

ORIGINAL ARTICLE

EVALUATION OF THE TREATMENT EFFECTIVENESS OF GINGIVITIS BY THE ORAL DYSBIOSIS INDEX IN PATIENTS WITH DIFFERENT REACTIONS OF PSYCHOPHYSIOLOGICAL MALADAPTATION

10.36740/WLek202011122

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ABSTRACT

The aim: The purpose of this study was to evaluate the dynamics of changes of oral cavity dysbiosis index in patients with various reactions of psychophysiological maladaptation after treatment of gingivitis in different observation terms.

Materials and methods: Study was conducted on the basis of Department of Therapeutic Dentistry of Ternopil National Medical University during 1 year from January 2018 till January 2019. The study involved treatment of 58 patients 19-44-years old with gingivitis on a background of different psycho-physiological maladaptation reactions, of whom was formed the I main group (37 people) and the II control group (21 people). For evaluation of the effectiveness of the proposed treatment and prevention complexes, we determined the dynamics of changes of oral cavity dysbiosis index after the treatment of gingivitis at different study times.

Results: In patients with gingivitis lysozyme activity increased by 15.02% ($p < 0.01$) and urease activity decreased by 24.46% ($p < 0.05$), according to before-treatment data. In patients of the first group, the oral dysbiosis index decreased in 1.5 times fold with respect to before-treatment data (0.37 ± 0.09 vs. 0.56 ± 0.08 , $p > 0.05$).

Conclusions: Therefore, as a result of the use of proposed treatment and prevention complex was able to increase the activity of lysozyme and reduce urease activity, which generally improved the oral cavity dysbiosis in the main group, which after 1 year of observation was equal to the medium degree in patients with all types of psychophysiological reactions.

KEY WORDS: gingivitis, psychophysiology, lysozyme, urease, dysbiosis

Wiad Lek. 2020;73(11):2457-2460

INTRODUCTION

According to WHO, periodontal tissue diseases remain unresolved in modern medicine, and their relevance is determined by the high demand of the population for the effective treatment of these diseases, and most importantly – prevention. Among the risk factors are crucial disorders of oral microbiocenosis and impaired dynamic equilibrium with the body's adaptive immune system, lack of antioxidant protection and transcapillary metabolism in the dental tissues. In the pathogenesis of the inflammatory process of the oral cavity, not only nonspecific protection, but also specific, associated with the function of adaptive immunity plays an important role. It was found that in saliva concentration of sIgA, IgA, IgG, IgM increased, also levels of IL-8, IL-1, but decreased content of IL-4 [1-8].

The role of psychological characteristics of the personality in the emergence and development of dental diseases has been substantiated by a number of studies of domestic and foreign scientists, in which features of the emotional and personal sphere of patients with different resistance to diseases of hard tissues of teeth and periodontium were considered. The analysis of the various factors influence on the occurrence of periodontal tissue diseases indicate that stress is a determining factor in the development of this pathology. In recent years, research on the

relationship between human psychological status and periodontal disease has been published and analyzed by scientists at the American Academy of Periodontology. As a result, 57% of studies confirmed a direct relationship between the development of periodontal disease and psychological factors [9-14].

The polyetiologic and complex multifactorial pathogenesis of periodontal tissue diseases involves a comprehensive approach to the administration of drugs, depending on the depth of periodontal tissue damage and disease course. Given the dominance of endogenous, local and general factors, first of all, the activity of the microbiological condition of the periodontium and oral cavity; hygiene factors, salivary gland function, functionality of neurohumoral factors, intoxication, lipid peroxidation, manifestations of dystrophic imbalance and others – the clinician needs to determine the benefits of an existing individual complex and appoint a well-founded etiologic and pathological medicines [15-18].

THE AIM

The purpose of this study was to evaluate the dynamics of changes of dysbiosis index of oral cavity in patients with various reactions of psychophysiological maladaptation after treatment of gingivitis in different observation terms.

