

Evaluation of efficiency of complex treatment of patients with generalized chronic parodontitis and bruxism

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Abstract

Relevance: the purpose of this work was to study the effectiveness of proposed treatment and rehabilitation complex for patients with generalized chronic periodontitis and bruxism.

Materials and methods: we examined 73 patients aged 30 to 45 years diagnosed with generalized chronic periodontitis of moderate severity and bruxism. Control group included 15 healthy individuals of the same age for clarify normal functional parameters. Clinical, Doppler flowmetry and electromyographic methods were used for evaluation of the effectiveness of proposed treatment and rehabilitation complex.

Results: the course of treatment resulted in the increase in blood flow perfusion volume by 37.7% ($p < 0.05$), of blood flow perfusion rate by 58.2% ($p < 0.05$) from baseline values. At the same time, the decrease in bioelectric activity of temporal muscle at rest by 51.82% ($p < 0.05$), at voluntary contraction – by 40.4% ($p < 0.05$), the decrease in bioelectric activity of masseter muscle at rest – by 47.4% ($p < 0.05$), at voluntary contraction – by 35.12% ($p < 0.05$) from values before treatment, were observed.

Conclusion: data obtained on the basis of electromyography and laser Doppler flowmetry showed that developed treatment and rehabilitation complex is an effective method for correcting the microcirculation in periodontal vessels and the functional activity of the muscles of maxillofacial area.

Key words: periodontitis, bruxism, fluctuorization, Doppler flowmetry, fluctuorization, bioelectrical activity, electromyography.

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Inflammatory periodontal diseases are the most important problem of modern dentistry occupying one of the leading positions in the structure of dental morbidity. At the same time, generalized chronic periodontitis, being the most frequent cause of tooth loss among the population, has a significant impact on the search for new effective methods of restorative correction of inflamed periodontal tissues and development of such methods making it one of the priority scientific and practical tasks of modern medicine [1, 3].

Periodontitis is a multifactorial disease. One of its causes is periodontal overload due to bruxism [2, 4, 5].

As a result, functional overload with unusual amount, direction and duration of action leads to such serious disorders as destructive changes and hemodynamic disturbances in periodontium.

Microcirculation disorders in periodontal tissues are one of the factors of pathogenesis of inflammatory periodontal diseases [6, 8, 9]. Numerous recent studies have shown that changes in microvasculature vessels during periodontitis are very different. It is important to note that there can be both structural and functional changes in vessels:

permeability disorders, decrease in number of functioning capillaries, changes in blood aggregation properties, which lead to the decrease of microvascular perfusion with blood. According to A.I. Varshavsky (1977), changes in all these components of jaw microvasculature occur simultaneously. The degree of these changes depends on the duration of chronic inflammatory process [7, 9].

The purpose of this work is to study the effectiveness of proposed treatment and rehabilitation complex for patients with generalized chronic periodontitis and bruxism on the basis of electromyographic and Doppler flowmetry methods of research.

MATERIALS AND METHODS

We observed 73 patients diagnosed with generalized chronic periodontitis of moderate severity and bruxism who received treatment at the clinical base of the Department of Therapeutic Dentistry with CPE course of BSMU and in "Zhemchuzhina" OOO dental clinic.

Control group included 15 healthy individuals (with intact dentitions, without complaints, of the same age) to clarify normal functional parameters.

Enrollment criteria were the following: age 30 to 45 years; diagnosis of generalized chronic periodontitis of moderate severity and bruxism, consent to a repeated long-term examination.

Clinical studies were carried out according to generally accepted scheme, the results were registered in patient medical record. Data on profession, working arrangements, schedule, fatigue were also recorded. During mouth cavity examination, the presence of dental plaque, hyperemia and jaw swelling was defined. Periodontal pocket depth and dental mobility were checked. Dental formula was also recorded, dental occlusion and occlusal contacts were evaluated. Masseter and temporal muscles were palpated.

For evaluation of the effectiveness of therapeutic measures, hygiene index, bleeding index and periodontal index were used. All indices were registered on the day of visit and after the treatment course.

For the evaluation of periodontal tissue hemodynamics, we used "Laser Analyzer of Blood Microcirculation LAKK-OP" (ООО "Lasma" Research and Production Enterprise, Russia).

Electromyographic activity of masseter muscle group was registered in all patients, from both sides simultaneously, using "Phoenix" four-channel electromyograph, version 6.12.5. (Neurotech).

