ЗДОРОВ'Я ЛЮДИНИ, ФІТНЕС І РЕКРЕАЦІЯ, ФІЗИЧНЕ ВИХОВАННЯ РІЗНИХ ГРУП НАСЕЛЕННЯ

EFFECTIVENESS OF RESTORATIVE TREATMENT OF GENERALIZED PERIODONTITIS IN PATIENTS LIVING IN ECOLOGICALLY POLLUTED AREAS OF PRYKARPATTIA

ЕФЕКТИВНІСТЬ ВІДНОВЛЮВАЛЬНОГО ЛІКУВАННЯ ГЕНЕРАЛІЗОВАНОГО ПАРОДОНТИТУ У ПАЦІЄНТІВ, ЯКІ ПРОЖИВАЮТЬ НА ЕКОЛОГІЧНО ЗАБРУДНЕНИХ ТЕРИТОРІЯХ ПРИКАРПАТТЯ

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Abstracts

Introduction. Generalized periodontitis often affects young people, especially those who work or live in environmentally unfavorable conditions.

Aim of the study is to investigate the effectiveness of restorative treatment of generalized periodontitis in patients living in environmentally polluted areas.

Research methods are clinical, radiographic, cytological, biochemical and statistical.

Results. The results of the periodontal index and the periodontal-alveolar-marginal index showed the dynamics of deterioration of the indicators of the index assessment of the state of the periodontal tissues with an increase in the degree of development of generalized periodontitis. The parameters of the papillary-marginal-alveolar index in the Parma modification in patients with generalized periodontitis of the 1st stage living in ecologically polluted areas were significantly higher than in patients living in relatively clean areas. The results of ultrasound osteometry indicated a decrease in jaw bone density in patients with generalized periodontitis who live in environmentally unfavorable conditions. The results of biochemical monitoring showed that all patients had pronounced changes in pro-oxidant-antioxidant homeostasis. Based on the results of clinical and laboratory studies, we have developed a complex influence on the main links of the pathological process, which acts both at the local and general level and affects the main links of the pathogenesis of inflammatory periodontal diseases. So, after three months, we achieved almost the same improvement in both groups of patients, indicating a reduction in the inflammatory process. But after 6 and 12 months, a more significant improvement was observed in patients with generalized periodontitis of the 1st stage.

Conclusions. The success of any treatment for patients with generalized periodontitis who live in environmentally unfavorable conditions is to not only eliminate the inflammatory symptoms of the disease but also to prevent the progression of inflammatory dystrophic changes.

Key words: generalized periodontitis, microbial factor, hygienic index, periodontal-alveolar-marginal index, treatment.

Вступ. Генералізований пародонтит часто виявляється в осіб молодого віку, особливо в тих, які працюють чи проживають в екологічно несприятливих умовах.

Мета дослідження – дослідити ефективність відновлювального лікування генералізованого пародонтиту у пацієнтів, які проживають на екологічно забруднених територіях.

Методи дослідження – клінічні, рентгенографічні, цитологічні, біохімічні та статистичні.

Результати. За результатами пародонтального індексу та пародонтально-альвеолярно-маргінального індексу спостерігали динаміку до погіршення показників індексної оцінки стану тканин пародонту зі збільшенням ступеня розвитку генералізованого пародонтиту. Показники папілярно-маргінально-альвеолярного індексу у модифікації Parma у хворих на генералізований пародонтит I ступеня, що проживають на екологічно забруднених територіях, були значно вищі, ніж у пацієнтів, які проживають на відносно чистих територіях. Результати ультразвукової остеометрії вказували на зниження щільності щелепової кістки в пацієнтів, хворих на генералізований пародонтит, які проживають в екологічно несприятливих умовах. Результати біохімічного спостереження показали, що всі пацієнти мали виражені зміни прооксидантно-антиоксидантного гомеостазу. На основі результатів клінічних та лабораторних досліджень ми розробили комплекс впливу на основні ланки патологічного процесу, який діє як на місцевому, так і на загальному рівнях, впливає на основні ланки патогенезу запальних захворювань пародонту. Отже, через три місяці ми досягнули покращення показників для обох груп пацієнтів практично однаково, що вказує на зменшення запального процесу. А от через 6 і 12 місяців суттєве покращення спостерігалось у пацієнтів з генералізованим пародонтитом I ступеня.

