SÉRIE "Medicína"

https://doi.org/10.52058/2695-1592-2022-9(16)-432-438

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MODERN VIEWS ON THE TONSILLAR PROBLEM

Abstract. This work presents analysis of modern scientific literature on determination of the function of tonsils of Waldeyer's ring (pharyngeal lymphoid tissue ring) and their role in the establishment and functioning of the local and humoral immunity in human organism.

Tonsils are the «first line of defense» courtesy of the factors on nonspecific protection of the mucous membranes of upper air passages. Characteristic are for these factors: diverse action mechanisms; they have typically antifungal, antibacterial action, which was noted in the factors of the system of non-specific secretory lipoprotease inhibitors, elafins and lactoferrins.

Differential immunodiagnostics between some pathological conditions of these structures can be carried out by way of determination of modern noninvasive methods of study of the immune factors, such as determination of cytokines, protective proteins, allergy, oropharyngeal secretion, reaginic antibodies; as well as for the assessment of provided treatment efficacy.

Bearing in mind the obtained data of the analysis of literature sources it can be said, that even under the conditions of a chronic inflammation the Waldeyer's ring tonsils have a marked immunological effect owing to cytokines, cells-regulators and effector cell. Because even under such conditions they can produce polypeptides that have the regulatory and antitumoral capacity. The results of the studied literature sources indicate of the posed problem. Thus, as the active components of the local and systemic immunity the Waldeyer's ring tonsils must be maximally preserved except cases when they serve as the permanent source of infection with irreversible changes and negative effect on the associated organs.

Keywords: palatine tonsils, mouth mucosa, lymphoid tissue, immunity, tonsillitis.



Introduction. This work presents analysis of modern scientific literature on determination of the function of tonsils of Waldeyer's ring (pharyngeal lymphoid tissue ring) and their role in the establishment and functioning of the local and humoral immunity in human organism. The analysis was carried out of scientific publications that most completely reflected modern views on the state of this issue, examined with a magnifying glass of history. As of today, the issue of choosing disease management of patients with tonsils diseases still remains a pressing problem owing to the frequent irrational approaches.

Analysis of research and publications. Many domestic and international experts are engaged in the study of tonsillar problems in an interdisciplinary dimension.

Purpose of the article. To carry out analysis of scientific literature by way of comparing modern views on that issue and the experience of the past.

Presentation of the main material. Tonsillar problem is very common in the world, and the presence of metatonsillar complications makes this pathology relevant not only for otolaryngologists, but also for other specialties. Therefore, knowledge of the functions of the tonsils of the lymphopharyngeal ring and the results of new scientific research on this issue will allow a better understanding of their role in the formation and functioning of local and systemic humoral immunity in the human body. Thus, errors in the diagnosis and treatment of tonsil diseases can be avoided.

It must be remembered that aside from the tonsils lymphoepithelial formations include also the Peyer's glands, solitary follicles, appendix, that in their totality make up the lymphoepithelial complex - lymphpoid tissue associated with the mucous membrane. There is a phenomenon of the «mucous membranes' solidarity», acknowledged as far back as in the late 70's, the so-called concept of systemic immunity of the mucous membranes (MM), that is: wherever a contact of the organism with the antigen has taken place, information about it is transmitted to all units of the immune system of MM. Some authors discovered that the palatine tonsils are reservoir and replication sites of HIV. So, it is still controversial whether tonsillectomy is of general benefit [1, 2].

As the Waldeyer's ring tonsils are located on the boundary of the external and internal mediums and serve as the portal of entry for the microbial agents thus ensuring a contact between antigens and lymphocytes and the formation of lymphoid cell clones in the tonsils' tissue that are specific with respect to this antigen. Accordingly, lymphoid formations of the pharynx inform further on structures of the immune system: bone marrow, spleen, lymph nodes. The particularity of the Waldeyer's ring tonsils allows antigens – cutting off the immune response – produce a direct effect on the tonsils' tissues [3].

As the Waldeyer's ring tonsils play the role of the «portal of entry» of infection, when they accomplish the adaptive functions the mechanisms of antimicrobial protection can be impaired, which results in the development of a local



infectious inflammatory process [4]. As it is known, the MM area of only one tonsil is three times as large as the MM of the pharynx, and that is why owing to the high intensity of antigenic irritation there occurs formation of the immune reaction (of primary or secondary type) and migration of the formed immunocytes into the MM or salivary glands. The local immunity of the oropharynx is ensured with the aid of all specific reactions of the organism, nonspecific protective factors of the MM together with the complement system, system of mononuclear phagocytes, interferons and lisocyme [5].

The Waldeyer's ring tonsils fulfill also the function of immunologic protection of the organism - from regulation of the mast cell infiltration into the MM of upper air passages (UAP) to the formation of highly specific virus and microbial agents antibodies of predominantly class A. Thus, they appear to be the «agency of information» on the antigen composition of the environment, in the result of which there takes place production of the antibodies and formation of the «immune memory cells» [6].

The tonsils can form immunoglobulines of all known classes, which has been proved by numerous studies using methods of functional morphology, determination of cells-antibody producers in the tonsils of humans and animals and synthesis in the cells cultures of virus and microbial agents antibodies in vitro [7]. Under normal conditions the Waldeyer's ring tonsils produce little effect on the level of antibody production in the organism. This is observed also in the presence of inflammatory processes – when on the level of some immunoglobulines of A and M classes and titers of streptococcus and staphylococcus antigens specific antibodies can fluctuate considerably [8]. Based on the conducted studies in case of a chronic inflammation of the Waldeyer's ring structures it was established, that the processes of formation of antibody producers of various classes in the zone of secondary follicles take place at a weaker pace. This process can be connected with the impairment of functionalstructural links between stroma, lymphoid and epithelial tissues and cells and serve as the indication of detecting development of local adrenal insufficiency [9].