All patients underwent dental computed tomography on "Sirona" device by Galileos (Germany), before and after the course of treatment.

No contraindications for further therapeutic measures in patients were found. Intergroup comparison of average parameters was carried out according to Student's test.

We proposed a treatment and rehabilitation complex for patients with GCP and bruxism. In addition to basic therapy, these patients were referred for physiotherapy exercises for the muscles of maxillofacial area, fluctuorization, and relaxation splints (guards) on lower jaw.

Fluctuarization was carried out with alternating currents from "AFT SI-O1-MicroMed" device at the area of masseter and temporal muscles, transdermally, using contact electrodes. Electrodes were fixed on the most prominent points of muscles during voluntary contraction of muscles determined during palpation. A bipolar symmetrical fluctuating current was used, with the frequency of 100-2,000 Hz, current density of 1-2 mA/cm², 5 minutes for each muscle, with the total time of not more than 20 minutes, 3 procedures a day per course.

Therapeutic exercises for the muscles of maxillofacial area were carried out daily for 10-15 minutes, 10-12 procedures per course. Therapy included the following exercises: opening and closing of mouth, lateral movements of lower jaw, folding lips into a tube, mouth opening while pushing the lower jaw forward, pushing the lower jaw forward with simultaneous movement to the sides, circular movements of lower jaw with the inclusion of mimic muscles, pulling the upper lip down, raising the lower lip up (touch the upper lip), maximum displacement of mouth to the right, then to the left, circular motion of lips, narrowing eyes with raising of muscles of zygomatic area upwards, narrowing of the left (right) eye with raising of muscles of zygomatic region.

RESULTS AND DISCUSSION

In patients with GCP, the following complaints prevailed during initial examination: pain and discomfort in the mouth (87%), bad breath (97%), bleeding gums when teeth brushing, eating, taste of blood in the mouth (100 %), change of the color of gums (78%), painful movements of lower jaw (89%).

Objectively, supra- and subgingival dental deposits, congestive venous hyperemia of gums (cyanosis), swelling of gums and smoothness of the top of interdental papillae were revealed in all patients; there were no contours of gingival sulcus; the depth of periodontal pockets was 4-5 mm, mainly in the area of the interdental spaces; no teeth mobility or displacement were found; bleeding was recorded. 23% had non-carious lesions of teeth: exposure of the surfaces of teeth roots, wedge-shaped defects, caries in the neck area or on root surface. Obtained data on hygienic indices show poor oral hygiene.

Results of Doppler flowmetry showed that patients with generalized chronic periodontitis and bruxism in 100% of cases are diagnosed with functional hemodynamic disturbances represented by decreased linear and volumetric rate of tissue blood flow; this indicates decreased periodontal tissue perfusion and is associated with marked functional overload of periodontal tissue due to bruxism. Decrease of blood flow rate parameters is associated, in our opinion, with spasm of arterioles, venous congestion in microvasculature, as well as severe rheological disorders.

According to the results of dental computed tomography before treatment, inflammatory resorption of bone tissue was detected in 100%, uneven decrease in the height of interdental septae to ½ of the length of roots was observed. DCT of all patients showed no cortical plate at the top of interalveolar septum.

Control group showed symmetric activity of the same muscles, and their coordinated functions. Electromyographic data of the masseter muscle group of healthy individuals were close to those presented in literature. The magnitude of maximum amplitude of biopotentials of masseter and temporal muscles (µV) in healthy individuals at physiological rest and during defined activity was taken as average for this age group (25-35 years).

Analyzing the data on masseter muscle group in patients with generalized chronic periodontitis and bruxism, the following can be noted: the amplitude of masseter and temporal muscles exceeds the norm by 2.5-3 times. The presence of spontaneous activity is characteristic for all studied muscles. This indicates that the masseter and temporal muscles are constantly filled in.

Analysis of clinical symptomatology dynamics allowed to establish that the use of treatment program which includes basic therapy, therapeutic physical training exercises and fluctuation results in significant positive changes. 86% of patients had no complaints of pain, 83% – of bleeding gums, 79% – of halitosis. This was observed not only in stopping patients' complaints, but also in improving the condition of periodontal tissues characterized by the disappearance of edema and hyperemia of gums (91%) which acquired pale pink color, dense elastic structure, regular configuration of papillae and gingival margin.