Висновки. Успіх будь-якого лікування хворих на генералізований пародонтит, які проживають в екологічно несприятливих умовах, полягає в тому, щоб не тільки усунути запальні ознаки захворювання, а й попередити прогресування запальнодистрофічних змін.

Ключові слова: генералізований пародонтит, мікробний фактор, гігієнічний індекс, пародонтально-альвеолярно-маргінальний індекс, лікування.

Introduction. Today, periodontal tissue disease is one of the important problems of modern dentistry [1], which is associated with the prevalence of the disease and the decrease in the age of patients with this pathology [2]. Generalized periodontitis is often found among young people, especially those who work or live in environmentally unfavorable conditions [3; 4; 5; 6]. According to various authors, environmentally unfavorable living conditions are one of the etiological factors in the development of pathological changes in periodontal tissues [7; 8]. The problem of adequate diagnosis and effective treatment of periodontal tissue pathology against the background of living and working conditions is relevant and practically significant, since there is a large number of chemical enterprises in the territory of the Carpathian region where young people work [9; 10; 11]. The Kalush district, which has been declared a zone of emergency ecological situation, attracts the special attention of scientists.

Methods. The study was approved by the Ethics Committee of the Faculty of Dentistry of Ivano-Frankivsk National Medical University. Clinical examination of patients was performed on the basis of the clinic of the Department of Dentistry of the Research and Training Institute of Postgraduate Education of Ivano-Frankivsk National Medical University.

During the observation, we examined 110 patients, including 90 patients with generalized periodontitis of stage I–II (chronic course), who live in ecologically polluted areas, and 20 people with intact periodontium, who made up the control group, aged from 18 to 59 years old.

The observation included patients with generalized periodontitis, who gave individual consent to use the proposed treatment scheme. Clinical and X-ray examination was carried out on the basis of the therapeutic department of the "Dentistry Center" of the university clinic of the Ivano-Frankivsk National Medical University. To unify examination data and process the results obtained during observation, we used self-developed special examination maps, which contained the results of clinical, biochemical, radiological, and osteometric examination methods and their dynamics under the influence of complex treatment of patients with generalized periodontitis.

Patients were randomized as follows:

Group 1–45 patients with generalized periodontitis, whose treatment was carried out by a generally accepted method, which, in turn, were divided into: subgroup I-A – patients with generalized periodontitis – stage I (22 people), and subgroup I-B – patients with generalized periodontitis – stage II (23 people).

Group 2–45 patients with generalized periodontitis, who were treated using our proposed method, which, in turn, were divided into: subgroup II-A – patients with generalized periodontitis – stage I (23 people), and subgroup II-B – patients with generalized periodontitis – stage II (22 people).

Group 3 – control group (a group of practically healthy people) of 20 patients with intact periodontium, who lived in the ecologically unfavorable conditions of the Prykarpattia region.

The clinical examination of patients for generalized periodontitis was aimed at studying the anamnestic data of each patient, complaints both of a general nature and specific to periodontal tissue diseases. In the anamnesis of the disease, special attention was paid to such indicators as the duration of the disease, the possible cause of its occurrence, the peculiarities of the course of the pathological process, the nature of previous treatment measures, and their effectiveness. We studied complaints about pain in the periodontium, purulent discharge from periodontal pockets, bleeding gums, and tooth mobility. The clinical examination was carried out according to the standard method of examining a dental patient.

We also used biochemical methods of monitoring the blood serum of patients with generalized periodontitis to observe changes in indicators of lipid peroxidation and antioxidant protection and to study the dynamics of these indicators under the influence of drug treatment with the use of quercetin.

Cytological monitoring methods were used to assess the state of the periodontium.

To determine the state of the bone tissue and the degree of development of generalized periodontitis, radiological observations such as orthopantomography and focused radiography were used.

The density of bone tissue of the jaws in patients with generalized periodontitis was studied with the help of ultrasound echoosteometry.