MATERIALS AND METHODS

The clinical stage of the research was conducted on the basis of Department of Therapeutic Dentistry in Ternopil National Medical University during 1 year from January 2018 till January 2019. The study involved treatment of 58 patients 19-44-years old with gingivitis on a background of different psycho-physiological maladaptation reactions, of whom was formed the I main group (37 people) and the II control group (21 people). The following psychophysiological states were considered in the study: without reactions of psycho-physiological maladaptation (WRPD), reactions of psycho-physiological maladaptation (RPD), somatogenic asthenic symptom complex (SASC), acute neurotic disorders (AND) and neurotic disorders with prolonged course (NDPC).

Further studies were aimed at assessing changes in dysbiosis index of oral cavity after complex treatment of gingivitis at different observation times (3, 6, 12 months). Dysbiosis index (DI) was determined by the formula proposed by prof. Levytskyi A.P. [19] using the average activity results of urease and lysozyme:

$$DI = \frac{\text{Urease activity}}{\text{Lysozyme activity}} \times 100$$

Results interpretation:

- 0,15-0,30 – moderate dysbiosis;
- 0,30-0,50 – average dysbiosis;
- 0,50 and > – strong dysbiosis.

For determination of DI, the activity of lysozyme in the oral fluid was definitited by serial dilutions with the test microbe *Micrococcus lysodeikticus*. The urease activity was determined by the ability of this enzyme to break down urea with the formation of ammonia, which is quantified using a Nessler reagent. The statistical processing of the results was carried out using standard statistical analysis programs In VivoStat v.3.0, SofaStat v.1.4.6. and Libre Office Calc. v.5.2.2.2.

RESULTS

In the first group treatment was carried out in accordance with our developed treatment and prevention complexes: hygienic training and education; individual selection of oral care products and professional oral hygiene. Also, local procedures in I group included:

- antiseptic rinsing the mouth with rinses containing chlorhexidine bigluconate (“Perio-AID 0,12%”, “Meridol Med-CHX – 0,2%”, “Curaprox Curasept 0,12%”, “Eludril 0,10%”);
- applications of Perio-AID gel on gums, which were carried out by:
 - 3 times per day during 4 days for patients with RPD and WRPD;
 - 3-5 times per day during 5 days with SASC;
 - 5-7 procedures per day, during 7 days with AND and NDPC;

Assignment of drugs of general effect in patients of group I was carried out with the consultative assistance and under the supervision of related doctors of the relevant specialization.

For general strengthening of the body the drug – “Triovit” (KRKA):

- 1 capsule once a day during 1 month for persons with RPD, WRPD, SASC;
- 1 capsule twice a day during 2 months for AND and NDPC.

“Magne-B6 stress control” (Sanofi) containing anhydrous magnesium citrate and pyridoxine hydrochloride to enhance the body’s stress resistance. The drug was prescribed: 1 tablet 3 times a day during 1 month for persons with RPD, WRPD, SASC; 2 tablets 2 times a day for 1 month with AND and NDPC;

“Calcemin” (Bayer) was prescribed to improve bone remodeling. The drug was prescribed (after taking “Magne-B6”): 1 tablet a day for 1 month for persons with RPD, WRPD and SASC; 2 tablets a day for 1 month, with a repeated course of 3 months for AND and NDPC.

The treatment scheme of II group patients included: professional oral hygiene, prescribing topical antiseptics, non-steroidal anti-inflammatory drugs depending on the severity of periodontal tissue diseases, sanitation of the oral cavity (according to the order of the Ministry of Health of Ukraine).

