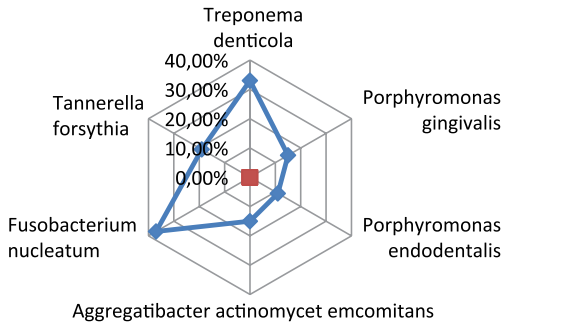

Fig. 5. **Dynamics of the influence of the therapeutic and prophylactic complex on changes in the titers of periodontal pathogenic microflora in the comparison group**

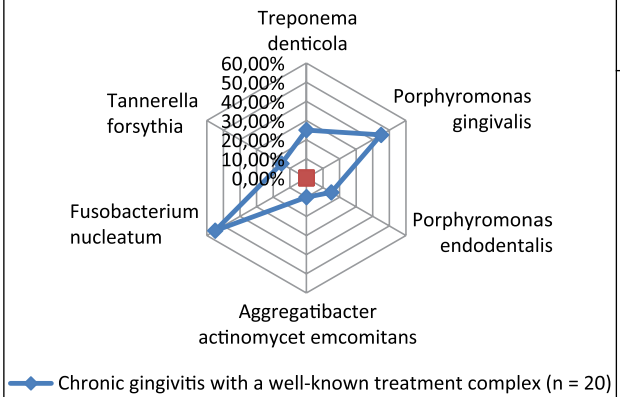

Fig. 6. **Dynamics of the influence of the therapeutic and prophylactic complex on changes in the titers of periodontal pathogenic microflora in the group with chronic gingivitis**

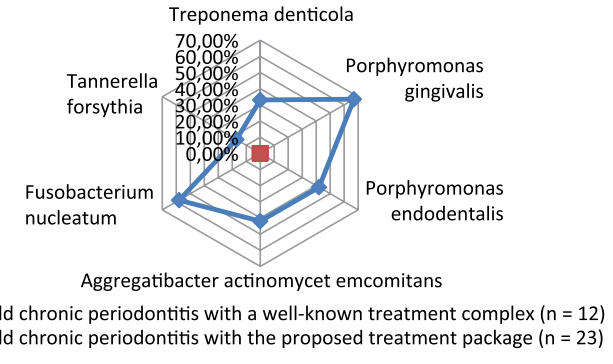

Fig. 7. **Dynamics of the influence of the therapeutic and prophylactic complex on changes in the titers of periodontal pathogenic microflora in the group with mild chronic periodontitis**

nucleatum was detected in 34.28%, Porphyromonas gingivalis – 22.85%, Aggregatibacter actinomycetemcomitans – 14.29% of cases. When diagnosed with chronic gingivitis (CG) and periodontitis (CP), the frequency of their occurrence is significantly higher, respectively, for Porphyromonas gingivalis by 2 times, for Fusobacterium nucleatum by 1.5 times, for Aggregatibacter actinomycetemcomitans by 2.6 and 3.2 times (table 2).

In most cases, the analysis of data obtained during microbiological studies by PCR in patients with clinically intact periodontal disease, chronic gingivitis and periodontitis of mild severity in the studied biotopes of the oral cavity revealed periodontopathogenic microorganisms in critical or low titers (Fig. 4).

Detection of the presence of representatives of the orange and red complex, regardless of the clinical state of periodontal tissues, is closely related to the identified clinical indicators, in particular, with bleeding gums during probing, the presence of chronic inflammation and periodontal pocket.

Analysis of data obtained before the proposed treatment package showed that high DNA titers of the desired periodontal pathogens were identified in 46 patients (43.8%), including 8 patients with clinically intact periodontal disease (22.85%), with chronic gingivitis in 15 patients (42.85%) and 23 patients with mild chronic periodontitis (65.71%). The treatment contributed to their significant reduction (χ^2 = 8.57, p = 0.003). The best results were observed in the dynamics of reducing the content of first-order periodontal pathogens T. denticola, P. gingivalis and A. actinomycetemcomitans (Fig. 5-7).