Results. The results of our clinical examination of patients with generalized periodontitis who live in environmentally polluted conditions confirm the opinion that patients with generalized periodontitis of stages I–II are characterized by pronounced changes in the periodontal tissues, which grow with the increase in the stage of the disease development [12].

Damage to periodontal tissues is manifested by destructive changes in periodontal tissues with impaired microcirculation. A pronounced vasomotor reaction and long-term expansion of blood vessels are the cause of impaired blood supply in the periodontal tissues, which, in turn, is a pathogenetic link in the violation of mineralization of the jaw bones [13]. Scientists have proven that generalized periodontitis is accompanied by structural changes in cells and intercellular substances [14; 15; 16].

The microbial factor plays an important role in the occurrence of periodontal tissue pathology [17]. Exo- and endotoxins affect the cell wall of the gums, causing an increase in the permeability of blood vessels in the cellular elements and intercellular substance of the gums, a violation of antioxidant protection and other changes in metabolism [18]. Patients with generalized periodontitis develop endogenous intoxication of the periodontium and the body in general, which is more observed among people who live in environmentally unfavorable areas [19].

The obtained results of hygienic indices according to Green-Vermillion in patients with generalized periodontitis of stages I–II were significantly different from those in the comparison group ($p<0.05$). It should be noted that the indicator of the hygienic index according to Green-Vermillion (2.72±0.35) points for patients with generalized periodontitis of stage I almost doubled the following indicators in patients who lived in ecologically clean areas: (1.59) points and (1.44±0.11) points, which confirms the negative impact of the ecologically unfavorable environment on the state of the periodontium.

According to the results of the periodontal index and the periodontal-alveolar-marginal index, we observed the dynamics of deterioration of the indicators of the index assessment of the state of the periodontal tissues with an increase in the stage of development of generalized periodontitis. We have established a directly

proportional dependence of oral hygiene indicators and an increase in the intensity and spread of the inflammatory dystrophic process in the periodontal tissues ($p<0.05$).

We found a significant difference between the indicators of the bleeding index according to H.R. Muhlemann, S. Son in patients with generalized periodontitis of stage I–II. These indicators were significantly different from the results of the bleeding index according to H.R. Muhlemann, S. Son in the control group ($p<0.05$). Indicators of index evaluation of periodontal tissues of patients with generalized periodontitis of stage I were quite high: periodontal index – 3.79±0.86 points, papillary-marginal-alveolar index in the Parma modification (54.55±9.06)%, index bleeding according to H.R. Muhlemann, S. Son in the modification of I. Cowell – 2.68±0.73 points, compared to healthy people: periodontal index – 0.1±0.02 points, papillary-marginal-alveolar index in the modification of Parma (4.49±0.53)% and bleeding index according to H.R. Muhlemann, S. Son in the modification of I. Cowell – 0.2±0.02 points, respectively. In patients with generalized periodontitis of stage II, the periodontal index significantly worsened and was 6.81±0.99 points, and the dynamics of the papillary-marginal-alveolar index in the Parma modification was 60.22±14.06%, and the index of bleeding according to H.R. Muhlemann, S. Son in the modification of I. Cowell (2.92±1.03) increased slightly and did not significantly differ from those in patients with generalized periodontitis of stage II.

At the same time, the parameters of the papillary-marginal-alveolar index in the Parma modification obtained by us in patients with generalized periodontitis of stage I (54.55±9.06)% living in ecologically polluted areas were significantly higher than in patients living in relatively clean territories (43.44)% [20].

Discussion. As a result of the conducted clinical examination, it was established that patients with generalized periodontitis who live in environmentally unfavorable areas were characterized by more pronounced changes in periodontal tissues than patients who live in ecologically clean areas.

Quantitative and qualitative characteristics of cytomorphometric observation confirm the presence of chronic inflammation with pronounced destructive changes and phenomena of hyperkeratosis in periodontal tissues in patients with generalized periodontitis against the background of environmentally unfavorable living conditions. In particular, in patients with generalized periodontitis of stage I, the destruction index reliably increases by 3.11 times to the indicator 1620.45±485.78, the inflammatory-destructive index by 1.94 times to the indicator 7.57±1.71, $p<0.05$. In patients with generalized periodontitis of stage II, the destruction index increases by 3.81 times to the indicator 1984.02±636.34, the inflammatory-destructive index by 2.44 times 9.51±1.99, $p< 0.05$.

