Research Article

Effeciency of Initial-I Stage Generalized Periodontitis Treatment Among Medical University Students According to Indicators of Oral Cavity Prooxidant-antioxidant System

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Abstract
Periodontal diseases are one of the most important problems in dentistry, due to its very high dissemination. Inflammatory processes in periodontal tissues are more common among young people, which, in the future, without adequate treatment lead to irreversible changes in structure of cellular bone. This causes development of new effective therapeutic complexes aimed at eliminating etiopathogenetic factors development of periodontal tissues inflammatory diseases and the targeted influence on the pathological processes in these tissues.

The objective of the study was to analyze the efficiency of suggested initial-I stage generalized periodontitis treatment among second-year students of medical university.

Materials and methods. To achieve this goal, we examined and treated 50 students with initial-I stage of generalized periodontitis without somatic pathology, which were divided into two groups, depending on treatment method. First group included 25 students who received advanced treatment; second group included 25 students, who received usual treatment. Control group consisted of 20 clinically healthy students. The state of oral cavity prooxidant-antioxidant system was determined by the level of malone dialdehyde (MDA), diene conjugates (DK), superoxide dismutase (SOD) activity, glutathione-S-transferase (G-ST), and the activity of glutathione peroxidase (GPO).

Results and discussion. Periodontal diseases, namely, initial-I stage of GP, are accompanied by an imbalance of oral cavity prooxidant-antioxidant system indicators. This is confirmed by an increase number of MDA and DK (p< 0.001), and a decrease in SOD, G-ST, GPO (p< 0.001) compared to clinically healthy students.

Conclusions. The results of GP treatment in first group were significantly better in relation to the second one (p<0.05), indicating the effectiveness of the proposed advanced treatment of initial-I stage of GP.

Keywords
generalized periodontitis; prooxidant-antioxidant system; oxidative stress; medical students

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Problem statement and analysis of the latest research

Periodontal diseases are one of the most important problems in dentistry, due to its very high dissemination [1]. Inflammatory processes in periodontal tissues are more common among young people, which, in the future, without adequate treatment lead to irreversible changes in structure of cellular bone. This causes development of new effective therapeutic complexes aimed at eliminating etiopathogenetic factors development of periodontal tissues inflammatory diseases and the targeted influence on the pathological processes in these tis-

sues [2].

Today, it is known that a significant role in pathogenesis of generalized periodontitis (GP) is played by the imbalance in lipid peroxidation system (LPO), peroxide oxidation of proteins and antioxidant defense. Excessive activation of LPO leads to formation of active forms of oxygen (AFO) [3, 4]. Oxidative stress may occur when intracellular concentrations of AFO increase over physiological parameters. Increasing of oxidative stress can lead to an imbalance of oral cavity prooxidant-antioxidant system, which is decisive in periodontal diseases inflammatory occurance [5, 6, 7]. Malone dialdehyde (MDA) and diene conjugates (DK) are the main products of lipid peroxidation and are indicators of oxidative stress [5, 8].

The human body has a range of antioxidant defense mechanisms (non-enzymatic and enzymatic antioxidants) to eliminate reactive oxygen species and prevent their harmful consequences on the organism [9, 10]. Antioxidant enzymes protect tissues from oxidative injury by purifying free oxygen radicals generated by various metabolic processes, regulating the degree of inflammatory response. Antioxidant molecules are present in all fluids and tissues of body. The most important intracellular enzymes that protect cells and tissues from free radicals derived from oxygen are superoxide dismutase (SOD), glutathione peroxidase (GPO), and glutathione-Stransferase (G-ST) [10, 11].

A deficiency or decrease in antioxidant capacity increases the susceptibility to oxidative stress, and the resulting damage is thought to be involved in the pathogenesis of various diseases. Previous studies have shown that periodontal disease was associated with a reduced salivary antioxidant capacity and increased in oxidative damage within the oral cavity. There is increasing evidence that oxidative stress is an important contributing factor in the pathogenesis of periodontal diseases [10, 11].

