MODERN MEDICINE AND PRACTICE
http://inovatus.es/index.php/ejmmp
EUROPEAN JOURNAL OF MODERN MEDICINE AND PRACTICE
Vol. 2 No. 11 (Nov - 2022) EJMMP ISSN: 2795-921X

FUNDAMENTALS OF IMMUNOPATHOGENESIS AND PATHOPHYSIOLOGY OF EXUDATIVE OTITIS MEDIA

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Annotation: According to statistics, ear diseases occupy the second place in the structure of general otorhinolaryngological pathology, second only to diseases of the nose and paranasal sinuses. Most ear diseases are accompanied by the development of various types of hearing loss, which worries the patient not only in the acute period of the disease, but also becomes chronic. The social significance of the treatment of this pathology is given by the fact that more than half of all patients with hearing loss are of working age.

Key words: exudative otitis media, neoplasms of the nose, paranasal sinuses and nasopharynx, complex treatment, local immunocorrection.

Exudative otitis media (EOM) is a common inflammatory disease of the middle ear, characterized by the accumulation of serous-mucous fluid in the cavity behind the tympanic membrane [2; 5;8]. According to the literature, EOM is most common in children [1; 10; 13]. However, recent data indicate an increase in the incidence of EOM in the structure of adult pathology of otorhinolaryngology [3; 16; 21].

For decades, many studies have been devoted to describing the mechanisms of development of exudative otitis media. In one of these studies, conducted in 1878 by A. Politzer, a theory was put forward - "hydrops ex vacuo", according to which the reason for the development of EOM lies in the factors leading to negative pressure in the middle ear [24]. Also, the formation of secretion in the tympanic cavity is a consequence of inflammatory processes in the mucous membrane of the middle ear and occurs under the

influence of a number of factors [9; 17]. These theories of EOM development reflect part of the links of a single pathological process of development of chronic inflammation of the middle ear [6;10; 18].

The transition of the inflammatory process from the nasopharynx to the pharyngeal opening is accompanied by the spread of the inflammatory process and the development of dysfunction of the auditory tube, which is accompanied by a violation of the outflow from the middle ear [2; 4; 7]. This creates a negative pressure and increases the content of carbon dioxide in the tympanic cavity. As a result, an exudate is formed in the tympanic cavity, followed by the addition of bacteria from the nasopharynx [19; 23; 25; 28]. In addition, the violation of the function of ventilation and drainage of the Eustachian tube, caused by an imbalance between the mechanism of opening and closing of the Eustachian tube, also contributes to the invasion of microorganisms in the tympanic cavity. Increased exudation leads to an increase in the intensity of blood flow, squeezing of the veins and impaired drainage. Exudate, as a component of the inflammatory reaction, reduces the concentration of toxins and incoming blood serum antibodies promote phagocytosis, which is supported by the inflammatory reaction and stimulation of the release of leukocytes in the focus of inflammation [20; 27; 33].

The structure of the healthy mucous layer of the middle ear is dominated by basal cells, non-ciliated cells with secretory granules, and, to a small extent, ciliated cells with and without secretory granules. Moreover, the main role in the nonspecific protection of the middle ear cavity falls on the auditory tube [11; 12; 18]. Thanks to the produced mucus and the mobility of cilia, mucociliary transport is realized, which is an effective mechanism for protecting the middle ear cavity [1; 18; 31].

The inflammatory process in the middle ear cavity usually does not pass to the mucous membrane during EOM. A characteristic pathological picture is expressed in edema, capillary hyperemia and leukocyte infiltration of the mucous membrane. In addition, a slightly increased number of goblet cells is observed in the epithelial layer, due to which the exudate includes a certain amount of mucus. Scientists believe that it is the combination of such changes that leads to severe hyperplasia of the mucous membrane of the middle ear. The auditory ossicles, with accumulated exudate, lose their mobility, which, together with inflammatory changes, leads to a significant impairment of the auditory function. Perforation and development of transmeatal otorrhea is the result of an increase in the volume of exudate in the middle ear. This causes an increase in pressure on the eardrum, which can lead to microcirculation disorders, including trophic and necrotic changes [1; 18; 22; 26].

