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CONTENTS

MEDICINE

PHARMACY

MEDICINE

THE BASICS APPROACH TO BONE ANTIGEN AND LOCAL IMMUNITY OF ORAL CAVITY AT THE STAGE OF PROSTHETIC SUPPORT OF THE COMPREHENSIVE TREATMENT OF THE GENERALIZED PERIODONTITIS

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Abstract. *Generalized periodontitis (HP) occupies one of the leading places in the structure of dental diseases. The expediency of using certain orthopedic structures at the stages of therapeutic and surgical treatment of GP, the choice of orthopedic structure, its specificity and preference, depending on the degree of severity and nature of the course of GP, the peculiarities of the dentition, and the rational timing of the application of various orthopedic structures, requires scientific justification. To evaluate the results of complex treatment of GP it is advisable to use indicators of specific reactions that objectively reflect the processes occurring in the alveolar process under the influence of the orthopedic Prostetics.*

The purpose of this study was to establish the role, place and correspondence of tissue allergy to bone antigen and the level of local immunity at the stages of orthopedic support in the complex treatment of GP.

Materials and methods. To achieve this goal, clinical, radiological and immunological methods of investigation were used. To determine the tissue allergy to the bone antigen, the inhibition of migration of leukocytes (RTML) was chosen. The state of local immunity was assessed in saliva according to the level of 11SIgA, 7SIgA, IgM and IgG in the Manchini reaction. The study was based on the dynamic observation of 132 patients with GP of I-II degree with chronic and exacerbated course, taking into account the results of examination of male patients 22-25 years old without a clinically established pathology from the osteoarticular apparatus and diseases of internal organs and systems. As orthopedic structures, non-removable non-invasive temporary spikes based on an inorganic matrix with pre-filled fibers and provisional crowns were selected.

Results and its discussion. As a result of the study, we found a pronounced tissue sensitization to the bone antigen in 61.05 ± 5.7 % of patients with chronic HA and in 80.0 ± 5.1 % of patients with exacerbated HP with no allergy to the bone antigen in practically Healthy people and does not significantly depend on the chosen orthopedic Prostetics.

When studying the indices characterizing the state of local immunity in general in patients with GP, a decrease in the immunoglobulin indices of all classes was found in comparison with the control group. An increase in the parameters of secretory immunity with the inclusion of the orthopedic component for 1-1.5 months in the complex treatment of GP depends more on the drug component and does not depend on the chosen orthopedic structure.

Conclusions. High tissue sensitization to the bone antigen in generalized periodontitis objectively reflects the level of the osteoclast process. The absence of a decrease in tissue allergy to bone antigen in the complex treatment of GP, including the orthopedic component, can not correct the failure in recognizing "one's" - "someone else's", normalize the distorted response to the antigen load and requires additional inclusion of specific methods, including the immunological component.

Keywords: *generalized periodontitis, tissue sensitization to bone antigen, local immunity, orthopedic treatment.*

Periodontium tissue diseases occupy one of the leading positions in the dental diseases structure. Note that the generalized periodontitis (GP) claims to take the key position among the periodontium diseases [1]. It's easy to notice a stable tendency of increasing GP's prevalence rate among people of the different age groups with a focus on the gender differences. In spite of improvement of the population's dental culture, the vast majority of patients seek periodontal help only

when having a developed pathological process in the periodontal complex. In other words, the issues of primary prevention of the GP are not sufficiently addressed today [2].

