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Research Article

# OTOMYCOSIS: MODERN PROSPECTS FOR DIAGNOSIS AND TREATMENT (LITERATURE REVIEW)

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## ABSTRACT

The problem of identifying and treating mycoses in otorhinolaryngology is gaining great importance not only because of their increasingly widespread distribution. This is due to the fact that fungal infections of the upper respiratory tract and ear are more severe than other inflammatory processes in this localization and can be the primary focus of visceral mycosis or cause sepsis, especially in childhood. An increase in the incidence of mycoses, infection and superinfection with fungi often contribute to the transition of acute processes into chronic ones, the occurrence of relapses and a more severe course of the disease. Delayed diagnosis and irrational treatment can lead to the generalization of a fungal infection, which is especially severe.

## KEYWORDS

Otomycosis , fungal infection, otitis.

## INTRODUCTION

Otomycosis , a fungal infection of the structures of the outer, middle and inner ear, is one of the most difficult to detect and intractable fungal diseases in humans. It is also one of the most common ENT pathologies of our time, accounting for almost 20% of all outpatient ENT consultations [1-4]. Beginning as a superficial mycosis, otomycosis often reveals itself at the stage of a chronic recurrent disease [5]. The ubiquity of microscopic fungi and the growing resistance of the latter to antimycotics are causing an increase in the number of cases of otomycosis , affecting individuals of both sexes of any age, continent, social and immunological status [6-9]. The purpose of the study is to study the epidemiology, etiological structure, pathogenesis, diagnosis and treatment of otomycosis in otolaryngological and dermatological practice, clinical and statistical differences between various forms of otomycosis , and study the problems of therapy for this disease.

Materials and methods. An analysis of Russian and foreign scientific literature on otomycosis for the

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period 2015-2023 was carried out, statistical data on its epidemiology and prevalence were studied, and the most pressing problems in the diagnosis and treatment of this disease were considered.

Results. The frequency of otomycosis in Europe reaches 20% of all otitis in adults and 27% in children [4]. The average age of the disease is 38.5 years [5]. According to Kiakojuri K. et al . and Aboutalebian S. et al ., women suffer from otomycosis 3 times more often than men (up to 72.2% of patients) [6, 7]. Primary otomycosis is characterized by a lower frequency and occurs in 23-34% of cases against 56-70% of secondary mycoses in people suffering from chronic ear diseases [8]. In the latter case, otomycosis is a serious complication, accounting for up to 12% of secondary hearing loss in case of untimely diagnosis and incorrect selection of antimycotic therapy [9]. Involvement of only parts of the external ear in the inflammatory process is observed in 62-67% of patients; fungal otitis media occurs in 17-20% of cases [10]. This division is considered conditional, since external mycotic otitis develops with an intact tympanic membrane, which is practically impossible in the case of long-term chronic otitis, which serves as the main background risk factor for otomycosis [11]. Involvement of the middle ear in the process is found in 45-65% of patients who were initially diagnosed with only external otomycosis , and in 77-78% of these patients no corresponding complaints were identified, which once again emphasizes the need to develop measures for the early diagnosis of otomycosis [7]. Complex, long-term treatment of this disease involves training patients, most of whom in the first stages of the disease do not have significant complaints, are treated on an outpatient basis and do not complete therapy, causing a chronic course [12]. Microscopic fungi are present in significant quantities on the healthy skin of the external auditory canal. These are fungi of the genera Aspergillus (80%), Penicillium (8%), Candida (14%), Rhizopus (1%) and Chrysosporium (1%) [13].

that cause otomycosis are represented mainly by opportunistic biota , which once again allows us to focus on the fact that otomycosis is, in essence, the result of a pathology of the immune system, low immunological status of the skin, etc. [14]. The greatest role in the development of this disease is played by molds of the genus Aspergillus (65%), such as A. orizae , A. niger , A. ochraceus , A. glaucus , A. versicolor , A. fumugatus , A. flavus , A. clavatus , A. nidulans , A. terreus . In the general structure of otomycosis pathogens , yeast-like fungi of the genus Candida make up approximately 24% (C. albicans , C. tropicalis , C. stellatoidea , C. pseudotropicalis , C. glabrata , C. brumpti , C. parapsillosis , C. krusei ), fungi of the genus Penicillium –10% (P. chrisogenum , P. nidulans , P. notatum , P. tardum , P. chermesinum , P. glaucus , P. puberulum , P. citrinum ) [14, 15]. In 3-5% of cases , fungi of the genera Mucor , Alternaria , and Kladosporium are found as causative agents of otomycosis [16]. Mixed infection is extremely typical for mycoses and occurs in 24-37% of cases, where concomitant pathogens of the disease are Staphylococcus aureus (up to 67%), various strains of streptococci (up to 7-12%), as well as other fungi (up to 20%) [ 4, 17]. In the group of factors predisposing to otomycosis , a special place is occupied by the structural features of the external ear, consisting of the auricle and external auditory canal, which are extremely susceptible to environmental influences and traumatic factors. Both of these anatomical structures are represented by elastic cartilage covered by skin with a small amount of subcutaneous fat, hair follicles, sebaceous and apocrine glands.