In patients with clinically intact periodontal disease with high titers, the proposed treatment complex resulted in complete elimination of plaque and gingival fluid in the biotope of P. gingivalis, A. Actinomycetemcomitans, T. denticola, and P. endodontalis, with a 3-and 2-fold decrease in Fusobacterium nucleatum and Tannerella forsythia, respectively (p ≤0.05) (Fig. 5).

In patients with chronic gingivitis, the treatment complex also contributed to the qualitative elimination of periodontopathogenic species belonging to the first order, while the content of P. endodontalis, Fusobacterium nucleatum and T. forsythia decreased quantitatively 3.4, 3.7 and 2.6 times with a statistically significant difference than in the first study (Fig. 6).

When diagnosed with chronic generalized periodontitis mild the complex of local treatment also contributed to their elimination and reduction in quality P. endodentalis, Fusobacterium nucleatum and T. forsythia, respectively, 2, 4 and 1.5 times (p ≤ 0.05) (Fig. 7).

The best effect was achieved in patients with the proposed method of local treatment in respect of complete elimination of T. denticola, P. gingivalis, A. actinomycetemcomitans, P. endodentalis и снижении Fusobacterium nucleatum и Tannerella forsythia (χ^2 = 0,99, p = 0,0009).

Depending on the clinical state of periodontal tissues, low titers of the desired types of periodontal pathogens were detected in 59 patients (56.1%), including 27 patients with TRC (77.14%), 15 patients with CG (57.14%) and 23 patients with CGPLST (65.71%). The complex of well-known treatment contributed to a decrease (χ^2 = 0.99, p = 0.0009), however, their complete elimination was not observed.

The studied periodontopathogenic microorganisms were detected before and after local treatment – T. denticola was detected in 18 patients, P. gingivalis in 21, and A. actinomycetemcomitans in 11 patients regardless of the clinical condition of periodontal tissues (χ^2 = 13.47, p = 0.0002; χ^2 = 9.26, p = 0.002; χ^2 = 4.00, p = 0.046).

CONCLUSION

1. The use of a therapeutic and prophylactic complex provides a significant increase in the therapeutic effect and an increase in the remission period for early manifestations of chronic inflammation in periodontal tissues.

2. The effect of a diode laser has a pronounced antimicrobial effect against periodontal pathogenic microorganisms located in various biotopes of the oral cavity and inaccessible to mechanical and antiseptic agents.

3. The results obtained by us showed a high effectiveness of the use of a therapeutic and prophylactic complex in the complex of local treatment of early manifestations of chronic inflammation in periodontal tissues in young people with identified risk factors in the form of high titers of periodontal pathogenic microflora.

Thus, the proposed complex of local treatment of early manifestations of chronic inflammation in periodontal tissues contributes to the complete elimination of periodontal pathogenic microflora of the first order.

СПИСОК ЛИТЕРАТУРЫ / REFERENCES

1. Атрушкевич В. Г., Орехова Л. Ю., Янушевич О. О., Соколова Е. Ю., Лобода Е. С. Оптимизация сроков поддерживающей пародонтальной терапии при использовании фотоактивированной дезинфекции. // Пародонтология. 2019;(24)2:121-126. DOI: 10.33925/1683-3759-2019-24-2-121-126. [V. G. Atrushkevich, L. Yu. Orekhova, O. O. Yanushevich, E. Yu. Sokolova, E. S. Loboda. Optimization of terms of supportive periodontal therapy when using photoactivated disinfection. Parodontologiya. 2019;24(2):121-126. (In Russ.)] https://doi.org/10.33925/1683-3759-2019-24-2-121-126.

2. Булкина Н. В., Китаева В. Н., Герасимова Т. В., Кропотина А. Ю., Вулах Н. А., Аристова И. С. Применение комбинированного воздействия лазерного и КВЧ-облучения аппаратом "Матрикс" в комплексном лечении заболеваний пародонта. // Вестник медицинского института "РЕАВИЗ": реабилитация, врач и здоровье. 2018; 1 (31):49-52. [N. V. Bulkina, V. N. Kitaeva, T. V. Gerasimova, A. Yu. Kropotina, N. A. Vulah, I. S. Aristova.Combined laser and microwave therapy (using "Matrix" apparatus) in the complex treatment of inflammatory periodontal diseases. Bulletin of the medical institute "REAVIZ": rehabilitation, doctor and health. 2018;1(31):49-52. (In Russ.).] https://elibrary.ru/item.asp?id= 32823970.