Results showed that using of treatment and rehabilitation complex based on physiotherapeutic technologies



Table 1. Effect of the treatment and rehabilitation complex on the parameters of index evaluation

Parameters		Generalized chronic periodontitis GCP (n = 73)
Hygiene index 0.50 ± 0.07, points	a	4.42 ± 0.17
	b	1.58 ± 0.12 p = 0.000; p ^a = 0.000
Bleeding index 0 ± 0, points	a	1.97 ± 0.08
	b	0.50 ± 0.04 p = 0.000; p ^a = 0.000
Periodontal index 0 ± 0, points	a	3.46 ± 0.10
	b	1.00 ± 0.12 p = 0.000; p ^a = 0.000
Depth of periodontal pockets (mm)	a	4.86 ± 0.07*
	b	3.02 ± 0.07*

a – values before treatment, b – values after treatment course,

* – significance of differences in parameters compared with healthy individuals,

^a – compared with mild GCP, p < 0.05 (according to Student's test)**Table 2. Effect of the treatment and rehabilitation complex on the parameters of periodontal microcirculation in patients with moderate GCP**

Parameters		Generalized chronic periodontitis GCP (n = 73)
Blood flow perfusion volume (perf. units) 30.77 ± 4.36	a	23.79 ± 0.76*
	b	25.94 ± 1.12 p = 0.000; p ^a = 0.00
Blood flow perfusion rate (perf. units) 3.86 ± 0.60	a	2.86 ± 0.15*
	b	3.00 ± 0.32 p = 0.000; p ^a = 0.000

a – values before treatment, b – values after treatment course,

* – significance of differences in parameters compared with baseline values,

^a – compared with control group, p < 0.05 (according to Student's test)

contributed to the improvement of dental status parameters of patients with GCP and bruxism and led to more significant changes in parameters with the decrease in hygienic index by 64.2% (p < 0.05), bleeding index – by 74.5% (p < 0.05), periodontal index – by 71% (p < 0.05) immediately after treatment course, in comparison with baseline values (Table 1).

The course of developed treatment and rehabilitation complex contributed to the restoration of normal microvascular reactivity in patients with GCP. After the course of treatment, the dynamics of functional hyperemia in patients of the main groups corresponded to that of intact periodontium. Performed complex treatment showed the significant improvement in microcirculation and the restoration of blood flow in periodontal tissues of these patients. Treatment course resulted in the increase in blood flow perfusion volume by 37.7% (p < 0.05), in blood flow perfusion rate by 58.2% (p < 0.05) from baseline values.

Parameters of bioelectric activity of masseter and temporal muscles at rest and at voluntary contraction during developed treatment and rehabilitation complex decreased significantly (Table 3). However, there was a decrease in bioelectrical activity of temporal muscle at rest by 51.82% (p < 0.05), at voluntary contraction – by 40.4% (p < 0.05), a decrease in bioelectric activity of masseter muscle at rest 47.4% (p < 0.05), at voluntary contraction – by 35.12% (p < 0.05) from the values before treatment.

CONCLUSION

Obtained results showed a high efficiency of this treatment and rehabilitation complex in the treatment of generalized chronic periodontitis of moderate severity and bruxism.

The use of this developed complex in such patients contributed to the significant increase in clinical efficacy of treatment by 37%.

Data obtained on the basis of electromyography and laser Doppler flowmetry showed that developed treatment and rehabilitation complex is an effective method for correcting the microcirculation in periodontal vessels and the functional activity of the muscles of maxillofacial area.

Table 3. Dynamics of bioelectric activity parameters of masseter and temporal muscles in patients with moderate GCP

Parameters			Generalized chronic periodontitis GCP (n = 73)
Temporalis muscle average amplitude, μV	at rest	a	79.6 ± 4.2
		b	38.3 ± 2.6; p = 0.00; p ^a = 0.000
	at voluntary contraction	a	695.0 ± 38.8 ^a
		b	389.1 ± 22.2; p = 0.00; p ^a = 0.400
Masseter muscle average amplitude, μV	at rest	a	63.4 ± 3.2
		b	33.2 ± 3.3; p = 0.00; p ^a = 0.00
	at voluntary contraction	a	615.1 ± 23.8
		b	399.0 ± 23.2; p = 0.00; p ^a = 0.011

a – values before treatment, b – values after treatment course,

* – significance of differences in parameters compared with baseline values,

^a – compared with control group, p < 0.05 (according to Student's test)

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