Violation of LPO and proteins peroxide oxidation processes often accompany the development of GP in young people and cause the need for using of antioxidant drugs complex in treating of GP [3, 12].

Despite numerous studies of LPO and a few studies of proteins peroxide oxidation, the com-bined study of these indicators in patients with GP and the impact of complex therapy are very relevant [3].

The objective of the study: To analyze the efficiency of suggested initial-I stage generalized periodontitis treatment among second-year students of medical university.

1. Materials and Methods

To achieve this goal, we examined and treated 50 students with initial-I stage generalized periodontitis without somatic pathology, which were divided into two groups, depending on treatment method. First group included 25 students who received advanced treatment; second group included 25 students, who received usual treatment. Control group consisted of 20 clinically healthy students.

Students of group I had advanced treatment, which included oral sanitation, professional hygiene with hygienic skills training, and local treatment – oral mouthwash "Octenisept" (diluted with distilled water 1: 3, 3 times a day – 1 week) and dissolving the pill "Lizak" (1 pill every 4 hours during 1 week). For general treatment patients of this group received a nootropic pill "Noofen" (1 pill 3 times a day during 1 month). Students of group II received usual treatment, which included sanation and professional hygiene of the oral cavity with hygienic skills training, local treatment – mouthwash with a solution of chlorhexidine 0.05% (3 times a day – 1 week) and dissolving the pill "Lisobakt" (2 pills 4 times a day). Patients of both groups received the vitamin-microelement complex "Vita-Supradyn Active" (1 pill once a day during 1 month).

To put final diagnosis of initial-I stage generalized periodontitis we used objective examination, clinical indices of PMA (papillary-marginal-alveolar index), PI (Ramfjord periodontal index), SBI (sulcus bleeding index, H.R. Muš lemann, S. Soon, modified by I. Cowell) and Green-Vermillion (OHI-S) index. The diagnosis was based on the classification of M.F. Danylevskyj periodontal tissue diseases [13].

To assess the state of the prooxidant-antioxidant system of periodontal tissues, oral fluid of 2nd year

Table 1. Indicators of oral cavity prooxidant-antioxidant system among medical university second-year students (M±m).

Indicator	Healthy n=20	Patients with GP			
		I group n=25	p	II group n=25	p
Malone dialdehyde, nmol/ml	0.26±0.02	1.02±0.09	p1<0.001	1.01±0.08	p2<0.001 p3>0.05
Diene conjugates, units	0.19±0.04	0.54±0.05	p1<0.001	0.53±0.03	p2<0.001 p3>0.05
Superoxide dismutase, %	53±3.22	20.64±0.82	p1<0.001	20.08±0.73	p2<0.001 p3>0.05
Glutathione-Stransferase, nmol/min*mg	12.33±0.79	3.36±0.36	p1<0.001	3.37±0.2	p2<0.001 p3>0.05
Glutathione peroxidase, μmol/min*mg	0.61±0.03	0.22±0.02	p1<0.001	0.2±0.01	p2<0.001 p3>0.01

Notes:

1. p1 – the reliability of differences in the indicators of I group patients with GP and healthy group;
2. p2 – the reliability of differences in indicators of II group patients with GP and healthy group;
3. p3 – the reliability of differences between indicators of I and II group.

students, which were taken in the morning, was examined. The material was collected twice before and after treatment. The state of oral cavity prooxidant system of the oral cavity was determined by the level of malone dialdehyde (MDA) by the method of Stalin N.D. (1977) [14] and the level of diene conjugates (DK), which were determined by the method of Gavrilov V.B. (1983) [14]. To study a state of the antioxidant defense system, superoxide dismutase (SOD) activity was determined by Chevari S. (1985) [14]; Glutathione-Stransferase activity (G-ST) by Habig W. H. et al. (1974) [14]; activity of glutathione peroxidase (GPO) by the method of Gerus IV, Meshchishena I.F. (1998) [15, 16].

The obtained data was processed using the statistical package "Stat Soft 6.0", the classical methods of variation statistics. The differences between the studied indicators were estimated by Student's criterion.