The results of our ultrasound osteometry indicated a decrease in jaw bone density in patients with generalized periodontitis who live in environmentally unfavorable conditions. The time of passage of ultrasound through the structure of the jaw bones in patients with generalized periodontitis of stage I–II was significantly different from the indicators obtained in the control group ($p<0.05$). The results of the echoosteometry indicators differed significantly from the ultrasound penetration rate in the group of healthy individuals (13.15±1.26) and in patients with generalized periodontitis of stage I – by 1.26 times, in patients with generalized periodontitis of stage II – by 1.51 times ($p<0.05$), which indicates the relationship between the density of bone tissue and the degree of development of the pathological process in periodontal tissues. According to clinical and radiological indicators, changes in the periodontal tissues corresponded to generalized periodontitis of the chronic course of stage I–II, while the signs of the disease are more pronounced for generalized periodontitis of stage II. The result of the aforementioned violations is a change in the structure and density of the jaw bones.

Violations of cell function in periodontal tissues are caused by damage to the lipid component of cell membranes, the basis of which is the activation of lipid peroxidation [3; 21; 22]. The results of our biochemical observation showed

that all patients with generalized periodontitis living in ecologically polluted regions of the Carpathian region had pronounced changes in pro-oxidant-antioxidant homeostasis.

It has been established that under conditions of oxidative stress, reactive oxygen species damage all biological structures. Observation of free radical oxidation of lipids in persons with generalized periodontitis before treatment revealed an increase in its stable products in the blood of patients of both groups, which indicates an increase in lipid peroxidation. In particular, a significant increase in thiobarbituric acid ($p < 0.001$) in blood serum was most observed for the II-B subgroup – 1.32 times ($p < 0.001$) compared to the control group. However, now the interest of researchers has increased to study the mechanisms of interaction of reactive oxygen species with proteins. It has been shown that in some pathological conditions, it is proteins, rather than lipids and nucleic acids, that are effective traps of generated reactive oxygen species, and their oxidative modification is considered one of the early and reliable markers of oxidative stress [23]. The results obtained by us correlate with observations [24] and indicate an increase in the level of peroxidation products of proteins of various fractions in blood serum and more pronounced than peroxidation of lipids. The greatest increase relative to the control was observed for proteins in the I-B subgroup of OMB430 (oxidative modification of proteins) by 2.49 times and OMB530 by 2.56 times ($p<0.001$). The obtained results confirm the correlation of the obtained indicators with the degree of generalized periodontitis.

A significant decrease in the level of total protein in blood serum in relation to the control was more clearly observed for the II-B subgroup – by 1.64 times ($p<0.001$). However, the results obtained by us differ from the results of studies by other authors [16] and can confirm the opinion of some researchers that under conditions of oxidative stress and excessive generation of reactive oxygen species, processes of uncontrolled modification of proteins, including blood plasma proteins, develop [25]. The latter causes the fragmentation of proteins, their denaturation, as well as the formation of primary amino acid radicals, which then enter into a secondary interaction with neighboring amino acid residues. And this, in general, creates a rather complex picture of the damaging effect of reactive oxygen species on protein macromolecules and leads to the loss of their biological activity by proteins and disruption of metabolic, in particular, regenerative processes.

At the same time, to neutralize the negative effect of reactive oxygen species on cell membranes, an antioxidant defense system exists and functions in the body, which combines in its concept several stages of neutralization of excess reactive oxygen species: neutralization of oxygen radicals (superoxide dismutase, ceruloplasmin, tocopherol, and others), inhibition of the effect of peroxides on membrane structures (peroxidases, catalase): enzymatic reduction of hydroperoxides, membrane-bound proteins and lipids [21; 26; 27]. So, in general, the functioning of the antioxidant defense system, on the one hand, is a component of the non-specific protection of cells and tissues from the harmful and destructive effects of reactive oxygen species, on the other hand, together with the assessment of the activity of the processes of lipid peroxidation and oxidative modification of proteins, it is one of the constituent characteristics cellular immunity. Based on these theoretical provisions, it is important to comprehensively study the processes of lipid peroxidation, oxidative modification of proteins, and the antioxidant system as components of nonspecific resistance of the body and, especially, their probable role in the development of generalized periodontitis.

