INTERNATIONAL MULTI DISCIPLINARY JOURNAL FOR RESEARCH & DEVELOPMENT
eISSN 2394-6334 Impact factor: 8.854 Volume 13, issue 05 (2026)

PATHOLOGICAL-ANATOMICAL AND IMMUNOHISTOLOGICAL CHANGES IN CHRONIC SUPPURATIVE OTITIS MEDIA AND IMPROVEMENT OF TREATMENT APPROACHES

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https://doi.org/10.5281/zenodo.19985971

Abstract: Chronic suppurative otitis media is one of the most common inflammatory diseases of the middle ear and remains an important problem in otorhinolaryngology. The disease is characterized by persistent inflammation, tympanic membrane perforation, purulent discharge, and progressive pathological changes in the middle ear mucosa and surrounding structures. Pathological-anatomical and immunohistological changes play a key role in the chronic course of the disease, recurrence, and development of complications. This article analyzes the morphological and immunohistological features of chronic suppurative otitis media and discusses approaches to improving treatment. The results indicate that chronic inflammation, epithelial metaplasia, granulation tissue formation, fibrosis, and immune cell infiltration are important mechanisms in disease progression. Comprehensive treatment based on accurate diagnosis, antimicrobial therapy, surgical correction, and immunological evaluation may improve clinical outcomes.

Keywords: chronic suppurative otitis media, middle ear, pathological-anatomical changes, immunohistology, inflammation, tympanic membrane, treatment optimization

Introduction

Chronic suppurative otitis media is a long-lasting inflammatory disease of the middle ear cavity, usually associated with persistent or recurrent ear discharge through a perforated tympanic membrane. This pathology is clinically significant because it may lead to hearing loss, recurrent infections, destruction of middle ear structures, and intracranial or extracranial complications.

The development and progression of chronic suppurative otitis media are closely related to persistent infection, impaired ventilation of the middle ear, dysfunction of the Eustachian tube, and changes in local immune response. Long-term inflammation causes structural changes in the mucosa, ossicles, tympanic membrane, and mastoid cells. These changes may include edema, mucosal hyperplasia, granulation tissue formation, fibrosis, and epithelial transformation.

Pathological-anatomical examination allows the identification of structural damage and the severity of inflammatory changes. At the same time, immunohistological analysis provides important information about local immune reactions, including the activity of lymphocytes, macrophages, plasma cells, cytokines, and inflammatory mediators. Studying these changes is

important for understanding the mechanisms of chronic inflammation and for improving treatment strategies.

Despite the availability of antibacterial therapy and surgical treatment, chronic suppurative otitis media remains difficult to manage in some patients. Recurrence, antibiotic resistance, and incomplete recovery of middle ear function are common clinical problems. Therefore, improving treatment requires a deeper understanding of the pathological and immunohistological mechanisms of the disease.

Aim of the Study

The aim of this article is to analyze pathological-anatomical and immunohistological changes in chronic suppurative otitis media and to determine ways to improve treatment effectiveness.

Materials and Methods

The study was based on the analysis of clinical, morphological, and immunohistological data in patients with chronic suppurative otitis media. Patients with persistent purulent discharge, tympanic membrane perforation, and clinical signs of chronic middle ear inflammation were evaluated.

Clinical examination included otoscopy, assessment of ear discharge, evaluation of hearing function, and analysis of disease duration. In selected cases, radiological examination was used to assess the condition of the mastoid process and middle ear structures.

Pathological-anatomical evaluation focused on changes in the tympanic membrane, middle ear mucosa, ossicular chain, and granulation tissue. Tissue samples obtained during surgical intervention were examined using standard histological staining methods.

Immunohistological analysis was used to assess the presence and activity of immune cells involved in chronic inflammation. Particular attention was given to lymphocytic infiltration, macrophage activity, plasma cell presence, and markers of chronic inflammatory response.

Treatment approaches were analyzed according to clinical effectiveness. These included local and systemic antimicrobial therapy, anti-inflammatory treatment, ear sanitation, improvement of middle ear ventilation, and surgical procedures such as tympanoplasty or mastoid surgery when indicated.

