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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

ТБИЛИСИ - НЬЮ-ЙОРК

GMN: Georgian Medical News is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board and The International Academy of Sciences, Education, Industry and Arts (U.S.A.) since 1994. **GMN** carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

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პაციენტი თვალის რაიმე პათოლოგიის გარეშე (საკონტროლო ჯგუფი), II - 30 პაციენტი კერატოკონუსის სუბკლინიკური ფორმით, III - 30 პაციენტი კერატოკონუსის I,II და III სტადიით.

III ჯგუფში (გამოხატული კერატოკონუსით) მატრიქსული მეტალოპროტეინაზა-9-ის მაღალი დონე დაუდგინდა 27 (90%) პაციენტს. II ჯგუფში (სუბკლინიკური კერატოკონუსით) მატრიქსული მეტალოპროტეინაზა-9-ის მაღალი დონე დაუდგინდა 25 (83,3%) პაციენტს. საკონტროლო ჯგუფში მხოლოდ ერთ (3,3%) პაციენტს ჰქონდა მატრიქსული მეტალოპროტეინაზა-9-ის მომატებული მაჩვენებელი.

მიღებული შედეგები მიუთითებს, რომ პაციენტებში კერატოკონუსის I-III სტადიით, ასევე, სუბკლინიკური კერატოკონუსით, საკონტროლო ჯგუფთან შედარებით,მომატებულია მატრიქსული მეტალოპროტეინაზა-9-ის დონე საცრემლე სითხეში. შესაბამისად,საცრემლე სითხეში მატრიქსული მეტალოპროტეინაზა-9-ის განსაზღვრა შესაძლოა ჩართულ იქნას კერატოკონუსის სადიაგნოსტიკო მეთოდთა არსენალში.

ANALYSIS OF THE LONG-TERM CLINICAL RESULTS OF USING 940 μm DIODE LASER IN PATIENTS WITH GENERALIZED MODERATE CHRONIC PERIODONTITIS

Cherepynska Yu., Volkova O., Riabokon E., Baglyk T.

Kharkiv National Medical University, Ukraine

Etiology of infectious periodontitis caused by strains of periodontopathogenic bacteria that included in subgingival biofilm was described in detail by numerous studies [17]. Anti-infective periodontal therapy is based on two aspects: 1) thorough removal of microbial associations on periodontal pockets surfaces and creating optimal conditioning for healing of periodontal wound [7-9]. Numerous studies have evidenced that mechanical and electro-mechanical destruction of biofilm does not eliminate the periodontopathogenic bacteria, since bacteria can survive both in depth of root cement, in surrounding soft tissues, and into dentinal tubules, which in some cases leads to recurrence of disease. Nowadays, a growing number of international reports evidences resistance of bacterial strains was becoming progressively to frequent doses of antibiotics, wherein incidence of fungal infection has increased significantly in recent years, and there is a tendency will be aggravated [19]. Tissue affected by biofilm unable to progress from granulation stage, seeking healing, to remodeling stage [10]. Thus, such tissue area is represented by chronic wound filled with biofilm [13], which will be advanced without treatment forming lesions of destruction and making systemic effects on the patient's health. Diode laser does not interact with hard tooth tissues; this fact makes it convenient for various medical manipulations in soft tissues surrounding the teeth, and makes diode exposure as safe as possible for hard tooth tissues [11]. Laser treatment simultaneously can provide multiple therapeutic effect: *photobactericidal* [1,15,18,20] and *photothermal disinfection* [14,16] of the periodontal pocket walls*, photobiostimulation* [3,12] effect on healing process; also it allows to implement a number of additional manipulations; de-epithelialization, degranulation, gingivectomy, gingivoplasty and frenectomy. Laser energy helps to seal the capillaries and lymphatic vessels, reduce edema in the treatment site, often minimize postoperative patient discomfort [2], and stimulate healing at the cellular level [6]. In others studies also concluded that effect of diode laser promotes healing of periodontal pockets [4]. Studies of molecular-biological analysis by Gojkov-Vukelic et al. point to a more prolonged reduction of periodontopathogenic bacteria with additional use of diode laser compared to the control group [5]. The above provisions encourage to study of diode laser effects on periodontal tissue as an additional method of treatment in patients with chronic generalized periodontitis for the simple reason that conventional methods of non-surgical periodontal therapy are limited with mechanical and pharmacological (drug) effects on periodontal tissues. Additional use of diode laser technologies in such pathology treatment allows spreading the range of effect on the affected soft tissue areas, to reduce significantly drug burden, and to create optimal conditions of periodontal pocket healing.