The immunological element of the study of middle ear diseases, in particular EOM, takes center stage as the most important component. The immunological response is a synergistic interaction between the humoral and cellular responses of the immune system to antigenic stimulation. Immunoglobulins of various classes produced by immunocompetent B-lymphocyte cells are characteristic signs of a humoral response.

In cellular immunity, T-lymphocytes are of critical importance, and their subpopulations, such as killer cells, helper cells, and immunological memory cells, are divided on the basis of their mode of action and participation in immunity. Cytotoxic T-lymphocytes of T-helper cells can cause lysis of target cell membranes. Under the influence of T-helpers, B-lymphocytes take part in proliferation and differentiation upon activation of antigens [27; 31].

"Local immunity" as a term is a set of protective adaptations and serves to protect the body from the external environment and is specific to the mucous membranes and skin of the body. This complex also includes non-specific defense mechanisms. These mechanisms include the mucociliary system and the synthesis of active proteins such as properdin and interferon [1; 27; 33]. This type of local immunity is usually defined by modern immunology as specific reactions to local lymphoid tissue, such as lymphoid and plasma cell infiltrates and localized accumulations of varying density in mucoid tissue [31].

Studies of the morphology, histology and immunomorphology of the middle ear mucosa have supported and refined the idea of immune protection of the middle ear, which was originally based on the detection of exudates in various types of otitis media. The mucociliary system of the mucous membrane of the middle ear is considered as one of the manifestations of the synergy of specialized and nonspecific defense mechanisms [27; 29].

In order to describe the immunopathogenesis of EOM, it is currently proposed to distinguish types of immune damage based on four types of immunopathological reactions. If there is an increased concentration of IgE in the secretion of the middle ear, then immediate type hypersensitivity, also known as type-I, can be assumed. Cytotoxic reactions may be observed in patients with tympanosclerosis (type II). The presence of immune complexes in the exudate of secretory otitis media indicates that the synthesis of immune complexes occurred in the presence of type III complement. The presence of a significant number of T cells in the mucoid exudate diagnoses delayed-type hypersensitivity (type IV) [30; 32].

According to this interpretation, the hypersensitivity hypothesis distinguishes between a specific immune stage and a non-specific inflammatory stage of immune inflammation. The development of the immune response occurs simultaneously with the work of tissue resistance mechanisms that are not specific to this tissue. This special form of immune response is associated with the production of secretory antibodies that are responsible for the protective effect of epithelial secretions [29]. Laboratory analyzes of exudate from the middle ear during EOM showed the presence of secretory immunoglobulins. Finding antibody-producing cells in the lymphoid-plasmic infiltrate of the plate [29; 30] confirms the hypothesis that the middle ear mucosa is responsible for the production of immunoglobulins at the local level.

It is widely known that an inflammatory disease that occurs in the cavity of the middle ear is characterized by the accumulation of exudate, consisting of soluble and insoluble components. Soluble components are similar to blood serum, while insoluble components consist of carbohydrate glycoproteins that are associated with proteins and are similar to mucins. The exudate may also contain various inflammatory cells that are involved in the middle ear's immune defense against infection. These cells include leukocytes, lymphocytes and monocytes; various oxidative and hydrolytic enzymes of lysosomal origin; complement and its fractions; inflammatory mediators, proteinase inhibitors, including antibacterial and antiviral antibodies - immunoglobulins [14].

Neutrophils, monocytes, macrophages, and lymphocytes are the most common types of inflammatory cells found in the middle ear exudate of patients diagnosed with EOM [29]. Eosinophilic leukocytes are less common in individuals with EOM. The revealed variations in the cellular composition indicate that EOM is an active process, which is characterized by changes in the cellular composition of the exudate, varying depending on the phase of inflammation. The presence of exudate indicates either a proliferative phase or a chronic course of the disease. Changes in the proportion of inflammatory cells present in the exudate during EOM have been associated with immunological processes that affect the nature and progression of the inflammatory process [32; 33].

All the information presented indicates an increase in the specific and nonspecific resistance of the mucous membrane and its epithelial cover in the middle ear and auditory tube. As a result of EOM, the number of secreting cells in the mucosal epithelium sharply increases, the capillary network increases, the enzymatic and immunological activity of the integumentary epithelium and lymphoid cells increases, and cell proliferation in the subepithelial layer sharply increases [15; 35].

