The Journal of Laryngology & Otology
January 2003, Vol. **117,** pp. 39–42

Otomycosis in Turkey: predisposing factors, aetiology and therapy

K. Murat Ozcan, M.D., Muge Ozcan, M.D., Aydin Karaarslan, M.D.*, Filiz Karaarslan, M.D.†

Abstract

Otomycosis usually requires long-term treatment and tends to recur. This study was performed on 87 patients with the clinical diagnosis of otomycosis and 20 controls in order to determine the pathogenic agents, predisposing factors and a cost-effective treatment. The predisposing factors included wearing head clothes (74.7 per cent), presence of dermatomycoses (34.5 per cent) and swimming (27.6 per cent). The most common pathogenic fungus was *Aspergillus niger* (44.8 per cent) in the otomycosis group. The only isolate was *Candida albicans* in the control group (2.5 per cent). We concluded that administration of four per cent boric acid solution in alcohol and frequent suction cleaning of the ear canal might be a cost-effective treatment for otomycosis since 77 per cent of the patients were treated effectively this way. Eighty per cent of the resistant cases had mixed fungal-bacterial infections, and 50 per cent of them had dermatomycoses. These resistant cases were treated by administration of tioconazole ointment.

Key words: Mycoses; Ear Canal; Risk Factors; Boric Acids

Introduction

Otomycosis is fungal infection of the ear. It usually involves the external auditory meatus, however, the disease may manifest itself in the middle ear in the case of a perforated tympanic membrane. The mastoid cavity may be involved following surgery.[1] Although not life-threatening, otomycosis can be a frustrating condition for both the patient and the physician due to a requirement for long-term treatment and its tendency for recurrence.[2]

Otomycosis constitutes nearly nine per cent of cases with otitis externa.[3] The most common pathogens vary from temperate to tropical regions.[3] Identification of the prediposing factors and the pathogenic agents is important for the success of the therapy and to prevent recurrences.

In this controlled study, pathogenic fungal/accompanying bacterial agents and predisposing factors for otomycosis were investigated and the results of therapy were presented.

Materials and methods

Ninety-seven ears of 87 consecutive patients with the clinical diagnosis of otomycosis were included in the study between May 2000 and March 2002. The sex-matched controls (20 patients, 40 ears) were the patients who were admitted to the ENT polyclinic with complaints other than aural ones, had normal otoscopic examinations, and accepted to participate in the study. All patients and the controls gave their informed consent.

The ages of the patients in the otomycosis group ranged between 14–85 years with a mean of 44 years. There were 17 males (19.5 per cent) and 70 females (80.5 per cent). The age distribution of the patients is presented in Figure 1. The ages of the 20 patients in the control group ranged between 12–65 years (mean: 40.8 years). There were four males (20 per cent) and 16 females (80 per cent).

A detailed history was obtained including the aural symptoms (itching, otalgia, hearing loss, aural

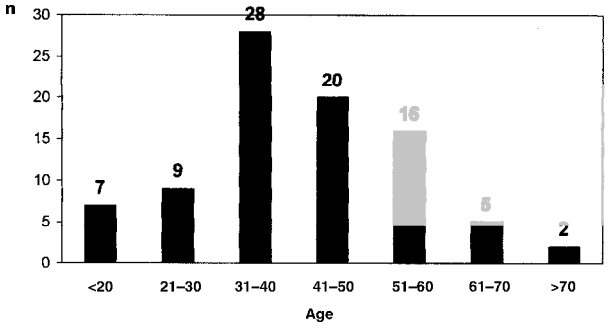

Fig. 1
The age distribution of the patients with otomycosis.

From the Departments of Otolaryngology and Dermatology† Ankara Numune Education and Research Hospital, Ankara and the Department of Microbiology*, Ankara University Faculty of Medicine, Ankara, Turkey.
Accepted for publication: 10 September 2002.

https://doi.org/10.1258/002221503321046621 Published online by Cambridge University Press

TABLE I
THE FUNGI ISOLATED FROM THE PATIENTS WITH OTOMYCOSIS

Isolated fungi	n	%
Aspergillus niger	30	44.8
Aspergillus fumigatus	12	17.9
Aspergillus flavus	12	17.9
Aspergillus terreus	1	1.5
Candida albicans	8	11.9
Candida tropicalis	3	4.5
Candida kefyr	1	1.5
Total	67	100

discharge and tinnitus), presence of dermatomycoses and possible predisposing factors. Complete otorhinolaryngological and dermatological examinations were performed.