The aim of this study is clinical research of level in clinical attachment loss (CAL), probing of periodontal pockets depths (PPD) and bleeding index (BoP) during combine therapy of patients with chronic generalized periodontitis of moderate severity when using a diode laser at 940 μm.

Material and methods. The study was conducted at the University Dental Center of Kharkiv National Medical University during period from 2013 to 2016, and involved 30 patients from them 17 men (56,6 %), and 13 women (43,4 %) aged 35-44 (mean age 40.3 years old) with diagnosed generalized moderate chronic periodontitis (GMCP); the subjects were divided into three equal

Table 1. Baseline demographic parameters

Group Contingent		Control group (CG)	1st study group (SG1)	2nd study group (SG2)
N		n=10	n=10	n=10
Sex	Male	5	6	6
	Female	5	4	4
Age (medium)		40.3	39.8	40.7

Table 2. Anatomical groups and number of teeth

Group of teeth Group	Incisors and canines		Premolars		Molars	
CG (n=286)	120		79		87	
SG1 (n=285)	120	360	76	235	89	262
SG2 (n=286)	120		80		86	
Total	**857**					

study groups: control group (CG, n=10) of conventional periodontal therapy, 1-st study group (SG1, n=10), which also used an additional diode laser therapy, and 2-nd study group (SG2, n=10), where the treatment plan was consistent with the SG1 group, excepting the use of antiseptic agents (Table 1).

Before treatment onset, it was scheduled a periodontal screening record (PSR) showing level of inflammatory process, namely level of clinical attachment loss (CAL) correlating with periodontal pocket depth (PPD), and recession (R) measured at six points around the tooth, presence of debris (Pl) on the four tooth surfaces, and degree of gingival bleeding (BoP), defined at four points. Local patient entry criteria for carrying out the active phase of periodontal therapy were included: index of hygiene, R1 (O'Leary, 1972) ≥25%, bleeding index BoP (Ainamo, Bay, 1975) ≥40%, periodontal pocket depth (PPD ≥4 mm ≤6 mm). General entry criteria of patients were excluded: administration of antibiotics and oral antiseptics during last three months, pregnancy, and presence of systemic diseases affecting the clinical study outcomes. The study did not included patients having less than 24 natural teeth inclusive of latest molars. All patients included in the research had the body mass index (BMI) 25–30 kg/m^2, were light-skinned and non-smoking within the last year.

As object to study were n=857 teeth (5142 sites); in the CG and the SG2 n=286 teeth were studied, in the SG1 n=285 (Table 2).

Therapeutic protocol. Before planning of therapeutic interventions, it was conducted professional hygiene of oral cavity and training in individual hygiene. The stages of treatment based on etiopathogenic, integrated and personalized principles, consisted of three main phases; the first was active anti-inflammatory, the second was reconstructive, and the third was supportive.

Active anti-inflammatory periodontal therapy in control group were provided conventional thorough debridement of teeth surfaces from dental plaque and application of 3% hydrogen peroxide (H_2O_2) solution, 0.2% chlorhexidine CHX) solution, and final application of 0.5% CHX gel for chemical decontamination of periodontal wound.