As a result of the treatment of gingivitis, the dynamics of changes of DI in different terms of observation was evaluated (tab.1). **After 6 months**, lysozyme activity increased by 12.51% in I group, ($p < 0.01$) and by 6.08% in II group, ($p < 0.05$) in relation to before-treatment data. However, in II group, the activity of lysozyme in the oral fluid was significantly lower than in patients of I group: WRPD – 8.26%, with RPD – 5.93%, ($p1 < 0.05$), SASC – by 2.81%, in the AND – by 4.94% and in the NDPC – by 10.96%, ($p1 < 0.01$). At this time of the study, the urease activity in oral fluid was significantly decreased in relation to before-treatment data in individuals of I group WRPD – by 29.42% and in RPD – by 27.64%, ($p < 0.05$). In other psychophysiological states of patients in the study groups, urease activity though decreased, but the obtained indices did not differ in statistical significance from baseline values ($p > 0.05$).

In I group, after 6 months, the oral DI, although decreased, but only in patients WRPD and RPD was treated as moderate with the corresponding values of 0.24 ± 0.06 and 0.29 ± 0.07 , ($p > 0.05$). With SASC and AND, the degree of oral dysbiosis was regarded as average, and with NDPC – strong, ($p > 0.05$). In the II group with RPD, WRPD, SASC was determined by the average degree, and in patients with PLR and NDPC – a strong degree of oral dysbiosis ($p > 0.05$).

After 12 months of studies in I group was determined a further increasing of lysozyme activity in the oral fluid: WRPD – by 12.94%, with RPD – by 12.10%, with SASC – by 14.28%, in the AND – by 17.09%, and at NDPC – by 20.0%, ($p < 0.01$). In II group, lysozyme activity at this study period was equal to the before-treatment data ($p \geq 0.05$) and was significantly lower in relation to the values of I group: WRPD – by 10.55%, with RPD – by 9.0%, with SASC – by 10.21%, with AND – by 9.59%, and in NDPC – by 10.96%, ($p1 < 0.01$).

After 12 months of studies was determined a significant decreasing of urease activity in I group, which in individuals WRPD was 30.48%, with RPD – by 28.64%, with SASC – by 24.44%, with AND – by 21.30% and at NDPC – 20.27% lower

Table I. Dynamics of lysozyme and urease activity, oral dysbiosis index in groups at different observation times

Terms	Parameters	Groups	WRPD	RPD	SASC	AND	NDPC
Before treatment	Lysozyme, mcg/ml	I+II	487,00±8,62	446,00±6,14	420,00±5,20	392,00±4,56	365,00±4,20
	Urease, umol/l	I+II	1,87±0,16	1,99±0,15	2,25±0,18	2,63±0,19	2,91±0,18
	Dysbiosis	I+II	0,38±0,09	0,45±0,08	0,54±0,09	0,67±0,10	0,78±0,11
After 6 months	Lysozyme, mcg/ml	I	545,00±7,20 ^{oo}	489,00±6,13 ^{oo}	463,00±5,10 ^{oo}	445,00±4,52 ^{oo}	428,00±4,18 ^{oo}
		II	500,00±7,15 ^{*,*}	460,00±6,18 ^{*,*}	450,00±5,15 ^{oo**}	423,00±4,50 ^{oo**}	400,00±4,19 ^{oo**}
	Urease, umol/l	I	1,32±0,15 ^o	1,44±0,15 ^o	1,75±0,18	2,18±0,17	2,39±0,17
		II	1,60±0,14	1,70±0,14	1,98±0,15	2,30±0,16	2,55±0,16
	Dysbiosis	I	0,24±0,06	0,29±0,07	0,38±0,09	0,49±0,12	0,56±0,14
		II	0,32±0,08	0,37±0,09	0,44±0,11	0,54±0,13	0,64±0,18
After 12 months	Lysozyme, mcg/ml	I	550,00±7,15 ^{oo}	500,00±6,12 ^{oo}	480,00±5,00 ^{oo}	459,00±4,52 ^{oo}	438,00±4,20 ^{oo}
		II	492,00±7,20 ^{**}	455,00±6,15 ^{**}	431,00±5,18 ^{**}	415,00±4,20 ^{**}	390,00±4,19 ^{**}
	Urease, umol/l	I	1,30±0,15 ^o	1,42±0,16 ^o	1,70±0,17 ^o	2,07±0,16 ^o	2,32±0,16 ^o
		II	1,69±0,14 [*]	1,80±0,14 [*]	2,07±0,17 [*]	2,16±0,16 [*]	2,41±0,17 [*]
	Dysbiosis	I	0,24±0,08	0,28±0,09	0,35±0,09	0,45±0,11	0,53±0,12
		II	0,34±0,08	0,40±0,10	0,48±0,12	0,52±0,13	0,62±0,15