3. Григорович Э. Ш. Хронический генерализованный пародонтит: клинико-морфологические и молекулярно-генетические основы гетерогенности заболевания, обоснование прогноза и персонификация терапии: автореф. дис. … д-ра мед. наук. 14.01.14./ [Место защиты ГБОУ ВПО «Первый МГМУ им. И.М.Сеченова» Минздрава России] / Москва., 2016. [E. H. Grigorovich. Hronicheskij generalizovannyj parodontit: klinikomorfologicheskie i molekulyarno-geneticheskie osnovy geterogennosti zabolevaniya, obosnovanie prognoza i personifikaciya terapii: avtoref. dis. … d-ra med. nauk. The place of protection of SEI HPE "First MSMU n. a. I.M. Sechenova" of the Ministry of Health of the Russian Federation] –Moskva., 2016. (in Russian)]. https://www.sechenov.ru/upload/medialibrary/4a6/dissertatsiya_grigorovich_esh.pdf

4. Орехова Л. Ю., Кудрявцева Т. В., Бурлакова Ю. С. Система локальной доставки лекарственных препаратов в пародонтологии // Пародонтология – 2016; 21(1). 44-49. [L. Yu. Orekhova, T. V. Kudryavceva,. Yu. S. Burlakova. System of local drug delivery in periodontics. Periodontology. 2016;21(1):44-49. (In Russ.)] https://elibrary.ru/item.asp?id=25647072

5. Орехова Л. Ю., Лобода Е. С., Обоева М. Л. Оценка эффективности комплексного лечения хронического генерализованного пародонтита с использованием лазерной фотодинамической системы «РАСТ 200». //Российская стоматология – 2016;9.1:101. [L. Yu. Orekhova, E. S. Loboda, M. L. Oboeva. Evaluation of the effectiveness of complex treatment of chronic generalized periodontitis using the laser photodynamic system "RAST 200". Russian dentistry. 2016;9.1:101. (In Russ.)] https://elibrary.ru/item.asp?id=26005929.

6. Орехова Л. Ю., Лобода Е. С., Обоева М. Л. Фотодинамическая терапия в комплексном лечении хронического генерализованного пародонтита. // Пародонтология – 2015;20. 1(74): 44-49. [L. Yu. Orekhova, E. S. Loboda, M. L. Oboeva. Photodynamic therapy in the complex treatment of chronic generalized periodontitis. // Periodontology. 2015;20.1(74):44-49. (In Russ.)] https://elibrary.ru/item.asp?id=23413723.

7. Орехова Л. Ю., Кудрявцева Т. В., Чеминава Н. Р., Тачалов В. В., Лобода Е. С. Проблемы стоматологического здоровья у лиц молодого возраста (обзор литературы). // Пародонтология. 2014;19. 2 (71):3-5. [L. Yu. Orekhova, T. V. Kudryavceva, N. R. Cheminava, V. V. Tachalov, E. S. Loboda. Dental health problems in young people (literature review). //Periodontology. 2014;19.2(71):3-5. (In Russ.)] https://elibrary.ru/item.asp?id= 22135425.

8. Окулич В. К., Колчанова Н. Э., Чернявский Ю. П. Особенности течения хронического периодонтита, ассоциированного с биопленкообразующими микроорганизмами. // Пародонтология. 2018; 23. 4: 9-14. [V. K. Okulich, N. E. Kolchanova, Yu. P. Chernyavskij. Features of progress of chronic periodontitis associated with biofilm-forming bacteria. // Periodontology. 2018;23;4:9-14. (In Russ.).] https://doi.org/ 10.25636/PMP.1.2018.4.2.

9. Оптимизация ранней диагностики, профилактики и лечения воспалительных заболеваний пародонта у лиц молодого возраста / Алькофиш М. А. М. // Диссертация на соискание ученой степени кандидата медицинских наук / Башкирский государственный медицинский университет. Уфа, 2019. [M. A. M. Al-Qufaish Optimizaciya rannej diagnostiki profilaktiki i lecheniya vospalitel'nyh zabolevanij parodonta u lic molodogo vozrasta. Dokt, Diss. [Optimization of early diagnosis, prevention and treatment of inflammatory periodontal diseases in young people. PhD. Diss.].Ufa, 2019;.]. https://elibrary.ru/item.asp?id=41521324.