In addition to the control group protocol before the cleansing of teeth surfaces from dental plaque, in the first study group were conducted laser decontamination of periodontal pockets using indium-gallium-aluminum-phosphate (In-Ga-Al-PO4) diode laser (940 μm, unactivated waveguide Ø 300 μm, 0,5 W/CW 10 sec. on the one surface), and laser coagulation of soft tissues in periodontal pocket and epithelial debridement of interdental gingiva (940 μm, active waveguide Ø 300 μm, 1W/CW, 15 sec. on the one surface), subsequent to subgingival scaling and root planning. In second study group, the treatment was carried out as in first study group, but completely excluded antiseptic drug administration during the treatment.

Supportive periodontal therapy was conducted after 6 weeks, 3, 6 and 12 months on the basis of updated data of periodontal card and repeated the initial treatment protocol in respective groups. Protocol of periodontal supportive therapy in the control group included: subgingival irrigation with 3% solution of H_2O_2 and 0.2% CHX; electro-mechanical removal of dental plaque, mechanical subgingival scaling and root planning; final application with CHX gel 0.5%.

In addition to the control group protocol, before the electro-mechanical removal of dental plaque, in the SG1 were conducted laser decontamination of periodontal pockets (940 μm, unactivated waveguide Ø 300 μm, 0,5 W/CW 10 sec. on the one surface), and laser coagulation of soft tissues in periodontal pocket and epithelial debridement of interdental gingiva (940 μm, active waveguide Ø 300 μm, 1W/CW, 15 sec. on the one surface), subsequent to subgingival scaling and root planning (Fig. 1).

Fig. 1. Clinical example in the phase of the active anti-inflammatory periodontal therapy (SG2). Irradiation of periodontal pockets - unin. Ø 300 µm, 0.5 W/CW, 10 sec. Coagulation and de-epithelization – in. Ø 300 µm, 1 W/CW, 15 sec.

Table 3. Treatment protocols of study groups

Step	Name of group / Name of procedure	Control group (CG)	1st study group (SG1)	2nd study group (SG2)
1	Preliminary antiseptic treatment	3% hydrogen peroxide sol., 0.2% chlorhexidine bigluconate sol.	3% hydrogen peroxide sol., 0.2% chlorhexidine bigluconate sol.	-
2	Laser decontamination	-	Ø 300 µm non-in 0,5 W/CW, 10 sec.	Ø 300 µm non-in. 0,5W/CW, 10 sec.
3	Subgingival scaling and root planing	+	+	+
4	Final antiseptic treatment	0.5% chlorhexidine bigluconate gel.	0.5% chlorhexidine bigluconate gel.	-
5	Laser coagulating and deepiteliation	-	Ø 300 µm in, 1W/CW, 15 sec.	Ø 300 µm in, 1W/CW, 15 sec.

Treatment protocol of patients in the SG2 was similar to the one of SG1, but without antiseptics use. All patients were given standard recommendations on oral care, warning against additional irritants of treated periodontal wounds (Table 3).

Data were entered and processed with the help of statistical package IBM Statistics 6.1. To check the distribution of the test match quantitative indicators of normal in groups used the Kolmogorov-Smirnov's consent. Since the law of distribution of all studied the amounts different from normal methods were used in the calculation of non-parametric statistics. In this case, the statistical significance of the differences was verified using the Kruskel-Wallis criterion (in the case of multiple independent populations) and the Wilcoxon W-test for dependent populations (dynamics of the data under study).

Results and their discussion. Analyzing of the results investigated clinical periodontological parameters of the whole oral cavity (mean ± standard deviation) between the initial and time measurements. In the next observation period - 6 weeks and 3 months later, at 6 and 12 months in the control group and in the study groups, we observed a positive dynamics in all groups. The results of treatment are shown in Table 4 - Table 7. In all groups, all clinical parameters showed a statistically significant decrease in all time intervals compared to baseline ($p<0.05$). The mean PPD at baseline was 4.3±0.2 in the control group, 4.33±0.19 in SG1, and 4.3±0.15 SG2 (Table 4).