Fungal and bacterial cultures were obtained from the ears with otomycosis and from the controls. The material for culture was obtained from the ear canal by means of a sterile swab. The scrapings from the suspected dermatomycoses (skin and/or nail) were obtained by a sterile scalpel. The materials from the ear were placed in transport medium (Stuart medium), the scrapings from the skin/nail were placed in a sterile petri dish and were sent to the microbiology department.

The materials were mounted in 10 per cent potassium hydroxide solution and were examined under the microscope for the presence of fungal mycelial elements, budding yeast and associated structures. Modified Sabouraud dextrose agar (Oxoid) with chloramphenicol (0.05 mg/ml), modified SDA (Oxoid) with cycloheximide, Czapec's agar (Czapec-Dox agar) (Oxoid) and dermatophyte selective medium (Dermasel, Oxoid) were used for fungal culture. Incubation was carried out at room temperature (28–30°C) for two to 15 days. The isolated filamentous fungi were identified by microscopic and cultural characteristics. A germ tube test and morphology on corn meal agar were studied to aid accurate identification of *Candida* species.[4–7] Bacterial cultures were performed using blood agar and McConkey's agar media. The microorganisms were isolated and identified by the methods defined in the *Manual of Clinical Microbiology*.[8]

The external ear canals of the patients were cleaned gently by suction. Topical four per cent boric acid solution in alcohol was administered as eardrops, twice a day. Patients were instructed to obstruct their ear canals while showering. The dermatologist administered appropriate therapy for dermatomycoses. The patients were called the next and the following days, and their ear canals were suction-cleaned. They were called for follow-up on the seventh and 14th days of therapy. The patients who were free of clinical disease were followed monthly for the next three months. Topical one per cent tioconazole cream was administered to the resistant cases at the end of two weeks of therapy as explained in the 'Results' section, and they were followed up for three months.

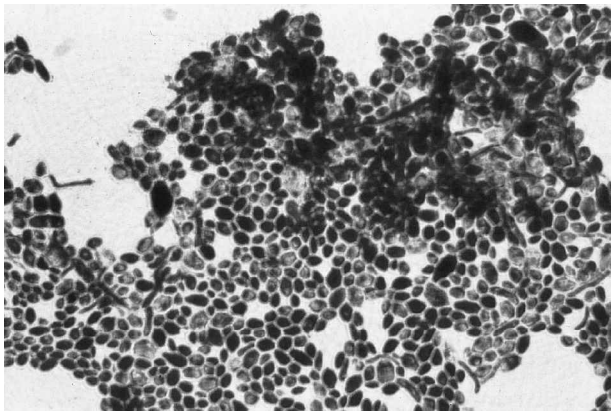

FIG. 2
Candida albicans. Gram stain of the colony on Saboraud's dextrose agar showing yeast cells (×1000).

Results

Otomycosis was evident in 97 ears of 87 patients and was bilateral in 10 of them (11.5 per cent). The left ear was involved in 41 patients (47.1 per cent) whereas the right ear was involved in 36 (41.4 per cent). The majority of the patients (65.5 per cent) were admitted in the summer and autumn when the weather was hot and humid in our region.

The most frequent symptom was itching of the ear (95.4 per cent) followed by otalgia (54 per cent), hearing loss (47.1 per cent), tinnitus (37.9 per cent) and aural discharge (33.3 per cent). The appearance of spores or mycelium in the ear canal was the most frequent finding (93.1 per cent). Purulent aural discharge (66.7 per cent) oedema of the ear canal (51.7 per cent) and perforation of the tympanic membrane (3.4 per cent) were the other findings.

Sixty-five patients (74.7 per cent) were wearing traditional head coverings and all of them were women. Twenty-four patients (27.6 per cent) had a history of swimming in the pool/sea and 20 of those (23 per cent) bathed in a spa-bath. Seventeen patients (19.5 per cent) had itching of other body parts, and three patients (3.4 per cent) had a history of long-term treatment with antibiotics.

There were fungal mycelial elements in 61 (62.9 per cent) on direct microscopic examination of the materials obtained from the otomycosis group. No mycelial elements were observed on direct microscopy of the materials obtained from the ears of the control group.

A total of 67 fungi were isolated in 63 ears (64.9 per cent) of the 58 patients in the otomycosis group. Two different species were isolated in four patients. The fungi were isolated bilaterally in five patients. *Aspergillus niger* was the most frequent isolate (44.8 per cent) (Table I). *Candida albicans* was isolated in only one ear in the control group (2.5 per cent) and this was the only isolate (Figure 2).

