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Research Article

MORPHOFUNCTIONAL RELATIONSHIPS OF CELLS IN THE BRONCH IN CHRONIC INFLAMMATION

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ABSTRACT

It has been established that under conditions of chronic inflammation of the lungs with bronchiectasis in children, destructive changes predominate in the structures of innate and acquired immunity of the airways, indicating their inability to effectively perform a protective function.

KEYWORDS

Children, bronchiectasis, innate immunity, acquired immunity.

INTRODUCTION

Chronic inflammatory lung diseases are still amongst the most common to date [8]. They cause at least 3 million deaths annually in the world [7], often leading to disability of patients. Of particular importance in the aggregate of inflammatory bronchial diseases is the pathology in children, in whom the mortality from pneumonia ranges from 3 to 19% [4]. In recent years, there has been an increase in chronic non-specific inflammatory lung diseases in children [2]. Due to destructive processes occurring in inflammatory bronchial diseases, normal histogenetic processes are often disturbed, leading to lung malformations [1].

Purpose of the study: to reveal the presence of different cell populations in the bronchial wall in chronic inflammation and their relationships.

MATERIAL AND METHODS

In the work there was used the material obtained during the surgery in 24 children with bronchiectatic disease, they were taken as the removed lung

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fragments and lobes. Age of the children was from 7 to 16 years. The control was lung material obtained in a forensic examination from 3 pediatric subjects who had died from trauma. Surgical and autopsy lung material was cut into small fragments containing bronchi of different diameters and fixed in Buena fluid. Stepped sections were prepared from paraffin blocks and stained with hematoxylin and eosin according to Van Gieson and Weigert method and impregnated according to Grimelius method to reveal argyrophilic apudocytes. The structures of innate immunity (bronchial epithelium), immunity and APUD cells - apudocytes were evaluated when studying histological preparations.

RESULTS OF THE RESEARCH

The study of histological preparations made it possible to establish that remodeling of the cellular components both epithelial and mesenchymal structures of the organ is observed at the development of inflammatory processes in the lungs at bronchiectatic disease. Bronchial epithelium has different structure in different sections. In most cases there is thickening due to hyperplasia of the basal cells. Most epitheliocytes are devoid of cilia; in those areas where cilia are preserved, they are adherent. The epithelium often contains bokalovid cells in a state of increased secretion. Along with this, there are also areas where the epithelial layer is represented by 1-2 layers of cells that lie on a thickened hyalinised basal membrane. The noted morphological signs of damage to the structure of the bronchial covering epithelium in conditions of chronic inflammation testify to a pronounced decrease of its protective properties, i.e. to a violation of mucociliary clearance mechanisms (Fig.1).

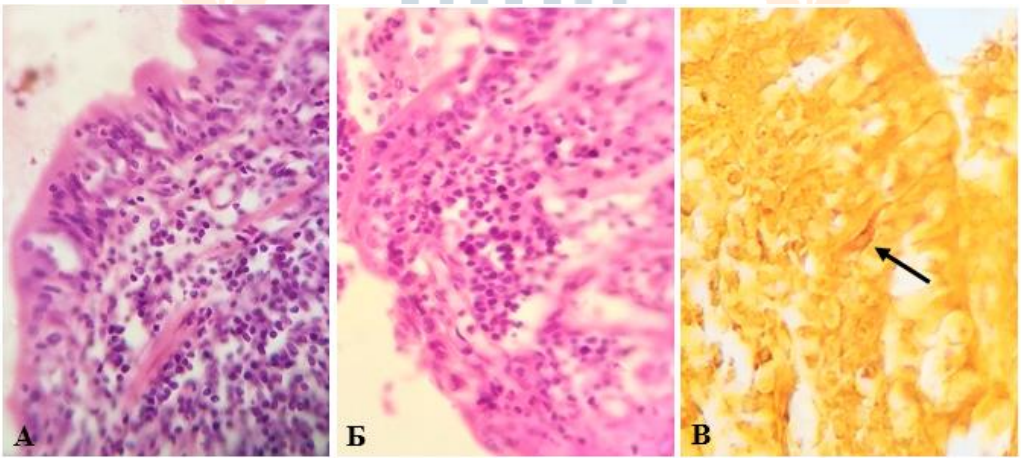

Figure 1. Thickening of the bronchial epithelial layer, hyperplasia of the bocalytic cells (A), area of epithelial denudation (B). Hematoxylin and eosin staining. Ob. 40, c.10. Argyrophilic apudocyte with a long apical process. Grimelius impregnation (B). Ob.40, ca.10.

It should be noted that along with destructive changes in the bronchial epithelium there are also regenerative processes. This is manifested in the previously noted hyperplasia of epithelial cells. Besides, argyrophilic apudocytes - cells performing regulatory functions - are found in the epithelium. Apudocytes have a spindle shape, have a long apical process that reaches the epithelial surface and ends in a small club-like thickening. The basal part of the cell is located on the basal membrane and is weakly argyrophilic, reflecting

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the release of a hormonal product by the apudocyte (Figure 1).