10. Пародонтология. Национальное руководство / под ред. Член. Корр. РАН, проф. Янушевича О.О., проф. Дмитриевой Л.А.. . Москва: ГЭОТАР-Медиа. Изд. 2.2018:752. [Parodontologiya: nacional'noe rukovodstvo / pod red/ chl-kor. RAN. prof. O.O. Yanushevicha, prof. L. A. Dmitrievoj. Moscow: GEOTAR-Media. Ed. 2.2018: 752.Periodontology: national leadership]. Moscow, GEOTAR-Media, Isd. 2. 2018. 752. (in Russian)]. http://www.geotar.ru › lots › NF0008226. Html.

11. Патрушева М. С., Михальченко В. Ф., Яковлев А. Т. Оценка цитокинового профиля и активности ферментов десневой жидкости у жителей г. Волгограда с интактным пародонтом и при пародонтите легкой степени тяжести. //Живые и биокосные системы. 2013;4:7. [M. S. Patrusheva, V. F. Mikhalchenko, A. T. Yakovlev. Evaluation of the cytokine profile and activity of gingival fluid enzymes in residents of Volgograd with intact periodontal disease and mild periodontitis. // Living and bio-inert system. 2013;4:7 (In Russ.)] URL: http://www.jbks.ru/archive/issue-4/article-7

12. Патрушева М. С. Эффективность медикаментозных лечебно-профилактических комплексов при лечении больных хроническим генерализованным пародонтитом легкой степени тяжести:/автореф. дис. … канд. мед. наук. 14.01.14./ [Место защиты ГОУВПО "Волгоградский государственный медицинский университет]. Волгоград, 2013. [M. S. Patrusheva. Effectiveness of medical treatment and prophylactic complexes in the treatment of patients with chronic generalized periodontitis of mild severity: avtoref. dis. ... cand. med. nauk./The place of protection of medical Sciences state medical University" Volgograd state medical University. Volgograd, 2013.] (in Russian)]. http://medical-diss.com/medicina/effektivnost-medikamentoznyh-lechebno-profilakticheskih-kompleksov-pri-lechenii-bolnyh-hronicheskim-generalizovannym-paro

13. Усманова И. Н., Герасимова Л. П., Кабирова М. Ф., Туйгунов М. М., Усманов И. Р. Клинико-микробиологическая эффективность применения фотодинамической терапии хронического гингивита и пародонтита у лиц молодого возраста. // Пародонтология. 2015; 2. (75):67-72. [I. N. Usmanova, L. P. Gerasimova, M. F. Kabirova, M. M. Tuigunov, I. R. Usmanov. Clinical and microbiological effectiveness of photodynamic therapy of chronic gingivitis and periodontitis in young people. // Periodontology. 2015;2.(75):67-72 (In Russ.)]. https://elibrary.ru/item.asp?id= 23498810.

14. Цепов Л. М., Николаев А. И., Петрова Е. В., Нестерова М. М. Патогенетическое обоснование клинического применения медикаментов в комплексной терапии при воспалительных заболеваниях пародонта (обзор литературы). / Пародонтология. 2018;23. 2 (87):4-9. DOI: 10.25636/PMP.1.2018.2.1. [L. M. Cepov, A. I. Nikolaev, E. V. Petrova, M. M. Nesterova. Pathogenetic substantiation of the clinical use of drugs in complex therapy for inflammatory periodontal diseases (literature review). Periodontology. 2018; 23; 2(87): 4-9. (In Russ.)] https://doi.org/10.25636/PMP.1.2018.2.1.

15. Цепов Л. М., Николаев А. И., Наконечный Д. А. Концепция одномоментной элиминации пародонтопатогенной микрофлоры в комплексном лечении хронического генерализованного пародонтита. Часть 1. Клиническая эффективность различных подходов в комплексной терапии хронического генерализованного пародонтита легкой степени. // Пародонтология. – 2016;21.4(81):10-16. [L. M. Cepov, A. I. Nikolaev, D. A. Nakonechnyj. The concept of simultaneous elimination of periodontopathogenic microflora in the complex treatment of chronic generalized periodontitis. Part 1. Clinical effectiveness of various approaches in the complex therapy of mild chronic generalized periodontitis. // Periodontology. 2016;21;4(81):10-16. (in Russian)]. https://elibrary.ru/item.asp?id=27639229.