The bony part of the auditory canal does not contain any sebaceous glands or follicles, which explains the

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more frequent involvement of parts of the outer ear in the mycotic process [18]. External factors predisposing to damage to the structures of the outer ear are long-term use of vacuum headphones and hearing aids without appropriate disinfection, uncontrolled use of antibacterial and hormonal ear drops and the presence of long-term infection of the outer ear [10, 19]. According to Agarwal P., 81% of patients experience trauma to the external auditory canal during hygiene and indiscriminate use of ear drops [20]. A predisposing background for otomycosis is also damage to the skin of the external auditory canal with seborrheic dermatitis, atopic dermatitis, and psoriasis [21]. The infectious dose for otomycosis is not decisive - for the development of the disease, only one contact with the patient or the contaminated surface of a household object is sufficient. When studying otomycosis among health workers, the development of the disease was recorded even with a single use of someone else's stethoscope [9, 22].

According to Mahmoudabadi AZ, fungal biota is found on hearing headsets and hearing aids in people who use them on a regular basis. According to the study, trauma to the external auditory canal occurs in 79.63% of cases, use of ototopic and/or oral antimicrobial drugs – in 24.07%, diabetes mellitus – in 11.11%, otological procedures – in 7.41% [23 ]. An interesting fact is the recent spread among the population of data on the "pronounced" bactericidal effect of earwax, which provokes a reduction in hygiene procedures, which can also serve as a predisposing factor in the development of external otomycosis [24]. In the group of primary otitis media, an important role is played by such factors as operations on the jaws and teeth, poor sanitation of the oral cavity after the use of inhaled steroids, which causes mycological alertness not only among dermatologists and otolaryngologists, but also among dentists, surgeons, and therapists [25]. Comorbid conditions such as diabetes mellitus, immunodeficiencies, and cancer signify an unfavorable prognosis for recovery and maintenance of healthy hearing during otitis media in patients with otomycosis [26, 27]. The group of this disease, which affects people over 70 years of age with diabetes mellitus and is characterized by a severe course and a diverse clinical picture, is united under the name "malignant otitis externa" [27, 28].

When studying the age groups of patients with otomycosis , it was found that children (up to 13-20%) and people over 60 years of age (17-24%) are affected approximately equally in relation to people of working age (31-50 years), whose share is 56-60%. [29]. The long course of mycoses, often with the absence of a pronounced inflammatory response from the body, contributed to the identification of special links in pathogenesis, characterizing otomycosis as a group of diseases with a slow development of clinical manifestations, often a sluggish course, difficult diagnosis and even more difficult therapy [30]. Fungal enzymes (proteases, phospholipases ), sporulation, branching hyphae, mycelial form, specific toxins ( aflatoxin , fumagillin ), phagocytosis inhibitors ( gliotoxin ) allow microscopic fungi not only to suppress the immune response of the patient's body, but also to successfully bypass, and in some cases cases - and not cause an immune response [25, 30]. Based on the depth of the lesion, superficial mycosis (mycosis of the external auditory canal) and invasive mycosis, which affects deep tissues, are distinguished. Superficial mycosis usually occurs in immunocompetent patients, invasive, as a rule, in immunocompromised patients. Superficial and invasive otomycosis differ in etiology, pathogenesis, extent of damage, methods of diagnosis and treatment. In the pathogenesis of otomycosis, the ability of fungi to grow invasively becomes of particular importance. The growth of fungal colonies on the

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surface of body tissues is ensured not so much through active penetration into cells, but through sporulation, proliferation of hyphae and extremely rapid involvement in the process of the patient's peripheral circulation [31].

Metastatic organ damage is an important feature of fungal infection, in which colony screening can be observed even with minimal clinical manifestation of mycosis in the primary lesion [7, 32]. In 50-65% of cases, damage to the middle ear is noted already at the preclinical stage of external otomycosis , when with the routine method of "otoscopy" all structures of the outer ear (including the eardrum) look intact. The latter causes a high incidence of primary chronicity otomycosis [29]. The disease does not have specific clinical manifestations that allow a reliable diagnosis to be made based on complaints and otoscopy results. In 45-70% of cases, otomycosis does not have clinical manifestations until the stage of damage to the structures of the middle ear [15, 18]. In 12-14% of patients, the disease is diagnosed at the stage of development of hearing loss, neurological and other complications. A subjective symptom of otomycosis is itching that does not disappear after hygiene procedures. Up to 50% of patients note an obsessive need (2-3 times a day) for mechanical ear cleaning (which does not bring relief), normal hearing acuity and the absence of discharge [8]. Otalgia and otorrhea accompany the course of otomycosis in more than 80% of patients [33].

