Immune Status of the Oral Cavity in Orthopedic Treatment

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ABSTRACT

The tasks of orthopedic dental treatment include not only the replacement of defects in the dentition or alveolar processes with prostheses, but also the prevention of their further destruction or recurrence of the disease. The prosthesis, therefore, is considered as a therapeutic agent, the reasonable use of which allows the implementation of therapeutic and preventive measures.

Keywords: orthopedic dental treatment

Introduction: The tasks of orthopedic dental treatment include not only the replacement of defects in the dentition or alveolar processes with prostheses, but also the prevention of their further destruction or recurrence of the disease. The prosthesis, therefore, is considered as a therapeutic agent, the reasonable use of which allows the implementation of therapeutic and preventive measures. Any prosthesis or orthopedic device made of various materials is, on the one hand, a therapeutic agent and, on the other hand, it can manifest itself as an undesirable (side) effect.

Recently, significant changes have occurred in the world dental practice, which caused the emergence of new methods for the treatment of dentoalveolar anomalies, and development and research related to the use of fixed orthodontic equipment began to occupy an increasing place [1, 2, 8]. To date, the factors of local immunity of the oral cavity, the nature of physiological and pathological processes that occur when using fixed orthodontic equipment have not been studied [3-5, 9].

Thus, the clinical and laboratory study of the dynamics of factors of local immunity of the oral cavity in the complex treatment of occlusion pathology, aimed at preventing complications, is timely and relevant.

Material and research methods:

We examined 75 people who applied for dental orthopedic care at the dental clinic of the Samara State Medical University, of which 35 were men and 40 were women aged 30 to 60 years, including the control group - 20 practically healthy people who did not use dentures and had all teeth. All patients were motivated to regular hygienic oral care and usually performed it using commercially available items and hygiene products of domestic and foreign production.

Dental examination before orthodontic treatment included the collection of complaints and anamnesis, examination, probing, percussion, etc. In addition, in order to clarify the causes of dentoalveolar anomalies, an X-ray examination (orthopantomography, teleroentgenography), the study of diagnostic models and clarification of the patient's habits were carried out.

All patients of the main group were divided into the following groups depending on the treatment:

group 1 (control) - 68 people, only professional

teeth cleaning and oral care training were carried out;

2nd group — 61 people in whom previous measures were supplemented with antibacterial therapy (Metrogyl Denta in courses of 7 days after the start of orthodontic treatment, 1, 3 months and 1 year after fixing fixed orthodontic equipment);

3rd group - 63 people who, in addition to the measures for the 2nd group, underwent correction of local immunity with the dietary supplement "Tinrostim" in courses of 7 days after the start of orthodontic treatment, 1, 3 months and 1 year after fixing fixed orthodontic equipment .

In all groups, laboratory studies were carried out before the start of orthodontic treatment, as well as after 7 days, 1 and 3 months from the moment of fixation of fixed equipment. The activity of lysozyme, the levels of secretory immunoglobulin A (sIgA) and interleukins- (IL-1b) and IL-4 were determined in mixed saliva. Saliva was obtained without stimulation by spitting into sterile test tubes.

When determining the activity of lysozyme, the method of O.V. Bukharin (1997) modified by P.G. Storozhuk et al. [7] was taken as a basis. The levels of cytokines and sIgA were determined by enzyme immunoassay using commercial kits "BioKhimMak" (Russia). The measurements were carried out using a V-500 vertical spectrophotometer (China).

Statistical processing of the obtained data was performed with the calculation of the arithmetic mean, the standard deviation, and the arithmetic mean error. The significance of differences between the two samples was assessed using Student's parametric test.

Research results and discussion:

7 days after the fixation of orthodontic equipment in saliva centrifugate, an increase in the content of IL, a decrease in the activity of lysozyme and the concentration of sIgA were determined, which indicated the effect of orthodontic treatment on local immunity.

In patients of the 1st group at this time, the activity of lysozyme (Fig. 1) became 2 times lower than the initial value. After 1 month, this indicator remained significantly lower (by 21%) than the value determined before the start of treatment. And finally, after 3 months, the activity of mixed saliva lysozyme in the 1st group returned to its original level. In patients of the 2nd group, 7 days after the fixation of orthodontic equipment, the activity of lysozyme decreased by 35%. After 1 and 3 months, this indicator in the group did not significantly differ from that before the start of treatment. In the 3rd group, before treatment and at all times after the fixation of orthodontic equipment, the activity of lysozyme remained at the same level.