The fungal mycelia were evident on direct microscopy of the materials obtained from hands and/or feet of the 30 subjects in the otomycosis group (34.5 per cent). Twenty-seven fungi were isolated from 26 patients (Table II). The same fungal species were isolated both in the ear and from the hands/feet in 10

https://doi.org/10.1258/002221503321046621 Published online by Cambridge University Press

TABLE II
THE FUNGI ISOLATED FROM THE DERMATOMYCOSES IN THE OTOMYCOSIS GROUP

Isolated fungi	n
Candida albicans	11
Aspergillus fumigatus	4
Aspergillus niger	3
Candida tropicalis	3
Tinea rubrum	2
Aspergillus terreus	1
Aspergillus flavus	1
Epidermofiton floccosum	1
Microsporum canis	1
Total	27

TABLE III
THE BACTERIA ISOLATED FROM THE EARS OF THE PATIENTS IN THE OTOMYCOSIS AND CONTROL GROUPS

Otomycosis group	n	Control group	n
Streptococcus epidermidis	19	*Straphylococcus aureus*	2
Staphylococcus aureus	13	*Streptococcus epidermidis*	1
Pseudomonas aureginosa	7		
E. coli	6		
Klebsiella pneumonia	5		
Corynebacter spp.	3		
Enterobacter spp.	1		
Serratia spp.	1		
Citrobacter spp.	1		
Total	56	Total	3

of them (17.5 per cent). There was only one case with dermatomycosis in the control group (five per cent) and *Epidermofiton floccosum* was isolated from that case.

Bacteria were isolated from 53 of the 97 ear cultures (54.6 per cent) in the otomycosis group. Two different bacterial species were isolated in three patients. *Streptococcus epidermidis* was the most frequent bacterial isolate (33.9 per cent). A positive bacterial culture was evident in three ears in the control group (7.5 per cent) (Table III).

There were persistent symptoms in 20 patients after the second week of the therapy. A mixed fungal and bacterial infection was evident in 16 (80 per cent) whereas dermatomycoses were apparent in 10 of them (50 per cent). Their ear canals were cleaned by suction and one per cent tioconazole cream was applied to the external auditory canal once a day. The patients continued to use four per cent boric acid solution in alcohol as ear drops. All patients were free of disease in two weeks. None of them required antibiotic otic drops.

No recurrences were observed over a period of three months.

Discussion

Otomycosis is frequent in tropical and subtropical regions.[9–11] It is frequently seen in Turkey and is a challenging problem due to recurrence and resistance to therapy.

Identification of the predisposing factors for otomycosis is important in order to prevent the recurrence. These factors may differ from region to region owing to different weather conditions and social habits although there may be common issues throughout the world. Hot and humid air was reported as a predisposing factor.[12] The majority of our patients were admitted in the summer and the autumn when it was hot and humid in our region. Being female as well as wearing traditional head coverings were reported as predisposing factors for otomycosis.[9,10] Traditional head coverings might increase the humidity of the ear canal and create an ideal environment for fungal growth.[10] These findings are in concordance with our findings since 80.5 per cent of our patients were female and 74.7 per cent of them were wearing head coverings. The highest incidence of otomycosis was between 20–30 years in the studies of Yehia *et al.* and Paulose *et al.*,[9,10] however, the disease most commonly affected patients between 31–60 years in our study.

Being a regular swimmer was reported as a possible predisposing factor for otomycosis.[10] Swimming was one of the most common habits in the history of our patients (27.6 per cent) and the majority had a history of swimming in the pool of a spa-bath (23 per cent). A perforated tympanic membrane was observed in only three ears in our study (3.4 per cent) although this prevalence was previously reported as high as 20 per cent.[10] We do not consider chronic suppurative otitis media as a predisposing factor.

Paulose *et al.* found six patients with skin or vaginal mycosis among 193 cases with otomycosis (3.1 per cent), however, microbiological details and the importance of this finding have not been mentioned.[10] Dermatomycoses were observed in 30 patients (34.5 per cent) in our series. The same pathogenic fungi were isolated from the ear of 10 of them (17.5 per cent). The dermatomycoses were asymptomatic in 13 patients (14.9 per cent) and were diagnosed during dermatological examination. The prevalence of dermatomycoses in the control group was only five per cent. Dermatomycoses were present in 50 per cent of the cases that were resistant to the initial therapy. We suggest that dermatomycosis can be a risk factor for recurrence because autoinoculation may be possible among the parts of the body. Patients with otomycoses must have a routine dermatological examination for diagnosis and treatment of dermatomycoses.