The presence of immunoglobulins in the exudate of the middle ear, the concentration of which is much higher than in the blood serum, is another indicator of the correct functioning of the local immune system. The concentration of immunoglobulins in the exudate of the middle ear is significantly higher than in the blood serum. In patients with EOM, the level of specific immunoglobulins, primarily IgA, increases, while

the level of IgM and IgE remains stable. The duration of disease in a patient correlates with an increase in the likelihood of detecting IgA in exudate from the middle ear. In addition, there is a correlation between an increase in the viscosity of the secretion and an increase in the frequency of IgA [32; 33].

Studies of the morphology, histochemistry and immunology of the middle ear mucosa confirm the presence of immune defense mechanisms in this area. The mucociliary system of the mucous membrane of the middle ear is the location of specific and non-specific protective mechanisms that are responsible for the manifestation of local immunity [27; 29; 30].

According to the results of a review of the relevant literature, the immunopathogenesis of EOM is not yet fully understood and requires further research. In order to find a solution to this problem, it is necessary to conduct a study of local immunopathological processes occurring at the level of the mucous membrane of the middle ear.

References

1. Baike E. V., Baike E. E. Modern ideas about the pathogenesis of chronic suppurative otitis media // Trans-Baikal Medical Bulletin - 2015. - No. 1. - P. 161-167.
2. Garov E. V. Chronic suppurative otitis media: terminology, diagnosis and treatment tactics. RMJ, (2011). 19(6), 390-393.
3. Grushina T.I., Melnikova E.A., Mirkhaidarova Z.M. Acupuncture (acupuncture) in adult patients with exudative otitis media // Physiotherapy, balneology and rehabilitation. 2018. №2. - p. 86-91.
4. Gurov A.V. Features of antibacterial therapy of acute purulent sinusitis and acute purulent otitis media // Medical Advisor. - 2018. - No. 6. - p. 78-82.
5. Nikiforova G.N. Exudative otitis media - modern approaches in conservative treatment // Clinical otiatry and methods of surgical rehabilitation of patients with hearing loss. – 2012 – p.31-32.
6. Zhumabaev R.B. Review of methods for the treatment of exudative otitis media in world practice // Bulletin of the AGIUV. - 2016.- №2. - P. 6-12.
7. Zaitseva O.V. Hearing loss in acute respiratory infections // MS. - 2018. - No. 20. - p. 30-34.
8. Kokorina V.E. Influence of concomitant gastroesophageal reflux disease on the course of diseases of the middle ear cavity and auditory tube // Far Eastern Medical Journal. - 2010. - No. 2. - p. 63-66.
9. Kunelskaya N.L., Yanyushkina E.S. Clinical and audiological patterns of development of the secretory stage of exudative otitis media // Russian otorhinolaryngology. Application. - 2010. - No. 2. - p. 181184.
10. Magomedov M.M., Nikitkin A.Yu., Levina Yu.V., Krasyuk A.A., Utesheva V.A. Exudative otitis media. Modern concepts and relevance of the problem // Bulletin of otorhinolaryngology. - 2012. - No. 5. - P.93-97.
11. Preobrazhenskaya, Yu. S., & Drozdova, M. V. (2014). Features of the treatment of patients with pathology of the lymphoepithelial pharyngeal ring, complicated by the development of exudative otitis media. Russian otorhinolaryngology, (3 (70)), 89-96.
12. Preobrazhenskaya, Yu. S., & Drozdova, M. V. (2018). Predisposing factors to the development of exudative otitis media in children with cochlear implantation. Russian otorhinolaryngology, (4 (95)), 84-88.
13. Ryazantsev S. V., Preobrazhenskaya Yu. S., Drozdova M. V. Features of otitis media in children at the present stage // MS. - 2017. - No. 16. - p. 84-87.

