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THE IMPORTANCE OF INTERLEUKINS IN THE REHABILITATION OF BRONCHIAL ASTHMA

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Abstract
Bronchial asthma (BA) is a chronic inflammatory disease of the respiratory tract characterized by bronchial hyperreactivity and reversible obstruction. Interleukins (IL) and cytokines that mediate immune and inflammatory processes play a key role in the pathogenesis of asthma. Rehabilitation of patients with asthma is aimed at reducing the severity of symptoms, improving the quality of life and reducing the frequency of exacerbations. Understanding the role of IL in the pathogenesis of asthma is necessary to develop effective rehabilitation strategies. Various IL are involved in a complex cascade of inflammatory reactions in asthma. IL-4, IL-5, and IL-13 produced by Th2 lymphocytes play an important role in the development of allergic inflammation by stimulating IgE production, eosinophil activation, and mucus hyperproduction. IL-17 produced by Th17 lymphocytes promotes neutrophilic inflammation and airway remodeling. IL-10, which has immunosuppressive properties, can have a protective effect, reducing the severity of the inflammatory reaction.

Keywords: Bronchial asthma, leukocytes, eosinophil, diagnosis, relapse, interleukin, inflammatory reactions.

Introduction

Bronchial asthma is a chronic inflammatory disease of the respiratory tract characterized by recurrent attacks of suffocation, coughing and wheezing. Asthma is based on bronchial hyperreactivity, that is, their hypersensitivity to various stimuli. Inflammation in the bronchi leads to narrowing of the respiratory tract, swelling of the mucous membrane and increased mucus production. These factors combine to obstruct the normal flow of air, causing the characteristic symptoms of asthma. The development of bronchial asthma is caused by a complex interaction of genetic and environmental factors. The main provoking factors include allergens (plant pollen,

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house dust, animal hair), respiratory tract infections, tobacco smoke, air pollution, physical exertion and emotional stress. The diagnosis of bronchial asthma is based on an assessment of the clinical picture, physical examination data and the results of functional research methods such as spirometry. Spirometry allows you to estimate the volume and speed of exhaled air, which helps to identify airway obstruction.Treatment of bronchial asthma is aimed at controlling symptoms, preventing exacerbations and improving the patient's quality of life. The basis of drug therapy consists of bronchodilators (dilating bronchi) and inhaled glucocorticosteroids (reducing inflammation). In some cases, other drugs may be used, such as leukotriene receptor antagonists and monoclonal antibodies. [1,3,9,10].

Modern rehabilitation programs for patients with asthma include various methods aimed at reducing inflammation, improving bronchial patency, and increasing exercise tolerance. The effect of these methods on the level of sludge and their activity may explain their clinical effectiveness. For example, physical exercise can help reduce the level of proinflammatory IL and increase the level of IL-10. Prospects for the Use of Interleukins in the Rehabilitation of asthma. In the future, the development of new rehabilitation strategies aimed at modulating IL activity may open up new possibilities for the treatment of asthma. For example, the use of biological drugs that block specific IL or their receptors can be an effective complement to traditional rehabilitation methods. Further research is needed to determine the optimal approaches to the use of IL in the rehabilitation of patients with asthma. Interleukins (IL) are a large group of cytokines that play a key role in regulating the immune system and inflammatory processes, including in children with bronchial asthma (BA). Their importance in the pathogenesis of asthma has been well studied, and understanding their role may be important for developing new approaches to rehabilitation. [1,3,9].

The role of interleukins in the pathogenesis of bronchial asthma in children: In asthma, there is an imbalance in the production of various interleukins, which leads to chronic inflammation of the respiratory tract, bronchial hyperreactivity and other characteristic signs of the disease. The main interleukins involved in the pathogenesis of asthma: IL-4, IL-5, IL-13: These interleukins produced by Th2 lymphocytes play a central role in the development of allergic inflammation in asthma. They promote IgE production, eosinophil activation, mucus hypersecretion, and respiratory tract remodeling. IL-17: This interleukin produced by Th17 lymphocytes is also involved in the inflammatory process in asthma, especially in non-allergic forms of the disease and in exacerbations caused by infections. IL-10: This interleukin has an anti-inflammatory effect and plays an important role in suppressing an excessive immune response. In asthma, there is often a violation of IL-10 production, which contributes to increased inflammation. [1,3,7,12,13,15].

