



Parameters of Humoral Immunity of the Oral Cavity in Patients Before the Start of Orthopedic Treatment

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Received 2nd Jan 2023,
Accepted 3rd Feb 2023,
Online 11th Mar 2023

Abstract: Relevance of the topic: As is known, oral fluid (RS) (saliva) containing a large number of substances with antimicrobial action: lysozyme, lactoferrin, immunoglobulins, antimicrobial peptides and other active substances is important in ensuring mucosal immunity of the oral cavity. The immunoglobulins contained in RYE (saliva), especially sIgA, prevent the adhesion of microorganisms, lysozyme destroys the walls of bacteria, and lactoferrin deprives bacteria of iron.

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Oral fluid contains components that determine its protective function – these are enzymes that make up complement systems, immunoglobulins. The composition of the oral fluid plays an important role in the functioning of not only the oral cavity, but also the body as a whole, being one of the indicators of homeostasis. Oral fluid is a substrate that has tremendous informative value, but its indicators are not always taken into account by clinicians.

The study of RV (saliva) is a valuable non-invasive method for assessing the general condition of the body and, in particular, the organs of the oral cavity. Collecting RYE (saliva) is convenient and simple, it is painless, the risk of infection of medical personnel is much less than when working with blood, and the content of certain substances in saliva (for example, hormones, antibodies, drugs, etc.) reflects their concentration in the blood. Modern technologies for the study of proteins in biological media make it possible to determine the levels of various immune indicators and their biological activity in RYE (saliva) and other secretions containing the studied proteins in minimal concentrations.

In connection with the above, it was of interest to study the state of humoral immunity parameters, as well as cytokine status, which were determined in the oral fluid of patients.

The study of the local immune status can expand the understanding of the state of the oral cavity after prosthetics, as well as provide an opportunity to review and use the data obtained for additional correction of orthopedic treatment.

To achieve this goal, according to the tasks, men and women from 20 to 70 years old who were in the Bukhgosmi clinic in the department of dentistry with a diagnosis of prosthetics were examined and 30 practically healthy people made up a control group.

Depending on the therapeutic and preventive measures, all patients were conditionally divided into three groups:

Group 1 (control) - 30 people, only professional teeth cleaning and oral care training were carried out;

Group 2 – 87 people who underwent metal-ceramic prosthetics;

Group 3 – 93 people who underwent zirconium prosthetics

In all groups, immunological studies were conducted before the start of orthopedic treatment, as well as 7 days, 1 month after the fixation of fixed equipment. Levels of sIgA, IgM, IgG, pro-inflammatory IL-1 β , IL-6, TNF- α and anti-inflammatory IL-10 cytokines were determined in the RV. The leading role in the system of local immunity of the mucous membranes is assigned to secretory IgA (sIgA), the main source of which is the parotid glands. sIgA is formed by the interaction of plasma cells synthesizing IgA and the secretory component, the synthesis of which is carried out by epithelial cells of the ducts of the salivary glands [2.4.6.8].

Secretory antibodies of the oral fluid are immunoglobulins of the IgA and IgM classes and are of local origin. They are produced by plasma cells located under the basement membrane in the connective tissue layer of the mucous membrane - in its own plate.

Analysis of the obtained data revealed that the content of immunoglobulins of all classes before treatment in patients in need of prosthetics were close to the indicators of control values. Thus, the sIgA level in the main group averaged 825 ± 8.80 mg/ml when in the comparison group its concentration was 780 ± 8.59 mg/ml ($P < 0.001$). The IgM concentration exceeded the values of the control group by 1.2 times (82 ± 2.71 mg/ml vs. 68 ± 1.31 , $P < 0.001$), as well as the IgG content differed from the control group by 1.5 times (56 ± 1.11 mg/ml vs. 37 ± 1.13 mg/ml, $P < 0.01$) (

The data obtained by us can be interpreted as follows. According to numerous studies, the ratio of immunoglobulins in the oral cavity is different than in the blood serum. If IgG is mainly present in human blood serum, and IgM is contained in small amounts, then the level of IgA in saliva can be 100 times higher than the concentration of IgG. At the same time, saliva contains much more sIgA than other immunoglobulins, so the ratio of IgA/IgG in saliva is 400 times higher than that in blood serum [1.3.5.7.9].

Therefore, in the absence of pronounced inflammatory processes in the oral cavity (periodontal disease of various degrees, gingivitis, stomatitis, etc.), the obtained indicators are absolutely appropriate.

The development of inflammatory diseases is determined by the state of cytokine regulation. Most of both pro- and anti-inflammatory cytokines are present not only in peripheral blood, but also in other body fluids. The sources of their production are both lymphocytes and macrophages embedded in the epithelium of the mucous membranes, as well as epithelial cells of the mucous membranes and the salivary glands themselves. Another source of cytokines in RV (saliva) may be their transudation from blood serum. However, many researchers have noted that the content of cytokines in RYE (saliva) does not correlate with their level in the blood, which indirectly indicates their local synthesis.

