IJIMM, Volume 3, Issue 4, 2025 ISSN: 2995-5319
http://medicaljournals.eu/index.php/IJIMM/issue/view/3
INTERNATIONAL JOURNAL OF INTEGRATIVE AND MODERN MEDICINE

Morphological Aspects of Lung Disease

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Annotation: The article provides an analysis of literature data on the study of clinical and functional consequences of bronchopulmonary dysplasia in children. At the same time, a long-term preservation of respiratory dysfunction was established, with the inclusion of a violation of bronchial patency, a decrease in the diffusion capacity of the lungs and bronchial hyperreactivity in such patients., The need to study clinical and morphological aspects was noted.

Keywords: bronchiectasis, children, clinical and morphological characteristics.

Relevance. In recent years, it has been accepted that bronchiectasis is a multi-etiological pathology, the pathogenesis of which involves a complex interaction between the body, respiratory pathogens and environmental factors. Such interaction leads to a vicious cycle of recurring infections, airway inflammation and tissue remodeling, contributes to impaired clearance, destruction of structural elements of the bronchial wall, and forms dilation and obstruction of small bronchi. The incidence in children aged 0–14 years living in developed countries is considered low and ranges, for example, from 0.5 per 100,000 children in Finland to 3.7 per 100,000 children in New Zealand. However, among Aboriginal children from Central Australia, the incidence rates reach 200 per 100,000 children [13]. In India, due to the unsatisfactory level of medical care in children under 4 years of age after pneumonia, bronchiectasis is diagnosed in 212–2646 cases per 1 million children per year [14]. In the Russian Federation, no studies have been conducted on the prevalence of bronchiectasis in children. There are statistical data on the prevalence of nosological forms corresponding to ICD-10 codes J44 (other chronic obstructive pulmonary disease) and J47 (bronchiectatic disease) in children aged 0 to 14 years: 98.3 per 100,000 in 2010 and 89.3 per 100,000 children in 2011 [6].

Thus, bronchiectasis remains an important problem affecting socially disadvantaged groups of the population, especially children living in developing countries where overcrowding, poor hygiene and limited access to health care occur [16].

Among children, bronchiectasis occupies an important place in the structure of bronchopulmonary pathology. In this regard, attention to the study of various aspects of this disease, including its etiopathogenesis, does not wane. Recent genetic, structural and functional studies have revealed that the epithelium of the mucous membrane of the respiratory tract and lungs is a key organizer of the immune response. In addition, there is now convincing evidence that epithelial dysfunction is involved in the development of inflammatory lung diseases [15]. The basis for the formation of bronchiectasis may be congenital and hereditary diseases.

Congenital anomalies of the bronchopulmonary system are detected in 8-10% of patients with chronic inflammatory lung diseases [7,9]. It was found that only 18.0% of patients had congenital bronchiectasis. At the same time, it turned out that 38.5% of children had a hereditary predisposition to respiratory diseases [8]. There is evidence that chronic pulmonary suppurations subject to surgical treatment are caused by congenital malformations of the lungs in 66% of children [3]. However, according to a number of researchers, even with careful differential diagnostics, the cause of bronchiectasis cannot be determined in 26-53% of cases [17].

Bronchiectasis is divided into cylindrical, saccular and mixed. In addition, spindle-shaped, cystic and varicose bronchiectasis are described. Due to the fact that one patient may have different variants of bronchiectasis, the localization and prevalence of changes within specific bronchopulmonary segments are of greatest importance.

Cylindrical bronchiectasis usually occurs with sclerosis of the bronchial walls. In this case, the lumen of the bronchus is uniformly expanded over a fairly large area. This often occurs against the background of other lung diseases - secondary bronchiectasis. The cylindrical form of bronchiectasis does not contribute to the accumulation of a large volume of pus, so the general condition of the patient is usually not too severe, and sometimes such bronchiectasis can regress when the cause that caused it is eliminated (infection, atelectasis, aspiration of a foreign body) [6].

Saccular bronchiectasis is a single spherical or oval expansion on one side of the bronchus. Quite often, this form of bronchiectasis occurs in congenital defects of the bronchopulmonary tissue. The sacs are blind protrusions of the wall, which can reach large sizes. Accumulation of a large volume of sputum and pus is characteristic. The course of the disease is usually severe [11,12,18,20].

Some authors suggest MRI of the lungs as a possible alternative to CT in patients with primary immunodeficiency and increased radiosensitivity [21].

The components of the APUD system are called neuroendocrine, since they express genes of both neuronal and endocrine cell phenotypes, including the synthesis and release of amine (serotonin, 5-HT) and various neuropeptides (including bombesin). Hyperplasia of apudocytes and NETs has been established in chronic diseases in children, as well as in experimental pneumonia. In recent years, intensive studies have been conducted on the neuroendocrine cells of the APUD system of the lungs and other organs in many physiological and pathological conditions of the organ [4,9].

However, the structural features of lung endocrinocytes in children with bronchiectasis have not been studied to date. In this regard, it is not possible to fully assess the morphofunctional state of the endocrine apparatus of the lungs in inflammatory pathological processes, including bronchiectasis.

The role of APUD system cells in lung development and postnatal reorganization of blood circulation in fetuses and newborns is well known. Under experimental conditions, apudocytes release secretory granules under the influence of acute or chronic hypoxia, hypercapnia, irritation by nitric oxide and various medicinal and narcotic agents (nicotine, reserpine, calcium iontophoresis). Apudocytes also participate in the pathogenesis of diseases.

Their hyperplasia is observed in patients with acute pneumonitis, chronic obstructive pulmonary diseases, heavy smokers, patients with non-immune bronchial asthma, and children with bronchodysplasia [2]. When the epithelium structure is disrupted and there are no endocrine cells in it, the processes of immunogenesis occur under the epithelium. The appearance of numerous plasma cells indicates an intensive efferent phase of immune development [19].

The congenital structures should also include the constant detection of cells of the APUD system - apudocytes, both single and in small groups of 2-5 cells [10].

It is justified to classify patients with a history of lung malformations as a risk group for the early development of chronic obstructive pulmonary disease [1]. On this basis, chronic bronchitis and bronchiectasis can also develop [5].

Conclusion. The study of literature data on the study of clinical and functional consequences of bronchopulmonary dysplasia in children, adolescents and young adults showed long-term persistence of respiratory dysfunction, including impaired bronchial patency, decreased diffusion capacity of the lungs and bronchial hyperreactivity in such patients. This contributes to the need for research in this area.

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