16. Цепов Л. М., Николаев А. И., Наконечный Д. А. Концепция одномоментной элиминации пародонтопатогенной микрофлоры в комплексном лечении хронического генерализованного пародонтита. Часть 2. Клиническая эффективность различных подходов в комплексной терапии хронического генерализованного пародонтита легкой степени. // Пародонтология. -2017;22. 2(83):3-8. [L. M. Cepov, A. I. Nikolaev, D. A. Nakonechnyj. The concept of simultaneous elimination of periodontopathogenic microflora in the complex treatment of chronic generalized periodontitis. Part 2. Clinical effectiveness of various approaches in the complex therapy of mild chronic generalized periodontitis. // Periodontology. 2017;22;2(83):3-8. (in Russian)]. https://elibrary.ru/item.asp?id= 29232374.

17. Цепов Л. М., Николаев А. И., Нестерова М. М., Петрова Е. В. Хронический генерализованный катаральный гингивит и хронический генерализованный пародонтит: общие истоки, последовательный переход? (дискуссия). // Вестник Смоленской государственной медицинской академии. 2018;17.3:198-205. [L. M. Tsepov, A. I. Nikolaev, M. M. Nesterova, E. V. Petrova. Chronic generalized catarrhal gingivitis and chronic generalized periodontitis: common origins, sequential transition? (Discussion). // Bulletin of the Smolensk state medical Academy. 2018;17.3:198-205. (in Russ.)] https://elibrary.ru/item.asp?id=35722173.

18. Холмструп П., Племонс Ж., Мейл Й. Новая классификация заболеваний пародонта и тканей вокруг имплантатов. Заболевания десен, не ассоциированные с зубной бляшкой / Холмструп П., Племонс Ж., Мейл Й. / Пародонтология. 2019;24.4 (89):9-14. [Holmstrup P., Plemons J., Meyle J. Non-plaque-induced gingival diseases // Parodontologiya. 2019;24(4) (89):9-14. (In Russ.).] https://elibrary.ru/item.asp?id= 41531663.

19. Bjarnholt T. The role of bacterial biofilms in chronic infections //APMIS Suppl. – 2013; 136:1-51. https://doi.org/10.1111 / apm.12099.

20. Brook I. Microbiology and management of periodontal infection // Gen. dent.- 2003; 51(5):424-428. PMID: 17180163 https://doi.org/10.1038 / nrn2038.

21. Evaluation of the state of some oral obligate anaerobic and opportunistic microflora by periodontal inflammatory diseases. / Al-Cafes M.A.M., Usmanova I.N., Gerasimova L.P., Tuygunov M.M., Usmanov I.R., Gubaidullin A.G. // Journal of Pharmaceutical Sciences and Research. 2017;9.10:1720-1724. https://elibrary.ru/item.asp?id=30412344.

22. Nair S., Faizuddin M., Dharmapalan J. Role of autoimmune responses in periodontal disease //Autoim. Dis.- 2014;596824. https://doi.org/1155/2014/596824.

23. Neugebauer J., Kistler F., Kistler S., Scheer M. Open decontamination. // New in dentistry. – 2016;7:2-10. https://doi.org/10.1016 / j.cpme.2014.04.002

24. Offenbacher S. Periodontal diseases: pathogenesis. // Annals of periodontology. – 1996;1.1:821-878. https://doi.org/10.1902 / annals.1996.1.1.821

25. Ohlrich E.J., Cullinan M.P., Seymour G.J. The immunopathogenesis of periodontal disease // Aust. Dent. J.- 2009;54: 2-10. https://doi.org/10.1111/j. 1834-7819. 2009. 01139.икс.

26. Taubman M.A., Kawai T., Han X. The new concept of periodontal disease pathogenesis requires new and novel therapeutic strategies. // Journal of clinical Periodontology. – 2007;34:367-369. https://doi.org/10.1111/j. 1600-051X. 2007. 01065.икс.

27. Van Dyke T.E., Serhan C.N. Resolution of inflammation: A new paradigm for theof pathogenesis periodontal disease. // Journal of Dental Resorch. – 2003;82:82-90. https://doi.org/10.1177/154405910308200202.

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