IL-1 (α and β) (IL-1) Producing cells are monocytes, macrophages, dendritic cells, endothelial cells, etc. Its active production is observed in inflammatory processes, tissue lesions. IL-1 participates in almost all stages of the immune response, promotes the activation of cells in the focus of inflammation, enhances the production of other cytokines, as well as prostaglandins, collagen and fibronectin synthesis, stimulates phagocytosis, generation of superoxide radicals, causes degranulation of mast cells. [10.12.14.16.18.20].

The immunological role of IL-1 β is to launch the first stages of the immune response, involving certain T-lymphocytes – T-helpers in the process. It stimulates the conversion of B-lymphocytes into

plasma cells, accelerates the formation of antibodies. The inflammatory role of IL-1 β is manifested by an increase in neutrophil motility, stimulation of cell activity in the focus of inflammation, and increased activity of other cytokines [11.13].

Analysis of the obtained data revealed that the content of IL-1 β before treatment in patients was relatively close to the control data. Thus, the level of IL-1 β in the main group averaged 7.5 ± 0.20 pg/ml when in the comparison group its concentration was 4.2 ± 0.26 pg/ml ($P < 0.001$).

It is known that the role of IL-6 in inflammation is closely related to IL-1 β and TNF- α . Cytokine producing cells are monocytes, macrophages, Th2 cells, bone marrow stromal cells, fibroblasts, hepatocytes, etc. IL-6 is an inducer of maturation of B cells into plasma cells, their production of antibodies. Cytokine is a powerful stimulator of the production of proteins of the acute phase of inflammation by liver cells. This proinflammatory cytokine is able to enhance the proliferation of endothelial cells []. After meeting with the antigen, specialized cells initially secrete IL-1 β and TNF- α , and only then IL-6 [21.22].

The data obtained indicate that the concentration of IL-6 in the general group of patients before the start of orthopedic treatment exceeded the values of the control group by more than 1.3 times (14.7 ± 0.46 pg/ml versus 11.8 ± 0.55 , pg/ml, $P < 0.001$), which indicates an already formed inflammatory focus in the oral cavity.

The next stage was to study the synthesis of tumor necrosis factor - α (TNF- α), which is a product of monocytes, macrophages, endothelial basophils, mast and myeloid cells, neuroglia cells and has a wide spectrum of biological action. This cytokine plays a role in the development of an inflammatory response: it initiates the synthesis of interleukin-1, interleukin-6, and also stimulates the proliferation of T- and B-lymphocytes [15.17.19.21.23].

As a rule, the content of TNF- α is not determined, or is at a low level in the blood serum of healthy donors, whereas with the development of the pathological process, its amount increases several times. Thus, the synthesis of TNF- α in patients in the general group before prosthetics averaged 12.3 pg/ml, when in the control group these values were equal to 9.4 pg/ml, which is 1.3 times more ($P < 0.001$).

In this study, the level of the important anti-inflammatory cytokine IL-10 in rye was studied. The main effect of IL-10 is anti-inflammatory. It is realized through the suppression of the activity of macrophages and T-lymphocytes, and also suppresses the production of all pro-inflammatory cytokines, interferon, and the proliferative response of T cells to antigens and mitogens [23.24]. Acting as a Th2-cytokine and due to its ability to suppress cytokine production in monocytes and Th1-lymphocytes and inhibit the antigen presenting ability of monocytes, IL-10 inhibits the cellular immune response, stimulating at the same time the proliferation of B-lymphocytes and humoral immune response [22].

Conclusion

When analyzing the data obtained as a result of the study, a significant increase in the level of IL-10 in the main observation group before orthopedic treatment was found to be 1.2 times (10.6 pg/ml versus 8.5 pg/ml) ($P < 0.01$). Thus, the data obtained by us on the humoral link of local immunity and the cytokine status of the oral cavity indicate a weakening of the local immune protection of the oral cavity associated with the need for prosthetics.

Thus, the level of IL-1 β decreased to 16.4 ± 0.74 pg/ml ($P < 0.001$), IL-6 to 28.7 ± 0.72 pg/ml (before treatment 14.7 ± 0.46 pg/ml) ($P < 0.001$), TNF- α - 24.5 ± 1.03 pg/ml (before treatment 12.3 ± 0.32 pg/ml) ($P < 0.001$), IL-10 - 15.3 ± 0.65 pg/ml (before treatment 10.6 ± 0.32 pg/ml) ($P < 0.001$).

Thus, based on the conducted studies, it can be stated that the established cytokine imbalance in the RV indicates an increase in the antigenic load and an increase in the permeability of the oral mucosa as a result of the traumatic genesis of the prosthetic bed and as a consequence of the developed inflammatory process.

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