In the 1st group, 7 days after the fixation of orthodontic equipment, the content of sIgA in saliva (Fig. 2) became 2.3 times lower than the initial value. After 1 month, this indicator remained significantly lower (by 38%) than the value determined before the start of treatment. Finally, after 3 months, the sIgA level of the mixed saliva returned to baseline. In the representatives of the 2nd group, 7 days after the fixation of orthodontic equipment, the content of sIgA in saliva became 46% lower than the initial one. After 1 month, this indicator returned to normal and did not undergo significant fluctuations in the future.

When studying such an indicator as the concentration of IL-1|3 and -4 in the oral fluid (Fig. 3), significant differences in values were revealed before fixing orthodontic equipment. Thus, the concentration of IL-1|3 was 3.27 ± 0.12 pg/ml, and the concentration of IL-4 was 2.5 ± 0.10 pg/ml. By 7 days after the start of treatment, the concentration of IL-1 was 5.1 ± 0.18 pg/ml, and the concentration of IL-4 was 2.4 ± 0.10 pg/ml. A month later, the concentration of IL-1|3 was 3.82 ± 0.14 pg/ml, and the concentration of IL-4 was 2.94 ± 0.12 pg/ml.

3 months after the start of treatment, the concentration of IL-1 was 4.12 ± 0.15 pg/ml, the concentration of IL-4 was 2.91 ± 0.12 pg/ml. One year after the start of treatment, the concentration of IL-1|3 was 3.09 ± 0.11 pg/ml, the concentration of IL-4 was 2.29 ± 0.10 pg/ml.

Thus, on the one hand, the study of the cytokine profile confirmed the presence of an inflammatory process in the oral cavity in

orthodontic patients, and on the other hand, the maximum effectiveness of the complex prescription of drug antibacterial therapy in combination with a non-drug increase in local immunity of the oral cavity in orthodontic patients with non-removable equipment.

Discussion of the obtained data. A change in such a stable indicator as the reaction of mixed saliva under the influence of orthodontic treatment indicates that very pronounced changes occur in the oral cavity associated with a violation of local defense mechanisms, which leads to the development of an inflammatory process [6]. Probably, in the first week after fixation of fixed equipment, an inflammatory reaction develops to preliminary professional cleaning of the teeth, changes in the consistency of food, and later on to the accumulation of soft dental plaque. In this case, there is an increased formation of products of protein metabolism, decay of plaque, bacteria of the gingival sulcus and epithelium of the oral cavity [4]. On the one hand, this leads to a decrease in the activity of lysozyme and the concentration of sIgA in saliva due to their active use under conditions of antigenic and bacterial load. On the other hand, under the influence of substances formed after fixation of fixed equipment, phagocytic cells are activated, which is reflected in an increase in their ability to synthesize and secrete IL-1b and -4. These cytokines activate cells of the immune system, which can lead to the attachment of the immune component of the inflammatory process at a later stage of the study. This may be accompanied by the proliferation of B and T cells, an increase in the expression of IL-2 receptors, induction of the expression of lymphokine genes, activation of endothelial cells, and induction of the expression of cyclooxygenase and lipoxygenase genes, which causes an acute phase response [1]. At the same time, this does not exclude a concomitant inflammatory process in other tissues of the oral cavity, which ensures an increase in the level of IL-1|3 [10].

It was shown that in patients of the 1st group, even 1 month after the fixation of orthodontic equipment, low values of lysozyme activity and sIgA concentration in mixed saliva remained, these indicators returned to normal only after 3 months. Cytokine levels remained elevated throughout the study period. Probably, a decrease in the tension of local protective factors, such as lysozyme and sIgA, contributes to the activation of the flora, which supports the activation of the macrophage system of the oral cavity with increased production of cytokines.

In patients who underwent a course of antimicrobial therapy in combination with non-drug correction based on the dietary supplement "Tinrostim", normalization of local immunity factors was observed already 7 days after the fixation of orthodontic structures. This was manifested by an increase in lysozyme activity and sIgA concentration, as well as a decrease in IL levels to baseline.

Thus, the use of a full range of preventive measures, including antimicrobial agents in combination with the correction of local immunity immediately after the start of orthodontic treatment with non-removable equipment, made it possible to accelerate the elimination of inflammation of the periodontal mucosa and restore the factors of immune protection of the oral cavity.

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