To date, the direct use of interleukins for the rehabilitation of asthma in children is not a standard practice. However, understanding the role of these cytokines can be useful in the following aspects: Assessment of the effectiveness of rehabilitation measures: Changes in the levels of certain interleukins during rehabilitation can serve as an additional marker reflecting the dynamics of the inflammatory process and the effectiveness of measures (for example, physical therapy, environmental control). Development of new therapeutic approaches: Further study of the role of specific interleukins may contribute to the development of new drugs aimed at modulating their activity. For example, biological drugs that block the action of IL-5 or IL-4/IL-13 currently exist and are used in severe asthma. Although these medications are not part of standard rehabilitation,

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they can be prescribed to some children with severe uncontrolled asthma to improve disease control and reduce the need for other medications, which indirectly improves the quality of life and opportunities for physical activity. [1,3,7,12].

A personalized approach to rehabilitation: Determining the cytokine profile of a particular child can help to better understand the mechanisms of his asthma development and select the most effective rehabilitation measures aimed at correcting the identified immune disorders. However, this approach is still under research. Currently, the main methods of ASTHMA rehabilitation in children are aimed at education, trigger control, drug therapy (mainly inhaled corticosteroids), physical activity and psychological support. Changing interleukin levels is a complex process that depends on many factors, and their clinical significance in the context of routine rehabilitation requires further research. [1,3,9,15].

Thus, although interleukins play a fundamental role in the pathogenesis of bronchial asthma in children, their direct use in modern rehabilitation programs is still limited. However, further research in this area may contribute to the development of more personalized and effective approaches to the management of this common disease. Modern principles of rehabilitation of bronchial asthma in children include an integrated approach aimed at improving disease control, reducing the frequency and severity of exacerbations, and improving the quality of life and physical activity of the child. Key aspects of modern rehabilitation include: Education and awareness: Education of the child and parents: Providing complete information about asthma, trigger factors, proper use of inhalers and spacers, recognition of symptoms of exacerbation and actions in this case (drawing up an individual asthma action plan). Self-monitoring: Teaching the child (depending on age) and parents to independently assess symptoms, peak exhalation rate (PEP) using a peak flowmeter and adjust treatment in accordance with the action plan. Environmental control: Identification and elimination of triggers: Identification of individual asthma triggers (allergens, irritants, physical activity, cold air, infections, etc.) and taking measures to minimize them in the home and school environment. Creating a hypoallergenic lifestyle: Using hypoallergenic bedding, regular wet cleaning, using air purifiers, and limiting contact with pets if they have allergies. Drug therapy: Basic anti-inflammatory therapy: Regular use of inhaled corticosteroids (ICS) as the main therapy to control inflammation in the respiratory tract. The choice of dose and drug is carried out by the doctor individually, depending on the severity of asthma. [2,4,8,11,13,15].

Short-acting bronchodilators (BDCA): Use as needed to relieve acute symptoms (shortness of breath, cough, wheezing). Combined drugs: In some cases, combinations of ICS with long-acting beta2-agonists (DDBA) or leukotriene receptor antagonists (ALP) may be used. A step-by-step approach to therapy: Correction of the volume of therapy depending on the level of asthma control (increase with worsening, decrease with persistent control). Physical rehabilitation and physical therapy: Breathing exercises: Training in proper diaphragmatic breathing, prolonged exhalation, exercises to improve the drainage function of the bronchi. Metered-dose physical activity: Regular aerobic exercises (walking, swimming, running, etc.) under the control of well-being and respiratory function indicators. It is important to warm up before exercise and use a short-acting bronchodilator if necessary. Respiratory muscle training: In some cases, it may be recommended

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to train inspiratory muscles using special devices. Physiotherapy procedures: Various methods can be used (chest massage, inhalation, etc.) as prescribed by a doctor. [13,15].