At 12 months after treatment, there was a decrease in the CG parameters PPD to 2.91± 0.1, and in SG1 to 2.59 ± 0.11, and in SG2 to 2.58 ± 0.11. The change in PPD in the study groups (SG1 and SG2) both in early-term and in the long-term period of observation was higher than in the CG ($p <0.05$).

The change in CAL in the study groups (SG1 and SG2) was also higher in early-term and in the long-term period of observation than in the control group ($p <0.05$) (Table 5).

Table 4. Changing the parameters of depth of the periodontal pocket (PPD)

Group	Before treatment	After 6 weeks	In 3 months	In 6 months	In 12 months
CG	4,3 ± 0,2	2,81 ± 0,12	2,61 ± 0,22	2,95 ± 0,12	2,91 ± 0,1
SG1	4,33 ± 0,19	2,63 ± 0,11	2,59 ± 0,1	2,53 ± 0,11	2,59 ± 0,11
SG2	4,3 ± 0,15	2,62 ± 0,15	2,51 ± 0,15	2,51 ± 0,19	2,58± 0,11

Table 5. Change in parameters of the level of clinical attachment loss (CAL)

Group	Before treatment	After 6 weeks	In 3 months	In 6 months	In 12 months
CG	4,89 ± 0,12	4,1 ± 0,12	3,96 ± 0,13	3,93 ± 0,12	3,92 ± 0,11
SG1	4,91 ± 0,15	3,99 ± 0,11	3,87 ± 0,1	3,83 ± 0,11	3,81 ± 0,15
SG2	4,9 ± 0,23	3,98 ± 0,21	3,88 ± 0,23	3,82 ± 0,21	3,79 ± 0,13

Table 6. Changing parameters of bleeding degree (BoP)

Group	Before treatment	After 6 weeks	In 3 months	In 6 months	In 12 months
CG	76,1 ± 0,12	17,6 ± 0,02	17,8 ± 0,11	18,6 ± 0,02	22,9± 0,12
SG1	75,2 ± 0,13	12,8 ± 0,02	13,9 ± 0,12	11,8 ± 0,02	17,2 ± 0,11
SG2	75,3 ± 0,11	13,1± 0,13	13,8± 0,14	13,1± 0,13	17,1± 0,13

Table 7. Changing of the parameters of hygiene index (PI)

Group	Before treatment	After 6 weeks	In 3 months	In 6 months	In 12 months
CG	46,5 ± 0,13	20,4 ± 0,11	21,1 ± 0,11	19,4 ± 0,11	29,1 ± 0,1
SG1	46,8 ± 0,12	20,3 ± 0,13	20,7 ± 0,15	19,3 ± 0,13	28,2 ± 0,13
SG2	46,7 ± 0,11	19,81 ± 0,13	21,2 ± 0,13	20,1 ± 0,2	30,2 ± 0,3

The mean CAL at the baseline was 4.89±0.12 in the control group, 4.91±0.15 in the SG1, and 4.9±0.23 SG2. 12 months after treatment, the CAL parameters in CG decreased to 3.92±0.11, and in SG1 to 3.81±0.15, and in SG2 to 3.79±0.13.

Table 6 shows that mean value of BoP at baseline is 76.1±0.12 in the control group, 75.2 ± 0.13 in SG1 and 75.3±0.11 in SG2.

At 12 months after treatment, the BoP parameters in the CG decreased to 22.9±0.12, in SG1 to 17.2±0.11 and in SG2 to 17.1±0.13. The change in BoP in the study groups (SG1 and SG2) was also higher in early-term and in the long-term period of observation than in the control group ($p < 0.05$).

The mean PI at baseline was 46.5±0.13 in the control group, 46.8±0.12 in SG1 and 46.7±0.11 in SG2. At 12 months after treatment, the PI parameters in the CG decreased to 29.1±0.1, in SG1 to 28.2±0.13 and in SG2 to 30.2±0.3. Comparison of PI in all three groups (SG1, SG2 and CG) both in early-term and in the long-term period of observation were similar ($p<0.05$) (Table 7).