An important symptom is myringitis (inflammation of the eardrum). Tinnitus, a feeling of vibration, periodic "pulsation" in the ear often serve as a reason to consult a therapist and are mistakenly taken for manifestations of hypertension, cerebrovascular disease, fatigue, etc. [7, 34]. These symptoms are nonspecific and rarely serve as a reason to conduct a bacteriological examination at an appointment with an otolaryngologist, especially in the case of the integrity of the eardrum during otoscopy [19, 29]. Locally, pronounced inflammatory changes are detected in the external auditory canal.

Pathological discharge is usually presented in the form of a "wet newspaper", after removal of which easily bleeding granulation tissue is revealed [7, 19]. Mycotic otitis is often accompanied by complaints of hearing loss, congestion in the ear, headache on the side of the affected ear, and dizziness [35]. During routine otoscopy, the skin of the ear canal is significantly infiltrated, and eczematization may occur [7, 35]. Diagnosis of otomycosis currently presents certain difficulties and is often untimely. All clinical manifestations of otomycosis are characteristic of otitis of any etiology and a number of other diseases (neurinoma, mastoiditis, brain tumors, arthritis of the temporomandibular joint). Diagnosis of external otomycosis is carried out on the basis of complaints, clinical manifestations and external otoscopy. Invasive otomycosis is established using microscopic and cultural research methods [19, 36]. Note that in 80-87% of cases, the collection of material turns out to be incorrect, and opportunistic bacterial biota , such as Staphylococcus aureus, etc. grow on the media [5, 37]. In this regard, the correct collection of material for research acquires diagnostic relevance, on which the success of the growth of a fungal colony on culture media depends. In particular, biological material is collected using an ear button probe. Biological material, previously placed between two sterile slides and stained with a 10% potassium hydroxide solution, is subjected to microscopy [37, 38]. Culture inoculation is performed using the standard method on nutrient media of Sabouraud , Chapek, and others. In the diagnosis of invasive otomycosis , serological and

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molecular biological methods (polymerase chain reaction - PCR) can be used [14, 39].

The success of treatment for otomycosis depends on how timely it is started. Etiotropic therapy includes the entire arsenal of antimycotic drugs. Treatment of mycosis of the external auditory canal is often limited to topical antimycotics ( clotrimazole , bifonazole , econazole , miconazole , naftifine , natamycin , levorin , nystatin ). To treat invasive otomycosis , systemic azoles ( voriconazole , isavuconazole , posaconazole ) and polyene drugs (lipid forms of amphotericin B) are used [40-42]. Currently, the effectiveness of combined treatment of mycosis of the external auditory canal has been proven. The classic combination is the simultaneous combination of such groups of antimycotic drugs as azoles and allylamines . In particular, for external otitis, applications of 1% clotrimazole and 1% naftifine are used [43]. Clotrimazole has been proven to be highly effective in the treatment of external otomycosis in combination with low mycotic resistance to this drug [36, 44]. There are reports that for otitis caused by yeast-like fungi, a combination of allylamines and azoles is more effective , and for otitis caused by molds, a combination of allylamines and 1% chloronitrophenol is more effective [16, 45]. Indications for the systemic use of antifungal drugs are relapses of otomycosis , lack of positive dynamics during local treatment, the presence of a fungal infection of another localization, as well as the chronic form of the disease [39, 45]. Among systemic antimycotics , fluconazole and terbinafine , as well as amphotericin B, showed the highest clinical effectiveness [45, 46]. Physiotherapeutic procedures for otomycosis are not recommended.

The use of such agents as 3% boric acid, povidone - iodine, 2% acetic acid, 2% potassium iodide is justified in cases of absence of discharge from the ear with superficial otomycosis [47, 48]. Primary prevention of the disease includes hygiene of the outer ear, sanitation of foci of chronic infection, limiting contact with dust, disinfection of hearing headsets, limiting exposure to high humidity and the use of someone else's sound equipment [47]. Secondary prevention measures include patient education and follow-up with an otolaryngologist [47, 49].

## CONCLUSION

Thus, otomycosis is a group of fungal diseases of the outer and middle ear, characterized by a long course, difficulties in early diagnosis and selection of adequate treatment. Predisposing factors for the development of mycotic ear infections are poor hygiene, irrational and uncontrolled therapy with antibacterial and immunosuppressive drugs, and the presence of chronic concomitant pathologies. The modern view of the problem of otomycosis among the population determines an integrated approach to early diagnosis and treatment of this group of patients.

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