Psychological support: Dealing with anxiety and fear: Asthma can cause anxiety and fear of seizures in children and parents. Psychological support can help manage these conditions and increase treatment commitment. Increasing self-confidence: Engaging in physical activity and achieving asthma control helps to increase a child's self-confidence. Regular medical supervision: Follow-up visits to the doctor: Regular checkups with a pulmonologist or pediatrician to assess asthma control, correct therapy and plan of action. Assessment of respiratory function: Periodic spirometry to assess the condition of the respiratory tract. Current trends in the rehabilitation of bronchial asthma in children: Individualized approach: Rehabilitation programs are developed taking into account the individual characteristics of the child, the severity of asthma, the presence of concomitant diseases and family preferences. Active involvement of the child and family: The patient and his parents are active participants in the rehabilitation process, make decisions regarding treatment and lifestyle. [4,5,7,12,13].

The use of telemedicine technologies: Distance learning, monitoring of the patient's condition and consultations with a doctor using online platforms and mobile applications. Interdisciplinary approach: Participation in the rehabilitation process of not only pulmonologists, but also allergologists, physical therapy specialists, psychologists and other specialists, if necessary. Compliance with modern principles of rehabilitation can significantly improve the quality of life of children with asthma, reduce the risk of complications and provide them with the opportunity to lead an active and fulfilling lifestyle. It is important to remember that a rehabilitation program must be developed and supervised by a doctor. [1,3,7].

Interleukins (IL) are a large group of signaling molecules, cytokines, that play a key role in the immune system. The name "interleukin" comes from the words "between" (inter) and "leukocytes" (leukins), as it was originally believed that they are produced only by white blood cells and act on them. However, it was later found that interleukins can be produced by other cells of the body and affect a wide variety of cell types. Cytokines: Interleukins belong to the superfamily of cytokines, small protein molecules that transmit signals between cells. Regulators of the immune response: They are involved in almost all aspects of the immune response. To date, more than 30 different interleukins are known, each of which performs specific functions and interacts with specific receptors on target cells. Examples of interleukins are IL-1, IL-2, IL-4, IL-6, IL-10, and many others. Local and systemic action: Interleukins can act locally, at the site of inflammation or infection, and also have a systemic effect on the entire body. [7,12,13].

How interleukins are formed: The formation (synthesis) of interleukins is a strictly regulated process that occurs in response to various stimuli, such as: Antigen recognition: When immune cells (e.g. macrophages, dendritic cells, T-lymphocytes) recognize foreign substances (antigens) such as bacteria, viruses, fungi or other pathogens this activates intracellular signaling pathways. Cell activation: Activation of immune cells leads to the expression of genes encoding certain interleukins. This process involves transcription of DNA into RNA and subsequent translation of RNA into protein molecules of interleukins. Secretion: Synthesized interleukins are then secreted by the cell into the extracellular space. This process usually occurs by exocytosis. Synthesis regulation: The synthesis of interleukins can be regulated by a variety of factors, including other

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cytokines (including interleukins themselves by the feedback principle), waste products of pathogens, as well as signals from other body cells. Cells producing interleukins: [13,15].

Various cell types can synthesize interleukins, including: Leukocytes: Macrophages, monocytes, T lymphocytes (Th1, Th2, Th17, Treg), B lymphocytes, neutrophils, eosinophils, basophils, mast cells, NK cells. Other tissue cells: Endothelial cells, epithelial cells, fibroblasts, etc. Thus, interleukins are important mediators in the immune system, providing communication and coordination between different cells for an effective response to threats. Their formation is a complex and multi-step process regulated by many factors. [2,9,14,15].

Conclusion

Understanding the role of interleukins in the development and course of asthma opens up new perspectives for rehabilitation measures. Exposure to the level and activity of certain interleukins can be an important component of comprehensive rehabilitation. In particular, strategies aimed at reducing the level of pro-inflammatory interleukins (IL-4, IL-5, IL-13) and increasing the level of anti-inflammatory interleukins (IL-10) can help reduce inflammation in the respiratory tract, improve lung function, and reduce hyperreactivity. This can be achieved through a variety of methods, including drug therapy, immunotherapy, and lifestyle changes. Further research on the role of interleukins in asthma rehabilitation is necessary to develop more effective and personalized programs aimed at improving the condition of patients and increasing the effectiveness of rehabilitation measures.

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