A cumulative comparison of the results of BoP, CAL and PPD between SG1, SG2 and CG in the near and long term leads to a higher decrease in SG1 and SG2 in comparison with CG with statistical significance ($p<0.001$).

a

b

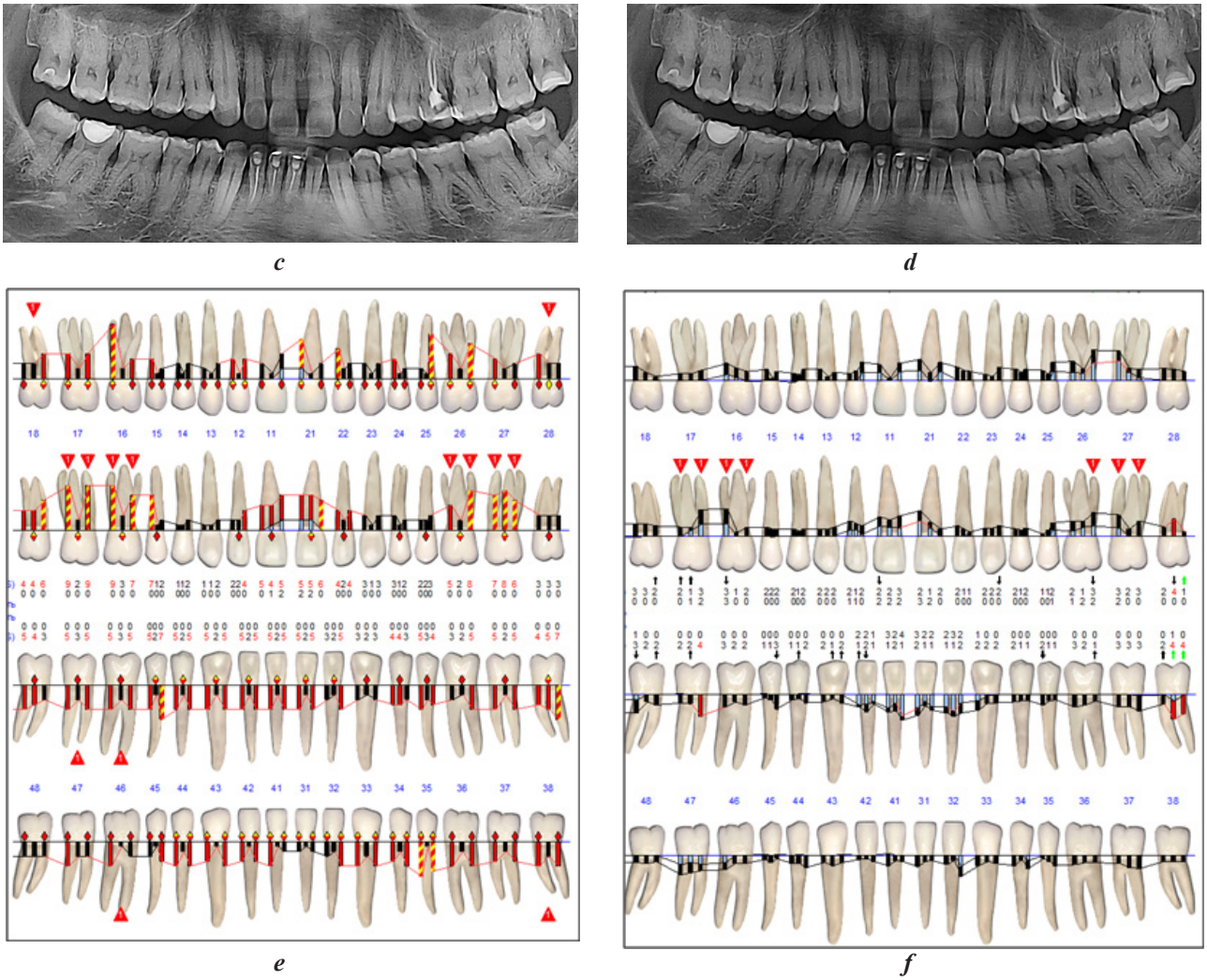

Fig. 2. Clinical example of periodontal therapy in the study group 2 (SG2). Patient 44-years old with GMCP. a - before treatment; b - in 12 months after treatment; c - orthopantomogram before treatment; d - orthopantomogram in 12 months; e - graphic periodontal card before treatment; f - graphic periodontal card in 12 months

