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MORPHOLOGICAL STRUCTURE OF POLYP TISSUE IN PATIENTS WITH CHRONIC POLYPOUS RHINOSINUSITIS

Djuraev Jamolbek Abdukaxxarovich
Tashkent State Medical University, Department of Otorhinolaryngology, Doctor of Medical Sciences, Professor
Email: jamolbek_djuraev@gmail.com
+998974000351
Soatov Ilyosjon Olim ugli
PhD, Assistant of the Department of Otorhinolaryngology, Tashkent State Medical University
Email: soatov.ilyosjon@gmail.com
+998993883355

Abstract

The pathomorphological structure of polyp tissues was analyzed in 90 patients with chronic polypous rhinosinusitis. The study focused on determining the structure of the integumental epithelium and membrane, cellular composition, polyp and glandular stroma composition, activation, and infiltration. In 26 (28.9%) patients, respiratory epithelium was most frequently identified as the main component of the polyp tissue. Goblet cell hyperplasia and desquamation were observed. In most cases, 60 (66.7%) polyp tissues showed multiple glands. The structural analysis of the obtained micropreparations revealed "young" forms of polyps in 68 (75.6%) patients, while the fibro-inflammatory type was observed in 23 (25.5%) cases. Important indicators of polyp recurrence were identified: significant thickening of the basal layer and membranes, activated eosinophilia, signs of integumental epithelium proliferation, increased sclerosis, and low stromal infiltration.

Keywords

polyp, morphology, tissue, rhinosinusitis

The interest of otorhinolaryngologists in the problems of diagnosing and treating polypoid rhinosinusitis, which is the main cause of nasal obstruction, has been growing for several decades. This disease has acquired great medical and social significance today. This is not due to an increase in the number of patients with polypoid rhinosinusitis in our country and abroad, but rather to the achievements in studying the etiopathogenesis of this disease, improvements in diagnosis, and the implementation of scientific advancements and modern technologies in treatment. These factors are inextricably linked not with an increase in the incidence of the disease, but with its recurrence.

Chronic polypoid rhinosinusitis (CPRS) is considered an important medical and social problem due to its widespread prevalence (1-4% of the population suffers from chronic polypoid rhinosinusitis), the long duration of treatment courses, and frequent recurrence. Bronchopulmonary, rhinogenic-orbital, and intracranial complications arising from chronic sinusitis not only worsen patients' quality of life but also lead to prolonged bed rest and, in some cases, disability.

Currently, it is emphasized that the development of chronic polyposis process stems from the combined changes in congenital or acquired biological defects (disruption of parasympathetic nervous system reactivity, decreased immunity, increased or decreased sensitivity of mucous membrane to various endo- and exogenous factors). These include the receptor apparatus of the

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nasal cavity and paranasal sinuses' mucosal cells, hyperactivity of mast cells, cell membrane defects, and environmental factors (infectious and atopic factors, mechanical, chemical, and physical influences).

The pathogenesis of CPRS is based on the complex interaction of various components, including stem cells (epithelium) of polyp tissues, inflammatory cells (e.g., eosinophils, neutrophils) and pathogenic cells (myofibroblasts). Toxic products of eosinophils have a harmful effect on the epithelium, while factors produced by the epithelium attract and retain eosinophils.

T-lymphocytes activate eosinophils and lead to their migration into the mucous membrane of the paranasal sinuses, where carrier structures enter the sinuses during normal air exchange. Activated eosinophils infiltrate the tissues and attempt to destroy foreign antigens by producing large amounts of toxic proteins, which leads to the formation of thick mucin that has a harmful effect on the mucous membrane. As a result, a chronic inflammatory process and tissue growth occur in this area. Eosinophils produce many cytokines, chemokines, and growth factors: IL-5, granulocyte-macrophage colony-stimulating factor, and others, which prolong their own lifespan and help attract new leukocytes (eosinophils, lymphocytes, and neutrophils) to the mucous membrane of the paranasal sinuses. These cells, in turn, also synthesize various cytokines, forming a continuous cycle - the inflammation becomes chronic. Thus, nasal polyps arise from chronic eosinophilic or neutrophilic inflammation.

Currently, a significant deterioration in the quality of life of patients with this disease is observed, especially for recurrent rhinosinusitis. Although the recurrence rate of CPRS is approximately 30%, criteria for assessing the risk of recurrence have not yet been developed.

There are the following variants of the histological structure of nasal polyps:

- Type 1 (edematous type of polyps) - characterized by edema, hyperplasia of goblet cells, and infiltration of leukocytes;
- Type 2 (fibro-inflammatory type) - characterized by prolonged chronic inflammation and metaplasia of the surface epithelium, and stromal sclerosis;
- Type 3 (glandular type) - characterized by severe hyperplasia of the seromucous glands;
- Type 4 (atypical polyps) - a type with neoplasia requiring differentiation.

In the developmental stage of edematous or glandular polyps, regression of polyposis can be achieved with the use of topical medications, while in the fibrous polyp stage, surgical intervention is necessary. To predict the risk of recurrence of polypoid rhinosinusitis, it is essential to develop a model and conduct a more in-depth study of the pathomorphological features of polyp tissues.

Purpose of the study

The aim was to determine the characteristics of the pathomorphological structure of nasal polyps to differentiate between clinical groups and identify possible signs of recurrence.

Materials and methods

The pathomorphological structure of polyp tissues was analyzed in 90 patients with chronic polypoid rhinosinusitis who were treated at the private medical center "Chilonzor Med Center."

The biopsy material was preserved in Carnoy's fluid and 10% neutral formalin solution. Subsequently, the material was embedded in paraffin. Tissue sections 5-8 μm thick were stained with hematoxylin and eosin. Microscopic examination of the preparations was performed to study the structure of the integumental epithelium.