We found a slight decrease in the activity of superoxide dismutase (%) in the blood serum in all groups before treatment, the largest one was found in the II-B subgroup – only 1.1 times ($p < 0.001$) compared to the control group, but a significant increase in the indicators of glutathione peroxidase in the blood serum, especially for II-A subgroup – by 1.56 times and II-B subgroup – by 1.55 times ($p<0.001$) relative to the control and ceruloplasmin indicators in blood serum are more, especially in the I-B subgroup – by 1.22 times ($p < 0.001$) relative to the control

group. Our results are consistent with works [23], which showed similar results in generalized periodontitis.

The identified biochemical changes confirmed the increase in peroxidation of lipids and proteins and a decrease in antioxidant protection in patients with generalized periodontitis of the first and second degree before treatment, who live in environmentally unfavorable areas.

The indicators of clinical and laboratory examinations of patients for generalized periodontitis obtained by us differ significantly from the results of studies by other authors [25; 26] and confirm that one of the pathogenetic links in the development of generalized periodontitis against the background of environmentally unfavorable living and working conditions is a violation of microcirculation in periodontal tissues, which is associated with the presence of oxidative stress in periodontal tissues and changes in biochemical processes in the gums and the body as a whole.

The results of clinical and laboratory studies of patients with generalized periodontitis living in environmentally unfavorable areas made us think about new methods of effective treatment of generalized periodontitis. The main task we set ourselves was to influence the main links of the pathological process, to provide the periodontal tissues in the focus of inflammation with a stable concentration of medicinal agents.

Our self-developed complex acts both at the local and general level, affecting the main links of the pathogenesis of inflammatory periodontal diseases.

When comparing the results of the index assessment of periodontal tissues between groups I and II, a significant difference was observed between the papillary-marginal-alveolar index in the Parma modification, and the bleeding index according to H.R. Muhlemann, S. Son in the I. Cowell modification 3 months after treatment ($p< 0.05$), after 6 months no significant difference was found between all indicators characterizing the state of periodontal tissues ($p<0.05$). In patients of group I, we traced the dynamics of the deterioration of the papillary-marginal-alveolar index in the Parma modification 6 months after treatment ($p<0.05$) and the periodontal index – after 12 months ($p<0.05$). The bleeding index according to H.R. Muhlemann, S. Son in the I. Cowell significantly worsened in patients of group I 12 months after complex treatment ($p<0.05$). 6 months after treatment, no significant deterioration of the papillary-marginal-alveolar index in the Parma modification and the periodontal index in patients of the II group was found ($p<0.05$), which indicates the stabilization of pathological changes in periodontal tissues within 6 months after treatment. The results of the periodontal index, the papillary-marginal-alveolar index in the Parma modification and the bleeding index according to H.R. Muhlemann, S. Son in the I. Cowell modification in patients of the II group after 12 months are significantly different from the indicators in the I group of patients, which indicates the superiority of the proposed complex scheme treatment of patients with generalized periodontitis who live in environmentally unfavorable conditions.

In group II of the patients, we observed the most pronounced changes in echo-osteometry indicators and X-ray observation. Scientists have proven the connection between the indicators of rheographic observation of periodontal tissues and X-ray, echoosteometric characteristics of bone tissue, and the normalization of blood supply in periodontal tissues ensures the improvement of the trophism of bone tissue of the jaws [28]. In our opinion, the combined use of low-frequency laser and quercetin ensures faster regeneration in periodontal tissues. Quercetin stimulates the formation of various forms of fibroblasts and, in turn, small blood vessels around these cells, because active differentiation of fibroblasts is impossible without sufficient blood supply [29], and a low-frequency laser improves trophic processes in the jaw bones, accelerating their remodeling [30; 31].

Complex treatment of patients with generalized periodontitis led to improvement of indicators of both the pro- and antioxidant system when using quartzetin (I-A, I-B subgroups) and when using quartzetin in combination with laser therapy (II-A and II-B subgroups) both in the near term and in the long term after treatment (after 3, 6 and 12 months).