Based on the study of graphic periodontal cards and the obtained CAL, PPD in the study groups and the control group, it is noted that the additional use of a diode laser contributes to a change in topography and an increase in the number of sites with a parodontal pocket depth≤4 mm, which, according to most authors, has a leading role in the impact on the structure and virulence of the biofilm, which improves the basic clinical parameters leading to prolonged remission (Fig. 2).

Conclusions. The distant results of parameters CAL, PPD and BoP in the study groups indicate that the additional use of diode laser emission in the treatment of moderate chronic generalized periodontitis contributes to more stable clinical situation in 6 and 12 months after treatment, comparing with the control group (p>0,05) and allows a greater reduction of the degree of surgical procedures volume.

The absence of statistically significant differences in the study groups in terms of early and long-term observations suggests there is no need to use antiseptic agents in the application of diode laser emission, thus reducing the impact on the patient's medication.

Laser energy can be used as additional therapeutic and surgical method in the treatment of different phases: in the phase of the active anti-inflammatory, in the reconstructive and supporting periodontal therapy.

Until social level of education among the population will be higher, and associated with the cause of periodontal disease and the lack of positive experience of treatment, the prevalence of periodontal disease will continue to have a tendency to increase. Laser therapy is an improvement in traditional medical procedures. It is less invasive and more effective, reduces the amount of time spent on treatment, and reduces the amount of surgical intervention. Both scientific and clinical studies point too many aspects related to the development of treatment methods to ensure more successful prevention and recovery of patients with periodontal disease.

Conflict of interest. Authors declare no conflict of interest.

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SUMMARY

ANALYSIS OF THE LONG-TERM CLINICAL RESULTS OF USING 940 μm DIODE LASER IN PATIENTS WITH GENERALIZED MODERATE CHRONIC PERIODONTITIS

Cherepynska Yu., Volkova O., Riabokon E., Baglyk T.

Kharkiv National Medical University, Ukraine

The experience of using a diode laser with a wavelength of 940 μm in the treatment of patients with generalized periodontitis of moderate severity of chronic course is presented. 30 patients were examined, including 17 men (56.6%), and 13 women (43.4%) aged 35-44 with chronic generalized periodontitis of moderate severity. It is concluded that the use of diode laser of 940 μm in the complex therapy of patients with chronic generalized periodontitis of moderate severity is clinically justified and an effective auxiliary method of treatment. The long-term results of the clinical study indicate that the additional use of a diode laser allows for more stable remission and a greater reduction in the volume of surgical interventions compared with control group.

Keywords: diode laser, chronic periodontitis, non-surgical treatment, clinical parameters of periodontitis.

РЕЗЮМЕ

АНАЛИЗ ОТДАЛЕННЫХ КЛИНИЧЕСКИХ РЕЗУЛЬТАТОВ ПРИМЕНЕНИЯ ДИОДНОГО ЛАЗЕРА 940 μm У ПАЦИЕНТОВ С ХРОНИЧЕСКИМ ГЕНЕРАЛИЗОВАННЫМ ПАРОДОНТИТОМ СРЕДНЕЙ СТЕПЕНИ ТЯЖЕСТИ

Черепинская Ю.А., Волкова О.С., Рябоконь Е.Н., Баглык Т.В.