Results

The analysis showed that chronic suppurative otitis media is accompanied by significant pathological-anatomical changes in the middle ear. The most common findings included thickening of the mucosa, inflammatory edema, granulation tissue formation, fibrosis, and persistent tympanic membrane perforation.

In long-lasting cases, epithelial metaplasia and structural remodeling of the mucosa were observed. These changes indicate adaptation of the tissue to chronic inflammation but also contribute to impaired function of the middle ear. Granulation tissue was frequently associated with recurrent purulent discharge and delayed healing.

Damage to the ossicular chain was observed in some patients, especially in cases with prolonged inflammation or cholesteatomatous changes. Such damage may lead to conductive hearing loss and worsen the functional prognosis of the disease.

Immunohistological examination revealed active inflammatory infiltration in the middle ear mucosa. Lymphocytes, macrophages, and plasma cells were commonly detected, indicating the presence of chronic immune activation. Increased macrophage activity was associated with tissue destruction and persistence of inflammatory processes.

The results also showed that local immune imbalance may contribute to chronicity of the disease. Persistent antigenic stimulation caused by bacterial infection supports continuous production of inflammatory mediators, which leads to mucosal damage, fibrosis, and recurrence.

Treatment analysis demonstrated that patients receiving комплексный treatment had better clinical outcomes. The combination of adequate antimicrobial therapy, local sanitation, anti-inflammatory management, and surgical correction when necessary reduced purulent discharge and improved middle ear condition.

Surgical treatment was especially effective in patients with anatomical defects, persistent perforation, granulation tissue, or cholesteatomatous changes. Tympanoplasty contributed to restoration of tympanic membrane integrity, while mastoid surgery helped eliminate chronic infectious foci.

Discussion

The findings confirm that chronic suppurative otitis media is not only an infectious disease but also a chronic inflammatory and immunopathological process. Persistent bacterial contamination initiates inflammation, but long-term tissue damage is maintained by immune cell activation, cytokine release, and structural remodeling.

Pathological-anatomical changes play a decisive role in the clinical course of the disease. Thickened mucosa, granulation tissue, fibrosis, and epithelial transformation reduce the ability of the middle ear to recover normally. These changes may also interfere with ventilation and drainage, creating favorable conditions for recurrent infection.

Immunohistological changes provide additional understanding of disease progression. The presence of lymphocytes and plasma cells indicates chronic antigenic stimulation, while macrophage activation suggests ongoing tissue destruction and repair. This explains why antibacterial therapy alone may not always be sufficient.

Improvement of treatment should therefore be based on a комплексный approach. It is necessary to eliminate infection, suppress excessive inflammation, restore anatomical structures, and improve ventilation of the middle ear. In addition, microbiological testing may help select appropriate antibiotics and reduce the risk of resistance.

Surgical treatment should be considered in patients with persistent perforation, recurrent discharge, granulation tissue, ossicular damage, or cholesteatoma. The choice of surgical method should depend on the pathological changes identified during clinical and morphological evaluation.

Another important direction is the use of immunohistological data to personalize treatment. Identifying the intensity and type of immune response may help predict recurrence risk and determine the need for additional anti-inflammatory or immunomodulatory therapy.

Conclusion

Chronic suppurative otitis media is characterized by complex pathological-anatomical and immunohistological changes that determine the severity, recurrence, and treatment outcomes of the disease. The most important morphological changes include mucosal thickening, edema, granulation tissue formation, fibrosis, tympanic membrane perforation, and possible ossicular damage.

Immunohistological findings demonstrate chronic immune activation with infiltration of lymphocytes, macrophages, and plasma cells. These changes support persistent inflammation and contribute to structural damage in the middle ear.

Improving treatment requires a comprehensive and individualized approach. Effective management should include accurate diagnosis, microbiological control, adequate antimicrobial therapy, anti-inflammatory treatment, ear sanitation, and timely surgical correction when indicated.

Pathological-anatomical and immunohistological assessment can help improve understanding of disease mechanisms, select appropriate treatment tactics, reduce recurrence, and improve hearing outcomes in patients with chronic suppurative otitis media.

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