In the studies of the role of organism allergization in the result of pathological conditions of the Waldeyer's ring structures quite a number of scientists arrived at the notion that it is possible to run differential immunodiagnostics between some pathological conditions of the Waldeyer's ring structures trough application of modern noninvasive methods of immunity factor studies, such as determination of cytokines, immune proteins, allergy, oropharyngeal secretion (OS), reaginic antibodies (IgE, IgG4) [10].

Increasing attention is paid by modern scientists to the issues of determination of biologically active substances in the OS, as this provides the opportunity to run diagnostics, predict and assess the efficacy of treatment of patients with various pathological conditions [11]. Some of them are of the opinion that the important component of OS are: proteins, proteolytic enzymes and their inhibitors that play a



significant role in the allergic and inflammatory reactions of the organism [12]. Thus, there has been determined presence of thymic hormones in the tonsils, though they disappeared after some time. Therefore, the tonsils have only the accumulative capacity and, similarly to other immunity systems, have no ability for their formation. There were also separated from the tonsils tissues protein substances similar by the character of action to the hormones separated from the thymus gland, however these factors did not have a restorative antibody response [13]. A significant role in pathogenesis of inflammatory and allergic diseases occupies determination of the effect of PS proteinases.

Determining activity indices of proteolytic enzymes and content of χ_1 -inhibitor of proteinases in OS in patients with UAP diseases found, that this method can be considered a valuable noninvasive method of assessment of the condition of such patients and efficacy of provided treatment [14].

Besides, tonsils of Waldeyer's ring can form both, primary and secondary levels of protection, as practically all types of interleukins, interferons, lymphotoxin, tumour necrosis factor, platelet-derived growth factor are separated from the tonsils' tissues. There was also determined a range of cytokines that have as a factor of inhibiting microphages and leucocytes – MIF and LIF, transfer-factor, that can delay hypersensitivity to antigens and enhance antigen response [15].

The theory prevails that tonsils of Waldeyer's ring play an important role in the processes of organism adaptation, namely: a small number of microbial agents filter through the tonsils, causing «physiological anginization» of the organism that takes place on the boundary of health and pathology. Dialyzable factor was found in patients with recurrent tonsillitis, that owing to the transfer factor properties was able to direct differentiation of stem cells towards the series of lymphoid cells. The processes of differentiation of stem cells into cells of the recipient's organism and production of trophic factor can take place through activation and differentiation of stem cells in various pathologic processes there was observed a manifested clinical effect, yet after some time the number of transplant cells was insignificant [11].

While conducting comparative analysis of morphological condition of the OS of UAP of the laboratory mice after application of mesenchymal multipotent stromal cells of human umbilical cord, some authors, detected activation of the reparative processes, structural and functional MM restoration against the background of atrophic infection genesis process, which testifies to the possibility of using these cells for treatment of atrophies of the MM of UAP. This is why it is expedient to continue studies in this direction [16].

The process of lymphopoiesis that earlier was identified as a separate function of the tonsils lies in the multiplication of T- and B-lymphocytes that come from the central organs, and in the formation of lymphocytes out of their predecessors and their specialization into effector cells. This being said, a part of lymphocytes formed



at that make their way into the systemic blood, while the other part migrates through the epithelial lining [17, 19].

Thus, tonsils, so to say, are the «first line of defense» courtesy of the factors on nonspecific protection of the MM of UAP. Characteristic are for these factors: diverse action mechanisms; they have typically antifungal, antibacterial action, which was noted in the factors of the system of non-specific secretory lipoprotease inhibitors, elafins and lactoferrins [20].

The Waldeyer's ring tonsils perform also the receptor function, characteristic of them is pain, thermal, touch sensitivity. Thus, tonsils can not only perceive the nervous impulses, but they can be the source of impulsation for other organs, for they contain similar to microganglions autonomic fibers, receptor endings, nervous cells and their clusters.

In some works authors discovered, that in 80% of patients after the acute tonsillitis the period of convalescence goes against the background of intestinal dysbacteriosis. Thus, the idea was confirmed of influence of the condition of intestinal eubiosis on the formation of chronic (recurrent) tonsillitis [21].

When studying the role of Helicobacter Pylori in the development of tonsil infection, its correlation was evaluated in tonsil tissues of patients with tonsillitis and non-infectious hyperplastic tonsils. Despite the fact that the colonization of H. Pylori contributes to the emergence of many painful conditions, the studies conducted did not confirm that this bacterium plays a role in the pathogenesis or development of tonsillitis [22].

Conclusions. Bearing in mind the obtained data of the analysis of literature sources it can be said, that even under the conditions of a chronic inflammation the Waldeyer's ring tonsils have a marked immunological effect owing to cytokines, cells-regulators and effector cell. Because even under such conditions they can produce polypeptides that have the regulatory and antitumoral capacity. Thus, as the active components of the local and systemic immunity the Waldeyer's ring tonsils must be maximally preserved. The results of the studied literature sources indicate of the posed problem: to carry out analysis of scientific literature by way of comparing modern views on that issue and the experience of the past.

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Vydavatel: Mezinárodní Ekonomický Institut s.r.o. , Česká republika International Economic Institute s.r.o. Praha, České republika

Magazín

Věda a perspektivy

Nº 9(16) 2022

Podepsáno k tisku ze dne 23. září 2022 Formát 60x90/8. Ofsetový papír a tisk Headset Times New Roman. Mysl. tisk. oblouk. 8.2. Náklad 100 kopií.