Results and discussion

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The following variants of integumentary epithelial structure were identified (Table 1). The most frequently observed were respiratory epithelium with goblet cell hyperplasia and desquamation products in 26 (28.9%) cases; respiratory epithelium, transitional epithelium, and squamous epithelium with goblet cell hyperplasia, desquamation, and erosions in 10 (11.1%) patients; respiratory epithelium with desquamation products, transitional epithelium, and squamous epithelium in 16 (17.8%) patients; and respiratory epithelium with desquamation products in 12 (13.3%) patients.

Table 1. Types of integumental epithelial structure in patients with CPRS (n=90)

Types of integumental epithelial structure	Number of patients	
	n	%
Goblet cell hyperplasia and respiratory epithelium, desquamation products	26	28.9
Metaplastic respiratory epithelium, transitional epithelium, desquamation products, goblet cell hyperplasia, erosion	10	11.1
Respiratory epithelium, transitional epithelium, squamous, desquamation products	16	17.8
Respiratory epithelium and desquamation products	12	13.3
Respiratory epithelium, squamous, desquamation products, with goblet cell hyperplasia	8	8.9
Respiratory epithelium, transitional epithelium, hyperplasia	5	5.6
Transitional epithelium, desquamation product, erosions	4	4.4
Transitional epithelium, squamous, desquamation product	9	10

A combination of respiratory epithelium and transitional epithelium with hyperplasia was found in 5 (5.6%) individuals. Transitional epithelium, desquamation product, and erosion were observed in 4 (4.4%) patients. A combination of transitional epithelium, squamous epithelium, and desquamation product was found in 9 (10%) patients. A combination of respiratory epithelium, squamous epithelium, desquamation product, and goblet cell hyperplasia was detected in 8 (11.1%) patients.

The cellular composition of polypoid tissues was analyzed. The number of eosinophils, neutrophils, and lymphocytes was determined. The obtained results are presented in Table 2.

Table 2. Cell composition of polypoid tissues in patients with CPRS (n = 90)

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Index	Eosinophils			Neutrophils			Lymphocytes		
	+	++	+++	+	++	+++	+	++	+++
Number of affected patients (n)	51	16	23	60	18	12	42	30	18
Percentage of affected patients (%)	56.7	17.8	25.5	66.7	20	13.3	46.7	33.3	20

Note: + - insignificant amount, ++ - moderate amount, +++ - significant amount.

In the polypoid tissues of patients with CPRS, eosinophils were observed in insignificant amounts in 51 (56.7%) cases and in significant amounts in 23 (25.5%) cases; neutrophils in insignificant amounts were observed in 60 (66.7%) cases, and in significant amounts in 12 (13.3%) cases; lymphocytes in insignificant amounts were noted in 42 (46.7%) cases, and in significant amounts in 18 (20%) patients.
The results obtained during the pathomorphological examination allow for the classification of polyp tissue into a specific pathomorphological type. (Table 3).

Table 3. Structure of polypoid tissues in patients with CPRS (n=90)

Types of polypoid tissues	Number of patients	
	N	%
Edematous (eosinophilic)	60	66.7
Fibro-inflammatory	23	25.5
Glandular	5	5.6
Atypical polyp	2	2.2

"Young" forms of polyps were detected in 68 (75.6%) patients. The edematous (eosinophilic) type of polypoid tissue structure was found in 66.7% of cases, while the glandular type was observed in 5 (5.6%) patients. "Old" forms of polypoid tissue structure (fibro-inflammatory type) were detected in 23 (25.5%) patients. Atypical polyps were found in 2 (2.2%) cases. It should be noted that there were some limitations in the classification of polypoid tissues: sclerosis was observed mainly in edematous tissues (for example, in the polyp pedicle) - this is generally considered insignificant. In one case, a polyp initially classified as atypical was later reclassified as a papilloma, and this patient was subsequently excluded from the study. We followed 89 patients over 3 years: during this time, recurrence of the polypoid process was detected in 29 (32.2%) cases.

Thus, important indicators of polyposis recurrence are: significant thickening of the basement membrane, high eosinophilia, and clear signs of integumental epithelium proliferation. The prevalence of these pathomorphological features is directly related to the intensification of stromal sclerosis, while a decrease in these signs leads to reduced stromal infiltration.

Conclusion

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It has been established that desquamation products, hyperplasia of goblet cells, and respiratory epithelium are the main components of polypoid tissues. In the polyp tissues of patients with CPRS, small numbers of eosinophils (56.7%), neutrophils (66.7%), and lymphocytes (46.7%) were found. In microscopic preparations, based on the structural type, "young" forms of polyps (75.6%) were predominantly detected, with "old" forms of polypoid tissue (25.5%) observed less frequently. Atypical polyps were found in 2 (2.2%) cases. A direct correlation was revealed between the occurrence of relapses and thickening of the basement membrane, the number of eosinophils in polyp tissues, the degree of stromal sclerosis, and changes in the integumental epithelium towards hyperplasia and metaplasia. An inverse correlation was found between the infiltration of polypoid tissues and the occurrence of recurrence. Important indicators of polypoid process recurrence were identified: significant thickening of the basement membrane, increased eosinophilia, and proliferation of integumental epithelium. The high prevalence of these pathomorphological signs is directly related to the progression of stromal sclerosis, while a decrease in these symptoms leads to reduced stromal infiltration. Pathological examinations are crucial for differentiating patients with CPRS, enabling the identification of groups with eosinophilic and neutrophilic inflammation, stromal edema and sclerosis, thickening of the basement membrane, and glandular hyperplasia. A comprehensive, in-depth study of the pathomorphological features of polypoid tissue structure further strengthens the differentiated approach to combined treatment of patients, increases its effectiveness, and reduces the likelihood of relapses.

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