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MORPHOLOGICAL CHANGES IN THE EPITHELIUM AND STROMA OF THE MUCOUS MEMBRANE OF THE MAXILLARY SINUS IN CHRONIC INFLAMMATION

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Abstract

This article describes the main structural changes of the maxillary sinus mucosa in chronic maxillary sinusitis, the mechanisms of their pathogenesis, and their clinical significance. According to the study results, the chronic sinusitis group demonstrated a significant increase in epithelial thickness, destruction of the ciliated epithelium, hyperplasia of the glandular apparatus, and a high degree of submucosal fibrosis.

Keywords

Chronic maxillary sinusitis, maxillary sinus, mucous membrane, morphological changes, histological examination, fibrosis, inflammatory infiltration.

Introduction

At present, the prevalence of chronic sinusitis is increasing among the world population, making the study of structural changes in the mucous membrane of the maxillary sinus during the pathogenesis of the disease highly relevant. The primary cause of sinusitis is infection of the upper respiratory tract, which is why the incidence of this disease peaks during the autumn-winter season [1,2,5,6,13,32,34].

Prolonged disease leads to irreversible structural changes in the mucous membrane of the maxillary sinus. These structural alterations contribute to the severity of the disease, drug resistance, and the development of complications [3,4,8,10,23,25,35].

Based on our scientific investigations, it is of great importance to identify the morphological changes in the mucous membrane of the maxillary sinus in chronic sinusitis and to study their role in pathogenesis. Research has shown that during the chronic inflammatory process, significant structural changes occur, such as epithelial thickening, altered glandular activity, and the development of fibrosis in the lamina propria [18,20,27,30,36].

Research objective

To identify and evaluate the morphological changes occurring in the epithelial and stromal layers of the maxillary sinus mucosa under conditions of chronic inflammation, and to study their significance in the pathogenesis and clinical course of the disease.

Materials and methods

This study was aimed at investigating the morphological structural changes in the mucosa of the maxillary sinus in patients with chronic sinusitis. The research was conducted at the clinical base of Tashkent State Medical University.

The study material consisted of biopsy samples taken from the maxillary sinus mucosa of patients diagnosed with chronic sinusitis who underwent surgical treatment (either maxillotomy

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or functional endoscopic sinus surgery). A total of 36 patients (both male and female) aged between 18 and 60 years were included in the study. As a control group, mucosal samples from the healthy maxillary sinus were obtained from 18 individuals who underwent surgery in the facial-maxillary region for traumatic reasons but had no pathology of the paranasal sinuses.

The collected biopsy specimens were fixed in 10% neutral formalin solution and embedded in paraffin blocks using standard histological techniques. Sections of 4–5 µm thickness were prepared and stained with hematoxylin-eosin. In some cases, Van Gieson staining was applied to identify connective tissue and collagen fibers.

Results and discussion

During the morphological examination, the following parameters were assessed: epithelial thickness, the degree of metaplasia and desquamation in the multilayered ciliated epithelium, fibrotic changes in the submucosal layer, dilation and stasis of blood vessels, the degree of lymphoplasmacytic infiltration, and hyperplasia or atrophy of the glandular apparatus.

Microscopic analysis was performed using a light microscope, and morphometric measurements were carried out with the help of specialized software. The obtained results were statistically processed, and significant differences between the chronic sinusitis group and the control group were identified.

Table 1

Chronic sinusitis gaymore space mucus floor morphometric indicators

Indicators	Control group	Chronic sinusitis
Epithelium thickness (µm)	32.4 ± 1.8	58.7 ± 2.6
Mucus floor thickness (µm)	410.2 ± 15.3	765.9 ± 28.4
Blood veins diameter (µm)	18.6 ± 0.9	36.2 ± 1.7
Inflammation infiltrate Density (kg /mm²)	42.8 ± 3.1	138.6 ± 6.9
Glands number (in 1 mm²)	6.2 ± 0.4	11.8 ± 0.6
Fibrosis tissue share (%)	8.5 ± 0.7	27.4 ± 1.9

The results of the study showed that in chronic sinusitis, there are distinct morphological changes in the mucous membrane of the maxillary sinus. In the experimental group, a significant increase in epithelial thickness was observed, which was found to be associated with the prolonged course of the chronic inflammatory process. An increase in collagen fibers and the development of fibrotic changes in the submucosal layer were also noted. This condition leads to a reduction in mucosal elasticity and impairment of sinus drainage function. Dilation of blood vessels and stasis create a basis for the development of tissue hypoxia.

The inflammatory infiltrate was found to be highly pronounced, consisting mainly of lymphocytes and plasma cells, indicating the predominance of a chronic immune-inflammatory process. Hyperplasia of the glandular apparatus results in increased mucous secretion, leading to the accumulation of pathological discharge in the maxillary sinus.

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The findings indicate that the morphological changes occurring in the mucous membrane of the maxillary sinus in chronic sinusitis are directly related to the prolonged duration of the disease and the severity of clinical symptoms. A detailed study of these structural changes is of significant importance for improving treatment strategies.

Conclusion

Morphological studies have shown that chronic sinusitis is associated with profound structural changes in the mucous membrane of the maxillary sinus. These findings contribute to a deeper understanding of the pathogenesis of chronic sinusitis and hold significant scientific and practical value for early diagnosis and the improvement of effective treatment strategies.

Under conditions of chronic inflammation, the mucous membrane of the maxillary sinus undergoes extensive morphological changes in both the epithelial and stromal components. In the epithelial layer, disruption of the multi-row ciliated columnar epithelium, a reduction in the number of cilia, metaplasia, and degenerative processes are observed. In the stroma, lymphoplasmacytic infiltration, edema, vascular dilation, and fibrotic changes are identified. These morphological alterations weaken the protective and drainage functions of the mucosa, sustain the chronic inflammatory process, and exacerbate the clinical course of the disease.

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