It's fair to mention that the complexity of the GP prevention as well as adequate patients' motivation to visit a periodonist in an early and timely manner are caused by a number of reasons. The key reason is the absence of clear vision of the GP's aetiopathogenesis, which definitely complicates planning and performance of adequate and productive preventive measures, makes the implementation of the comprehensive GP treatment with predictable forecast of efficiency of such treatment quite complicated [3]. Note that the methods of medicinal influence on the periodontal complex as well as the role and position of surgical treatment of the GP have been covered in the literature with a lot of details [4, 5]. At the same time, the problem of prosthetic support at all stages of the comprehensive treatment does't have sufficient coverage in the literature, the recommendations provided are contradictive and disputable, they are often based only on own conclusions, without relying upon evidence-based facts. In our opinion, this is an undeniable omission requiring scientifically based development of this field. It should be noted that in the literature, the main focus is placed on the unconditional role of traumatic occlusion as a factor contributing to the launch of the pathological process in the periodontium tissues [6].

It was demonstrated that a fixed occlusal trauma resulted from teeth overcrowding, teeth positioning outside of the arch, deep and distal occlusion, as well as teeth loss due to carious disease's sequellae is one of the key factors of ischemia that launches dystrophic process, while the subsequent and progressive decrease of the alveolar crest potentifies the disruption of the ligamentous apparatus [7]. This will later initiate traumatic overload of individual teeth and their displacement will activate the inflammatory and destructive processes in the periodontal bone tissue, enhancing the osteoclastic resorption, disrupting the metabolism of the bone tissue of the alveolar bone, initiating a process mismatch and resorption towards the latter [8]. An aggravating factor is the redistribution of the masticatory pressure resulting from the appearance of the horizontal and vertical components according to the law of the parallelogram of forces [9, 10]. However, despite the importance of the data obtained in this field, the prosthetic treatment issues at the early and final stages of the comprehensive GP treatment remain a weak link in this chain. The question of choice, role and expediency of application of certain prosthetic constructions at the stages of the therapeutic and surgical intervention into the GP remains debatable. The question of not only scientific validity of choosing a prosthetic construction, but also the question of this construction's specificity and preference depending on the degree of the GP severity and progression nature, as well as on the dental arch features still remain open [11]. The question of the rational timing of application of various prosthetic constructions remains controversial.

We assume that the ongoing discussion of this field is largely caused by the fact that for the scientific and evidence base, the studies have been often applied not allowing for an objective assessment of changes in the main component of the periodontal complex, such as the alveolar bone. The latter, on one hand, is a main benchmark for the periodontal complex, on the other hand it's a point of application of therapeutical (medicinal), surgical and prosthetic treatment. The appropriateness of the comprehensive GP treatment was often assessed from a number of nonspecific blood parameters, such as alkaline and acid phosphatase, estrogens, thyroxine, etc. [2]. Without detracting the importance of these studies, one should note their relative informativity due to the influence on these indicators of many components of the body as a whole (age and gender parameters, diseases of internal organs and systems, etc.). Often, it is not possible to objectively assess the effectiveness of certain prosthetic construction, to identify their correspondence for different categories of patients. In our opinion, it would be more expedient to focus the attention on the specific reactions that objectively reflect the processes occurring in the alveolar bone under the impact of the prosthetic construction.

We believe that the identification of the tissue allergy to the bone antigen as a specific reaction could be an important paradigm for an objective evaluation of the processes occurring in the alveolar bone under the impact of various types of prosthetic GP treatment. Note that the literature contains just a few information on the role of the tissue allergy (delayed-type hypersensitivity - DTH) to the bone antigen in the GP, there is no information on the role and position of the tissue allergy to the bone antigen at the stage of prosthetic treatment. We believe that the expediency of studying the tissue allergy to the bone antigen can be considered in 2 aspects. The first aspect is that the indicators of the DTH to the bone antigen objectively reflect the level of the osteoplastic process in the alveolar bone.

The second aspect allows discussing the issue of sensitization and tissue allergy to the bone antigen as a key link in the GP's aetiopathogenesis.

The appropriateness of such a hypothesis is evident due to the presence of similar and cross antigens in a number of aerobic microorganisms of the gingival crevice, periodontal pockets, oral cavity's mucous membrane with connective tissue of the alveolar bone, where a failure to recognize a "friend" or a "foe" may trigger not only the distortion of the local immunity functioning reaction, but it may also trigger the GP's autoimmune mechanism. To this end, the *purpose* of this study was establishing the role, position and correspondence of the tissue allergy to the bone antigen and the local immunity level at the stages of the prosthetic support in the comprehensive GP treatment.