In subgroup II-A, compared to subgroup I-A, three months after treatment there was a significant decrease in the number of OMB356 products by 13.76% ($p<0.001$), after 6 months by 13.00% ($p<0.001$), and after 12 months – by 14.25% ($p<0.001$). And in patients with generalized periodontitis of stage II (II-B–I-B) after three months there was a decrease in the number of OMB356 products by 4.78% ($p<0.01$), after 6 months – by 7.42% ($p<0.001$), after 12 months – by 6.97% ($p<0.001$).

In subgroup II-A, compared to subgroup I-A, after three months of treatment, there was a decrease in the number of OMB370 products by 8.59% ($p<0.01$), after 6 months – by 4.66% ($p<0.05$), after 12 months – by 4.58% ($p<0.001$). And in patients with generalized periodontitis of stage II (II-B–I-B) after three months there was a decrease in the amount of OMB370 products by 14.72% ($p<0.01$), after 6 months by 9.54% ($p<0.001$), after 12 months – by 9.66% ($p<0.001$).

In subgroup II-A, compared to subgroup I-A, after three months of treatment, there was a significant decrease in the number of OMB430 products by 16.89% ($p<0.01$), after 6 months – by 15.78% ($p<0.001$), and after 12 months – by 19.48% ($p<0.001$). In patients with generalized periodontitis of stage II (II-B–I-B) after three months, the number of OMB430 products decreased by 17.26% ($p<0.001$), after 6 months by 18.79% ($p<0.001$), due to 12 months – by 19.52% ($p< 0.001$).

In subgroup II-A, compared to subgroup I-A, after three months of treatment, there was a significant decrease in the number of OMB530 products by 17.1% ($p<0.05$), after 6 months – by 14.7% ($p<0.001$), and after 12 months – by 16.79% ($p<0.001$). And in patients with generalized periodontitis of stage II (II-B–I-B) after three months there was a decrease in the number of OMB530 products by 12.5% ($p<0.05$), after 6 months – by 18.68% ($p< 0.001$), after 12 months – by 18.9% ($p<0.001$).

As for ceruloplasmin, in patients with generalized periodontitis of stage I (II-A–I-A), after three months, its level decreased by 1.52% ($p<0.01$), after 6 months – by 2.86% ($p<0.001$), after 12 months – by 2.41% ($p<0.001$). And in patients with generalized periodontitis of stage II (II-B–I-B) after three months its level decreased by 1.41% ($p<0.01$), after 6 months – by 1.70% ($p<0.001$), and after 12 months – by 1.29% ($p<0.001$). So, after three months we achieved improvement in both groups of patients almost equally, indicating a reduction in the inflammatory process. But after 6 and 12 months, a more significant improvement was observed in patients with generalized periodontitis of stage I.

A significant improvement in the level of glutathione peroxidase was observed in patients with generalized periodontitis of stage I (II-A–I-A) which after three months decreased by 7.48% ($p<0.05$), after 6 months – by as much as 12.83% ($p<0.01$), and after 12 months – by 9.5% ($p<0.05$). But in patients with generalized periodontitis of stage II (II-B–I-B) a uniform improvement of the results was observed during the year. After three months, a decrease was found by 11.16% ($p<0.01$), after 6 months by 11.57% ($p<0.001$), and after 12 months – by 11.11% ($p<0.01$). Thus, we managed to stabilize the level of glutathione peroxidase, which also indicates a decrease in lipid peroxidation.

At the same time, it was possible to achieve an increase in superoxide dismutase concentration by 2.71% ($p<0.05$) after three months, by 2.07% ($p<0.01$) after 6 months, and by 2.84% ($p< 0.001$) after 12 months in patients with generalized periodontitis of stage I (II-A–I-A). In patients with generalized periodontitis of stage II (II-B–I-B) after three months, an increase of 1.76% ($p<0.05$) was found, after 6 months – by 1.63% ($p<0.05$) and after 12 months – by 1.9% ($p<0.001$). After the complex treatment of patients with generalized periodontitis of both groups using our proposed methods, there is a decrease in the activity of both indicators of the antioxidant system, namely ceruloplasmin, glutathione peroxidase, and a decrease in the concentration of the final peroxidation of lipids and oxidative modification of proteins against the background of an increase in superoxide dismutase.