Lymphoid structures are widely present in the bronchi of operated children, and there are considerably more of them than in controls. These include interepithelial lymphocytes, diffusely scattered lymphocytes, their focal clusters in the intrinsic lamina of the bronchial mucosa, periglandular and periductal lymphoid clusters, and lymph nodes [3].

In the bronchial epithelium, lymphocytes are located in moderate numbers throughout its thickness, some of them entering the bronchial lumen. Interepithelial lymphocytes alternate with neutrophilic leukocytes, which are found in large numbers both between epitheliocytes and in the own lamina of the mucosa. Lymphocytes are classified as small to medium-sized and many have hyperchromic nuclei. Diffusely scattered lymphocytes are abundant in the intrinsic lamina and submucosa, and large lymphoid clusters consisting of small lymphocytes are also found there (Fig. 2).

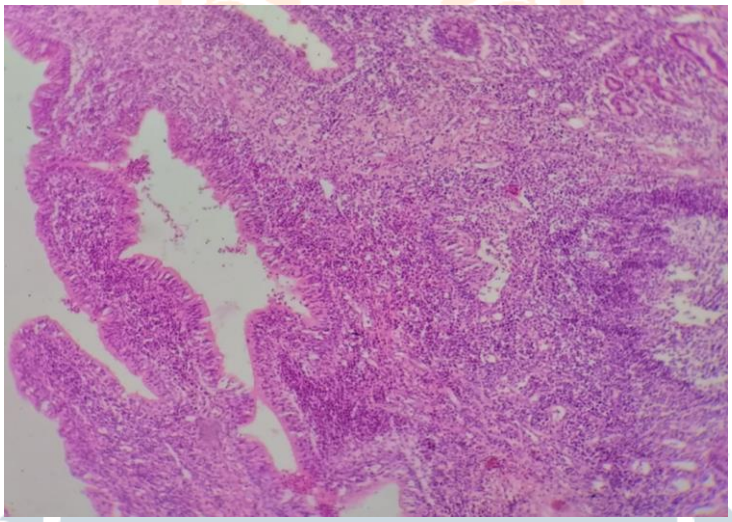

Figure 2. Lymphoid structures in the bronchus in bronchiectatic disease. Hematoxylin and eosin staining. Ob. 10, ca.10.

Lymphocytes also surround the glandular ducts, forming periductal clusters, and secretory sections of glands (periglandular clusters). The presence of lymph nodes of different sizes localized in all structures of the bronchial wall is a distinctive feature in the lung pathology we studied in comparison with the control. Lymph nodes are surrounded by a narrow band of small lymphocytes and contain a large reactive centre with large lymphocytes. However, they do not fill it completely; there are areas of lumen where they are not contained. This may be due to the presence of destructive changes within the lymph node.

The present study revealed changes in the structures of innate and acquired immunity in the lungs of children with bronchiectatic disease. Bronchial epithelium, along with destructive changes, shows increased proliferative activity of basal cells. This may be promoted by the increased functional activity of apudocytes, which is manifested by a decrease in the

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content of secretory product in their cytoplasm, especially in their basal part. In addition to macrophages and other lung cells, airway epithelial cells, which line the airway lumen, also use a number of Toll-like receptors to monitor the presence of microbes on the epithelial surface. This can lead to increased production of antimicrobial peptides, which serve as effector molecules of innate immunity, killing microorganisms, modulating immunity and enhancing wound healing (9). Innate immune cells form the first line of defence against invading pathogens. Neutrophils, natural killer (NK) cells, macrophages and their precursors monocytes are important for host defence, destroying pathogens, regulating immune cell recruitment and activation, they also have trophic functions, maintain tissue homeostasis and control the resolution phases of inflammatory responses. Inflammatory processes and innate immunity cells are tightly regulated by epigenetic mechanisms [6]. Components of innate immunity also ensure acquired immunity. Trained immunity may also contribute to inadequate immune responses which exacerbate pathology (10). According to our data, under conditions of long-term chronic inflammation in bronchiectasis, destructive changes in the reactive centres of BALT lymph nodes are observed. They may reflect a functional insufficiency of immunogenesis processes. Clinicians marked, that in children with chronic pneumonia with limited pneumosclerosis and bronchiectasis both before the operation, and in 6-12 months after resection of affected lung segments marked shifts of immunity and nonspecific resistance indices were registered. The pronounced and stable changes in immunological reactivity indicate the advisability of including immunomodulatory drugs in the complex treatment of such children [5].

CONCLUSIONS

Thus, under conditions of chronic lung inflammation in bronchiectatic disease in children, destructive changes prevail in the structures of innate and acquired immunity of the airways, indicating their inability to effectively perform their protective function.

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