We have set the following *tasks*:

1. Establish the role and position of the tissue allergy to the bone antigen at the prosthetic treatment stage using adhesive splints as an integral part of the comprehensive GP treatment.
2. Study the level of the tissue allergy to the bone antigen at the prosthetic treatment stage using temporary crowns as an integral part of the comprehensive GP treatment.
3. Identify the correspondence of the tissue allergy to the bone antigen with the level of secretory immunity at the stages of prosthetic GP treatment.

The clinical, radiological and immunological investigation methods were used.

The leukocyte migration inhibition test (LMIT) was selected for identifying the tissue allergy to the bone antigen. Being highly specific and informative, this test is included in the list of reactions recommended by the WHO for immunological studies. Taking into account that the reaction takes place in vitro, the conditions are created for multiple examination of patients and for the use of the tissue antigens that are not used in vivo.

As a tissue antigen, a water-salt extract of the bone tissue of group 0(I)D was used. The leukocytes migration index was performed after 24 hours, the index was calculated using the following formula:

$$migration\ index \quad MI = \frac{migration\ area\ with\ antigen}{migration\ area\ without\ antigen}, \qquad (1)$$

where the MI of 0.1 to 0.5 corresponded to the high degree of the tissue sensitization to the bone antigen (M. M. Averbakh et al., 1974).

The state of the local immunity was assessed in saliva on the basis of the level of 11SIgA, 7SIgA, IgM and IgG using the Manchini test.

Under our supervision, there were 132 patients with the GP of the I and II grade who had chronic and aggravated progression of the disease. In order to exclude the impact of a hormonal component, the results of the examination of male patients aged from 22 to 25 without the clinically established pathology of the osteoarticular apparatus and diseases of the internal organs and systems (the active treatment group) were taken into account for the interpretation of the data obtained. The control group consisted of 30 healthy males, without pathology of periodontal tissues and concomitant diseases of pathology.

For 57 patients (active treatment group A), the fixed non-invasive temporary splints (adhesive splints, AS) on the basis of the inorganic matrix with prepolymerized fibers (GrandTEC) were selected as prosthetic constructions.

In the control group B, we applied the temporary crowns for temporary splinting.

The choice of the AS was based on their wide popularity, due to the absence of the need for significant preparation of the dental tissue, as well as due to the one-stage procedure, relatively simple manufacturing, aesthetics, and AS repairability. The AS leave open the marginal edge of periodontium, thus facilitating the performance of the hygienic measures, conservative and surgical treatment of the GP [12, 13].

The choice of the temporary crowns for splinting was caused by stable fixation, redistribution of the masticatory pressure and equalization of the disturbed functional balance, in the same way as with the AS. However, the temporary crowns used for prosthetic treatment require significant preparation of the dental tissue, demonstrate a relative technological complexity, impossibility of treatment of retainer teeth without removing the construction, need for handling the interdental space, which complicates the entire range of the local therapy or surgical interference, impedes the hygienic care in full scope [14].

In the result of the study, we have established that the overwhelming number of the patients with the GP in general had a pronounced tissue sensitization to the bone antigen.

Thus, a pronounced tissue allergy to the bone antigen was observed in 61.05±5.7 % of the patients with the chronic GP. In the aggravated course of the GP, the LMIT with the bone antigen

allowed to establish a pronounced sensitization in 80.0±5.1 % of patients. We didn't observe the allergy to the bone antigen in practically healthy people (control group) (Table 1).