Харьковский национальный медицинский университет, Украина

Приведен опыт применения диодного лазера длиной волны 940 μm при лечении пациентов с генерализованным пародонтитом средней тяжести хронического течения. Исследовано 30 пациентов, из них 17 (56,6%) мужчин и 13 (43,4%) женщин в возрасте 35-44 лет с хроническим генерализованным пародонтитом средней степени тяжести. Делается вывод, что применение диодного лазера 940 μm в комплексной терапии пациентов с хроническим генерализованным пародонтитом средней степени тяжести является клинически оправданным и эффективным вспомогательным методом лечения. Отдаленные результаты клинического исследования свидетельствуют о том, что дополнительное применение диодного лазера позволяет достичь более стойкой ремиссии и в большей степени сократить объем хирургических вмешательств по сравнению с контрольной группой.

რეზიუმე

940 μm დიოდური ლაზერის გამოყენების მოგვიანებითი კლინიკური შედეგები პაციენტებში საშუალო სიმძიმის ქრონიკული გენერალიზებული პაროდონტიტით

ი. ჩერეპინსკა, ო. ვოლკოვა, ე. რიაბოკონი, ტ. ბაგლიკი

ხარკოვის ეროვნული სამედიცინო უნივერსიტეტი, უკრაინა

მოცემულია 940 μm სიგრძის ტალღის ლაზერის გამოყენების შედეგები საშუალო სიმძიმის ქრონიკული გენერალიზებული პაროდონტიტის მკურნალობისათვის. დაკვირვების ქვეშ იმყოფებოდა 30 პაციენტი, 17 (56,6%) მამაკაცი და 13 (43,3,%) ქალი,34-44 წწ. ასაკის,საშუალო სიმძიმის ქრონიკული გენერალიზებული პაროდონტიტით.

გამოტანილია დასკვნა, რომ 940 μm სიგრძის ტალღის დიოდური ლაზერის კომპლექსურ მკურნალობაში გამოყენება წარმოადგენს კლინიკურად ეფექტურ დამხმარე მეთოდს აღნიშნული დაავადების მკურნალობაში. კლინიკური გამოცდის შორეული შედეგები ადასტურებს,რომ დიოდური ლაზერის დამატებითი შეყვანა მკურნალობაში იძლევა უფრო მდგრადი რემისიის მიღწევის შესაძლებლობას და საგძნობლად ამცირებს ქირურგიული ჩარევების რიცხვს საკონტროლო ჯგუფთან შედარებით.

ОЦЕНКА КАЧЕСТВА ЖИЗНИ У ПАЦИЕНТОВ ПОСЛЕ ХОЛЕЦИСТЭКТОМИИ

[1]Койшибаева Л.М., [1]Тургунов Е.М., [2]Сандблум Г., [1]Телеуов М.К., [1]Баймуратова М.Г.

[1]Карагандинский государственный медицинский университет;
[2]Госпиталь Каролинского университета, отделение хирургии, Стокгольм, Швеция

Исследование качества жизни (КЖ) пациентов по сей день является одним из приоритетных направлений в медицине. Актуальность этой проблемы не вызывает никаких сомнений, поскольку исследование КЖ открывает возможность комплексного анализа состояния здоровья пациента.

Прогресс развития медицинской науки, изменение структуры заболеваемости населения и акцент на уважение прав пациента как личности привели к созданию новой парадигмы понимания болезни и определения эффективности методов лечения. Когда врачи стали все больше сознавать, что объективное уменьшение патологических изменений не всегда сопровождается улучшением самочувствия больного и результатом лечения должен быть удовлетворен больной, в медицине возник интерес к качеству жизни пациента [2]. КЖ в медицине отражает степень адаптации человека к болезни и возможность выполнения им привычных функций, соответствующих его социально-экономическому положению.

Результаты хирургического лечения чаще изучают посредством таких статистических показателей, как летальность, продолжительность пребывания в стационаре, количество послеоперационных осложнений [4]. Возникновение осложнений после консервативного или хирургического лечения ставит перед врачом за-