CLINICAL AND IMMUNOLOGICAL EVALUATION OF THE EFFECTIVENESS OF COMPLEX TREATMENT OF ACUTE RHINOSINUSITIS IN CHILDREN

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Abstract. *The development of acute rhinosinusitis is influenced by various local and systemic factors. General factors contributing to the development of inflammation in the paranasal sinuses include the state of individual reactivity and immune status, constitutional predisposition, and unfavorable environmental conditions. Local factors involve regional disturbances that impair sinus drainage, ventilation, and mucociliary transport. The paper also presents pathogenetically substantiated approaches to therapy and highlights the основные principles of rational use of antibacterial drugs in children with acute rhinosinusitis.*

Introduction.

Acute rhinosinusitis may have a viral, post-viral, or bacterial etiology. Recurrent acute bacterial rhinosinusitis is considered separately and is characterized by repeated episodes of acute bacterial inflammation of the paranasal sinuses without clinical symptoms between exacerbations. Antimicrobial peptides synthesized in response to the activation of Toll-like receptors effectively inhibit the growth and reproduction of pathogens. In turn,

chemokines and cytokines ensure the recruitment and activation of immune cells at the site of inflammation. Thus, Toll-like receptors function as “sensors” of the immune system, enabling timely recognition of pathogens and activation of protective responses. Currently, the rhinogenic theory of sinusitis development is the most widely accepted. Under conditions of normal mucociliary transport, bacteria are unable to maintain prolonged contact with the epithelial cells of the nasal cavity and paranasal sinuses. Viruses are among the main agents that damage the mucous membrane of the respiratory tract. Treatment of rhinosinusitis should be carried out in accordance with the clinical course of the disease (latent course or exacerbation), as well as taking into account its form. It includes both local and systemic therapy. Inadequate treatment of acute rhinosinusitis is one of the causes of chronic inflammation. On the other hand, irrational therapy may also lead to local and systemic complications. Antibiotic therapy is indicated in cases of bacterial etiology of acute rhinosinusitis. Antimicrobial peptides synthesized in response to the activation of Toll-like receptors effectively inhibit the growth and proliferation of pathogens. In turn, chemokines and cytokines ensure the recruitment and activation of immune cells at the site of inflammation. Thus, Toll-like receptors function as specific “sensors” of the immune system, enabling timely recognition of pathogens and the initiation of protective immune responses. The mechanism of receptor activation plays a crucial role in coordinating the interaction between innate and adaptive immunity. Innate immunity provides the primary defense of the organism, whereas activation of these receptors facilitates effective crosstalk with the adaptive immune system, ensuring a more specific and targeted immune response against pathogenic microorganisms. The paranasal sinuses are air-filled cavities located within the

bones of the skull and connected to the nasal cavity. The maxillary sinuses and the ethmoidal air cells are present at birth and are fully developed by the age of 3 years. The development of the sphenoid sinus begins at around 3 years of age, while the frontal sinuses start developing at 5–7 years and reach full maturation only during adolescence. The sinuses perform multiple functions, the most important of which include humidification and warming of inhaled air, modulation of voice resonance, absorption of external air pressure fluctuations, thermal insulation of the cranial base, and participation in immune defense.

The nasal cavity and paranasal sinuses are lined with pseudostratified ciliated columnar epithelium containing goblet cells that secrete mucus, as well as branched tubuloalveolar glands that produce serous or seromucous secretions. These secretions are transported to the surface of the mucous membrane through excretory ducts. The normal protective function of the nasal and sinus mucosa is ensured by the coordinated interaction of cilia of the epithelial cells (providing transport function), viscous mucus (gel layer) produced by goblet cells, and serous fluid (sol layer) secreted by the glands of the respiratory mucosa.

Currently, the rhinogenic theory of sinusitis development is considered the most widely accepted. Under conditions of normally functioning mucociliary clearance, bacteria are unable to maintain prolonged contact with the epithelial cells of the nasal cavity and paranasal sinuses. Viruses are among the primary agents that damage the mucous membrane of the respiratory tract.

When viruses penetrate the mucus layer and enter epithelial cells, they begin to replicate intensively, ultimately leading to cell death. As a result, affected areas of the ciliated epithelium lose their function. This disruption prolongs the contact time between pathogenic bacteria and epithelial cells,

thereby facilitating secondary bacterial infection. Studies have shown that perennial allergic rhinitis contributes to the development of rhinosinusitis due to increased mucus production and obstruction of sinus ostia caused by mucosal edema. Clinically, rhinosinusitis may present with fever, malaise, irritability, headache, toothache, and cough.

At present, rhinosinusitis is classified based on the duration and severity of the disease. According to severity, rhinosinusitis is traditionally classified as mild, moderate, or severe. In each clinical case, the overall severity is determined by evaluating the most pronounced symptoms.

Etiologically, rhinosinusitis may be viral, bacterial, fungal, parasitic, or mixed. In acute rhinosinusitis, monoflora is typically identified, whereas the presence of multiple pathogenic microorganisms is more characteristic of chronic forms of the disease.

Therefore, to minimize treatment failures associated with irrational therapy of acute rhinosinusitis, it is necessary to consider the etiological structure of the disease. The choice of antibacterial therapy is almost always empirical. However, the empirical approach does not imply randomness; it is based on knowledge of the most significant pathogens of the infection, their sensitivity to antibacterial agents, and the safety profile of the drugs.

Conclusion.

1. Effective mucociliary clearance and optimal physicochemical properties of mucus in the sinonasal region are crucial for protecting the respiratory tract from adverse environmental factors and preventing infectious diseases.

2. Despite the development of new classes of antibacterial drugs, amoxicillin maintains its leading position due to good tolerability, a high safety profile, convenient dosing regimen, the possibility of stepwise therapy, and low cost.