Table 1. Frequency of the tissue allergy to the bone antigen in patients with the GP of grade I to II

Group of patients under observation	Diagnosis	Tissue allergy to the bone antigen	
		number of patients observed	bone antigen LMIT
Active treatment group	GP, chronic progression	72	61.0±5.7; P<0.01
	GP, aggravated progression	60	80.0±5.1; P<0.01
Control group		30	0

Upon inclusion of a prosthetic component in the form of adhesive splints in the comprehensive treatment of patients with chronic progression (active treatment group A) for a period of 1 to 1.5 months, a pronounced tissue allergy to the bone antigen was found in 47.1±3.7 % of patients. At the same time, in the group of patients with temporary crowns with the same GP progression, a pronounced tissue allergy to the bone antigen after 1 to 1.5 months was observed in 52.9±3.6 % of cases. A similar trend was observed for the aggravated progression of the GP. Thus, upon applying the AS, a pronounced sensitization to the bone antigen was revealed in 72.1±2.5 % of patients within 1 to 1.5 months (active treatment group A), while in the group of patients with temporary crowning (active treatment group B), after the same period, a pronounced sensitization to the bone antigen was observed in 76.2±2.9 % of patients.

We believe that the use of the AS and temporary crowns as temporary prosthetic constructions within 1 to 1.5 months is not a sufficient temporary component to reduce the osteoclastic component of the dystrophic and destructive processes in the periodontal complex and does not substantially depend on the prosthetic construction selected.

When studying the indicators of the state of local immunity of patients with the GP in general, decreased indicators in the immunoglobulin of all classes was identified in comparison with the control group. Thus, while the level of 11SIg in the active treatment group was 1.12±0.05 g/l, this figure in the control group was significantly higher and reached 1.850±0.11 g/l. The amount of IgG in the active treatment group was lower than that in the control group, reaching 0.157±0.037 g/l and 0.201±0.038 g/l.

The IgM level was credibly lower in the active treatment group than that in the control group: 0.129±0.02 against 0.282±0.097, respectively.

In analyzing the local immunity indicators achieved within 1 to 1.5 months of prosthetic treatment in the framework of the comprehensive GP therapy, it was established that the inclusion of the AS as a temporary prosthetic construction in the comprehensive GP treatment was accompanied by an increased activity of all classes of the secretory immunity. However, such changes were credibly higher only in the aggravated progression of the GP and were in correlation with the prosthetic construction.

Thus, within the period of 1 to 1.5 months, the level of 11SIgA increased up to 1.750±0.13 g/l when the AS was included in the comprehensive GP treatment and up to 1.550±0.15 g/l when the temporary crowns were selected for temporary prosthetic splint. The same trend was maintained in relation to Ig, Class M and G (0.255±0.02 g/l when using the AS and 0.244±0.02 g/l when using the temporary crowns, correspondingly).

We believe that an increase in the secretory immunity indicators when including the prosthetic component in the comprehensive GP treatment for a period of 1 to 1.5 months depends more on the medicinal component. However, the AS, creating more comfortable conditions for making medical manipulations of both therapeutic and surgical nature as well as for the hygienic care can undoubtedly be considered more preferable than the temporary crowns. This postulate is completely consistent with the literature data.

The following was found in the result of the work performed:

1. High tissue sensitization to the bone antigen in generalized periodontitis, which objectively reflects the level of the osteoclasts process.

2. The absence of a decrease in the tissue allergy to the bone antigen within a period of 1 to 1.5 months when including the prosthetic component in the comprehensive generalized periodontitis treatment may indicate the insufficient time for adaptation to new occlusal relations.

3. An increase of the local immunity indicators on the basis of 11SIgA, 7SIgA, IgG and IgM data within 1 to 1.5 months is caused rather by the impact of medicinal treatment, than by introduction of the prosthetic treatment element.

4. We believe that the absence of a decrease in the tissue allergy to the bone antigen in the comprehensive GP treatment, including the prosthetic component, can not correct the failure in the

"friend" or "foe" recognition or normalize the distorted reaction to the antigenic load and requires additional inclusion of the specific methods, including the immunological component.

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