14. Salikov A.V. Exudative otitis media: functional and morphological changes in the nasopharynx and tympanic cavity, improvement of methods for their correction: Abstract of the dissertation of a candidate of medical sciences: 14.01.03; Kursk State Medical University of Roszdrav. - St. Petersburg, 2010.
15. Shcherbik N.V., Konushkin V.A., Starokha A.V., Litvak M.M. Ultrasound examination in assessing shunt patency after tympanostomy in exudative otitis media. Bulletin of Siberian Medicine. - 2014. - No. 1. - p. 129-134.
16. Yakovlev, V. N., Kunelskaya, N. L., & Yanyushkina, E. S. (2010). Exudative otitis media. Bulletin of Otorhinolaryngology, (6), 77-80.
17. Yanyushkina Elena Sergeevna. Conservative treatment of the secretory stage of exudative otitis media: Abstract of the dissertation of a candidate of medical sciences: 14.01.03; Moscow Scientific and Practical Center of Otorhinolaryngology. – Moscow, 2010
18. Coticchia, J. M., Chen, M., Sachdeva, L., & Mutchnick, S. (2013). New paradigms in the pathogenesis of otitis media in children. Frontiers in pediatrics, 1, 52.
19. Klein, J. O. (2015). Otitis externa, otitis media, and mastoiditis. Mandell, Douglas, and Bennett's principles and practice of infectious diseases, 767.
20. Lack, G., Caulfield, H., & Penagos, M. (2011). The link between otitis media with effusion and allergy: a potential role for intranasal corticosteroids. Pediatric allergy and immunology, 22(3), 258-266.
21. Leskinen, K., &Jero, J. (2005). Acute complications of otitis media in adults. Clinical Otolaryngology, 30(6), 511-516.
22. Nemade, S. V., Shinde, K. J., Rangankar, V. P., &Bhole, P. (2018). Evaluation and significance of Eustachian tube angles and pretympanic diameter in HRCT temporal bone of patients with chronic otitis media. World journal of otorhinolaryngology-head and neck surgery, 4(4), 240-245.
23. Parmar SM, Sood A, Chakkal HS. Prevalence of chronic suppurative otitis media in schoolgoing children. Indian Journal of Otology. 2018 Oct 1;24(4):223.
24. Politzer, A. (1878). Lehrbuch der Ohrenheilkunde, p. 298. Ferdinand Enke, Stuttgart.
25. Roshchektaeva, Y.U. The clinical and epidemiological characteristics of exudative otitis media in the child population of the city of Almaty. //Vestnikotorinolaringologii. 2014; (6): 43-46.
26. Sharma, V. K., Prajapati, N., Sharma, R., Iqbal, Z., &Dadoo, S. (2017). Radiological changes in anatomy of temporal bone in cases of unsafe chronic suppurative otitis media: A retrospective study. Indian Journal of Otology, 23(3), 176.
27. Sharma, S. K., &Pichichero, M. E. (2013). Cellular immune response in young children accounts for recurrent acute otitis media. Current allergy and asthma reports, 13(5), 495-500.
28. Yorgancilar, E., Yildirim, M., Gun, R., Meric, F., & Topcu, I. (2012). Congenital os vomer agenesis: case report and literature review. Ear, Nose & Throat Journal, 91(4), 164-171.
29. Vancikova, Z. (2002). Mucosal immunity-basic principles, ontogeny, cystic fibrosis and mucosal vaccination. Current Drug Targets-Immune, Endocrine & Metabolic Disorders, 2(1), 83-95.
30. Veenhoven, R., Rijkers, G., Schilder, A., Adelmeijer, J., Uiterwaal, C., Kuis, W., & Sanders, E. (2004). Immunoglobulins in otitis-prone children. Pediatric research, 55(1), 159-162.

31. Woodbridge, N. T., Baines, E. A., & Baines, S. J. (2012). Otitis media in five cats associated with soft palate abnormalities. Veterinary Record, 171(5), 124-125.
32. Wang, B., Tang, X., Xu, J., & Yao, H. (2012). Differential expression of Immunoglobulin A in the adenoids of children with and without exudative otitis media. International journal of pediatric otorhinolaryngology, 76(5), 728-730.
33. Zakaletz, L. O. (2010). Immunopathogenesis of polymicrobial otitis media. Journal of leukocyte biology, 87(2), 213-222.
34. Zelazowska-Rutkowska, B., Ilendo, E., Skotnicka, B., Wysocka, J., & Kasprzycka, E. (2012). Production of cytokines by mononuclear cells of hypertrophic adenoids in children with otitis media with effusion. Folia histochemica et cytobiologica, 50(4), 586-589.
35. Zhang, Y., Xu, M., Zhang, J., Zeng, L., Wang, Y., & Zheng, Q. Y. (2014). Risk factors for chronic and recurrent otitis media–a meta-analysis. PLoS One, 9(1), e86397.