However, it should be noted that significantly better results after treatment were achieved in

patients with generalized periodontitis of stage I than in patients with generalized periodontitis of stage II, which is obviously due to a milder course of the disease and indicates a decrease in lipid peroxidation and stabilization of proteins and cell membranes in both groups. At the same time, it can be seen that the improvement of all the results of their approach to the norm was obtained for subgroup II-A, which was prescribed applications of quartzetin gel and which was activated with the help of laser irradiation. The obtained results in this group approached the indicators of practically healthy patients after 3 months of treatment, however, in subgroups I-A and I-B, where only gel treatment was used, the dynamics of the indicated indicators had a less pronounced positive character. In our opinion, the indicators of lipid peroxidation and antioxidant protection can change not only due to generalized periodontitis, but also due to the presence of certain somatic diseases, due to which they do not yet manifest with pronounced clinical symptoms, and their detection in the early stages makes it possible to treat generalized periodontitis taking into account these symptoms.

Discussion. The results of our observation confirm the pronounced local anti-inflammatory effect of quercetin in both groups of patients with generalized periodontitis [29]. However, the results in group II of patients differed significantly in terms of clinical, laboratory, and biochemical indicators, which indicates the effect of low-frequency laser rays on bioflavonoids [30]. Scientists emphasize that the activated bioflavonoid is more active in all mechanisms of its effect on the human body [24]. The results of our observation confirmed the data of other scientists [23; 31] and ensured the introduction of the possibility of selecting a complex drug effect on the periodontal tissues of people who live and work in environmentally unfavorable conditions.

Thus, we found that the developed method of treating patients with generalized periodontitis who live in environmentally unfavorable conditions is optimal for periodontal tissues, as a preventive measure in the development of periodontal diseases and an element of complex treatment of patients exposed to harmful environmental factors. Positive treatment results were obtained in 34 out of 45 cases (75.5%), which indicates the high efficiency of the proposed comprehensive treatment of generalized periodontitis.

The conducted observations demonstrated the ability of the treatment complex to normalize the homeostasis of the oral cavity, inhibit the inflammatory process, reduce the symptom of bleeding, and improve the conditions for the repair of periodontal tissues. It can be argued that the high therapeutic effectiveness of the proposed treatment complex in patients with generalized periodontitis of stage I–II is due to its antioxidant, membrane-tropic, anti-inflammatory, immunomodulating, and periodontoprotective effects. This makes it possible to recommend it for local use as a pathogenetically justified means of treating generalized periodontitis.

However, we clearly understand that not all patients with generalized periodontitis can use the technique developed by us, due to the presence of concomitant pathology, in which the use of physical factors, in particular, the laser, is categorically prohibited. We agree with a number of scientists [30; 32] that it is better to use another method of treatment than to provoke an exacerbation of another disease or relapse. In such cases, we offer patients who live in environmentally unfavorable conditions to use the treatment scheme for the first group of patients and consider it the scheme of choice in such situations.

Conclusions. The success of any treatment for patients with generalized periodontitis who live in environmentally unfavorable conditions is to not only eliminate the inflammatory signs of the disease, but also to prevent the progression of inflammatory dystrophic changes. The results of our observation showed that the achievement of this goal is possible under the conditions of elimination of local factors (dental deposits, substandard fillings, irrational orthopedic and orthodontic treatment) and a complex medicinal effect on periodontal tissues and the body as a whole. The scheme of complex treatment of patients with generalized periodontitis who live in environmentally unfavorable conditions, which we have developed, normalizes the

clinical and laboratory characteristics of the mucous membrane of the gums and the bone structure of the jaw bones, ensures the stabilization of pathological processes in the periodontal tissues. The developed scheme of comprehensive treatment of patients with generalized periodontitis who live in environmentally unfavorable conditions should be widely implemented in the daily practice of dentists and periodontists.

Conflict of Interest. The authors declare that there is no conflict of interest that could be perceived as interfering with the publication of the article.

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