2. Results and Discussion

Having obtained the results of examination (Table 1), we observe significant changes in oral cavity prooxidant-antioxidant system parameters among patients with initial-I stage of GP.

Thus, MDA in patients of groups I and II is significantly higher in comparison with clinically healthy patients and exceeds this rate by 3.9 times (p<0.001). The number of DK in patients with GP is 2.8 times higher than in healthy ones (p<0.001).

As for antioxidant protection indicators, they also differ in I and II groups patients compared to healthy ones. The number of SOD was 2.6 times lower in patients with GP than in healthy ones (p<0.001). The GPO score is also 2.8 times smaller in both groups compared to healthy ones. Data values of G-ST in patients from I and II groups are smaller by 3.7 times in relation to healthy (p<0.001).

Data of I and II groups did not differ statistically (p>0.05).

After the treatment significant changes in the data of the prooxidant-antioxidant oral cavity sys-

Table 2. Dynamics of oral cavity prooxidant-antioxidant system indicators among patients with GP before and after treatment (M±m).

Indicator	Patients with GP					
	I group n=25			II group n=25		
	Before treatment	After treatment	p	Before treatment	After treatment	p
Malone dialdehyde, nmol/ml	1.02±0.09	0.29±0.03	p1<0.001	1.01±0.08	0.4±0.04	p2<0.001 p3<0.05
Diene conjugates, units	0.54±0.05	0.21±0.03	p1<0.001	0.53±0.03	0.22±0.03	p2<0.001 p3>0.05
Superoxide dismutase, %	20.64±0.82	56.64±2.81	p1<0.001	20.08±0.73	56.7±2.8	p2<0.001 p3<0.05
Glutathione-Stransferase, nmol/min*mg	3.36±0.36	12.74±1.25	p1<0.001	3.37±0.2	9.77±0.49	p2<0.001 p3<0.05
Glutathione peroxidase, μmol/min*mg	0.22±0.02	0.64±0.02	p1<0.001	0.2±0.01	0.56±0.02	p2<0.001 p3<0.01

Notes:

1. p1 – the reliability of differences in indicators of group I before and after treatment;
2. p2 – the reliability of differences between indicators of group II before and after treatment;
3. p3 – the reliability of differences between indicators of group I and the group II after treatment.

tem in groups I and II were obtained (Table 2).

Looking into the data of prooxidant system, there was a significant decrease of MDA in both groups after treatment ($p_{1,2}$<0.001). However, in group I, this indicator is significantly lower (0.29 ± 0.03 nmol/ml) as opposed in second group (0.4 ± 0.04 nmol/ml) (p_3<0.05). Analyzing the number of DK in groups I and II, we see that after treatment, this data also decreased in both groups, which is statistically confirmed ($p_{1,2}$<0.001).

The use of our proposed advanced treatment method of initial-I stage GP also affected the number of antioxidants in oral liquid. The number of SOD significantly changed after treatment in two groups ($p_{1,2}$<0.001), but score in first group was significantly better and equaled 65.64±2.81% in relation to second group – 56.7±2.8% (p_3<0.05). The G-ST after treatment also improved in two groups ($p_{1,2}$<0.001), although in I group, this result was statistically better (p_3<0.05). In order to the given GPO indicator, it is also improved in I and II groups after treatment ($p_{1,2}$<0.001), but this result is the best in I group where advanced therapy was performed (p_3<0.01).

3. Prospects of Further Researches

We plan further study of long-term treatment results of 2-year Medical University students with initial-I stage of GP, who were treated with help of improved technique.

4. Conclusions

1. Periodontal diseases, namely, initial-I stage of GP, are accompanied by an imbalance of oral cavity prooxidant-antioxidant system indicators. This is confirmed by an increase number of MDA and DK (p<0.001), and a decrease in SOD, G-ST, GPO (p<0.001)

compared to clinically healthy students.

2. As a result of the treatment, there was a significant improvement in parameters of oral cavity prooxidant-antioxidant system in groups I and II (p<0.001).

3. The results of GP treatment in first group were significantly better in relation to the second one (p<0.05), indicating the effectiveness of the proposed advanced treatment of initial-I stage of GP.

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