Notes:

* p<0,05; ** p<0,01; *** p<0,001 – a reliable difference in values for data before treatment

^o p<0,05; ^{oo} p<0,01; ^{ooo} p<0,001. – a reliable difference in values for data between main and control groups.

in relation to before-treatment data (p<0.05). In II group, the values of urease activity were equal to the initial data and were in persons: WRPD – by 30.0%, with RPD – by 28.57%, with SASC – by 21.76%, and in the AND – by 4.34% and for NDPC – 3.87% higher relative to similar values in I group individuals (p<0.05).

The dysbiosis index of the oral cavity of the studied I group in persons WRPD and with RPD was treated as moderate; with SASC and AND, the average and with NDPC was strong (p>0.05). In II group patients with RPD, WRAP, SASC, was determined as average and in the AND, NDPC were strong dysbiosis index.

DISCUSSION

Periodontal diseases have been and still remain one of the most common and topical dental diseases. Thus, more than 60% of the population over the age of 40 suffer from certain periodontal diseases, this figure increases to 100% in the elderly people. Pathological changes in the periodontium often occur against the background of concomitant diseases – digestive, metabolism disorders, cardiovascular and endocrine diseases, sensitization and infection of the human body [1, 16, 17]. At present time, the relationship between the state of immune protection and the balance of disorders of the prooxidant-antioxidant system have no doubt [20, 21, 22]. The previous statement is explained by the fact that with presence of somatic pathology, typical pathological processes

often develop, which are also accompanied by disorders of oxidative metabolism, which weaken the body's functioning of specific and nonspecific protection and lead to pathological and biochemical shifts among components of local immunity in the oral mucosa [5, 6, 23]. All of this become [20, 23, 24]. one of the conditions for enhancing the negative impact of the oral microbiota, which leads to a reciprocal increase in dys-metabolic disorders due to the underlying disease in patient [

At the considering that psychosomatic and psychoneurological diseases can lead to the formation of various defects of the immune protection system, which is a factor in increasing the adverse course of inflammatory diseases in the oral cavity of these patients. Quantitative analysis in the oral fluid of indicators of innate and adaptive immunity allows to personalize the approach to treatment taking into account the severity of disorders of the immune system at the local level. All of the above, makes it possible to perform modern diagnostics and, if necessary, correction of therapy, which increases its effectiveness and reduces the risk of complications in this category of patients [4, 18, 24, 25].

CONCLUSIONS

One of the important step in treatment of periodontal diseases should be the individual and differentiated development and implementation of local and general therapeutic measures, taking into account the clinical and psychosomatic status of this group of patients. In patients

with gingivitis the lysozyme activity increased, on average, by 15.02% ($p < 0.01$) and the urease activity decreased by 24.46% ($p < 0.05$), relative to before-treatment data. The dysbiosis index decreased in 1.5 times relative to pre-treatment data (0.37 ± 0.09 vs. 0.56 ± 0.08 , $p > 0.05$). At the same time, the values of oral dysbiosis index in the second group slightly improved according to the initial data.

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Conflict of interest:

The Authors declare no conflict of interest.

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Received: 01.11.2019

Accepted: 23.07.2020

A – Work concept and design, B – Data collection and analysis, C – Responsibility for statistical analysis, D – Writing the article, E – Critical review, F – Final approval of the article