The fungal culture was positive in 64.9 per cent of the ears with the clinical diagnosis of otomycosis. Since the diagnosis of otomycosis was basically clinical in our study and fungal mycelia were observed in 93.1 per cent of the cases on otoscopy, it is possible that some of the cases were not fungal. *Aspergillus niger* was the most common isolate (44.8 per cent). It seems that the pathogenic fungi for otomycosis in Turkey is similar to other Mediterranean countries where the majority of the pathogenic fungi were aspergilli.[2] There was only one isolate (2.5 per cent) in the control group and it was *Candida albicans*. It can be concluded that a positive fungal culture of the ear strongly suggests the presence of a fungal infection rather than saprophytic growth.

https://doi.org/10.1258/002221503321046621 Published online by Cambridge University Press

A standard treatment regimen for otomycosis has not yet been established. Meticulous cleaning of the ear canal may be sufficient in most of the patients.[2] Administration of mildly acidic drops, such as boric acid and alcohol, or modified Burow's solution may be a part of the initial therapy.[13] Topical antifungals may be administered in resistant cases. When combined with suction cleaning of the ear canal, four per cent boric acid solution in alcohol appears to be a cost-effective initial therapy for otomycosis since 67 of the 87 patients (77 per cent) recovered clinically in two weeks. Suction cleaning of the ear canal is very important and must be a part of the therapy. One per cent tioconazole cream may be administered in case of the treatment failure. The ointment form has some advantages over the eardrop form such as remaining over the ear canal skin for a longer time. Although there are no reports in the literature concerning the ototoxicity of tioconazole, the ointment form may be safer in case of a perforated tympanic membrane because its access into the middle ear may be less due to its high viscosity.

The presence of a mixed infection may indicate resistance to therapy since 80 per cent of our patients that were refractory to initial therapy had a mixed bacterial and fungal infection. Administration of antibiotic ear drops in a mixed infection is controversial. We did not administer any antibiotic ear drops to treat mixed infections. Application of topical one per cent tioconazole cream in addition to four per cent boric acid solution in alcohol was effective for the treatment of the stubborn cases. The weak antibacterial activity of tioconazole might be helpful in eliminating the bacterial infection.

Conclusions

Simultaneous treatment of otomycosis and dermatomycoses is important for preventing recurrences. Administration of boric acid solution in alcohol as an eardrop and frequent suction cleaning of the ear canal may be a cost-effective treatment of otomycosis. The presence of a bacterial infection besides a fungal infection of the ear and/or the presence of dermatomycosis may suggest resistance to therapy. In this case a topical antifungal may be administered in order to prevent treatment failure.

References

1 Falser N. Fungal infection of the ear. *Dermatologica* 1984;**169** (supp. 1):135–40

2 Stern CS, Shah MK, Lucente FE. In vitro effectiveness of 13 agents in otomycosis and review of the literature. *Laryngoscope* 1988;**98**:1173–7

3 Mugliston T, O'Donoghue, G. Otomycosis: a continuing problem. *J Laryngol Otol* 1985;**99**:327–33

4 Atlas RM, Parls LC. *Handbook of Microbiological Media*, 1st edn. Florida: CRC Press, 1993

5 Fisher F, Cook NB. Some opportunistic fungi. In: Kaszczuk S, ed. *Fundamentals of Diagnostic Mycology*, 1st edn. Philadelphia: Saunders, 1998:36–100

6 Goodman NL, Roberts GD. Laboratory diagnosis. In: Collier L, Balows A, Sussman M, eds. *Topley and Wilson's Microbiology and Microbial Infections*, 9th edn. New York: Oxford University Press, 1998:281–312

7 Roberts GD. Laboratory methods in basic mycology. In: Baron EJ, Finegold SM, eds. *Bailey and Scotts Diagnostic Microbiology*, 8th edn. St. Louis: Mosby, 1990:681–775

8 D'Amato RF, Baron EJ, Johnson RC, Murray PR, Rodgers FG, Graevenitz A. Bacteria. In: Balows A, Hausler WJ, Hermann KL, Isenberg HD, Shadomy HJ, eds. *Manual of Clinical Microbiology*, 5th edn. Washington: American Society for Microbiology, 1991:209–572

9 Yehia MM, Al-Habib HM, Shehab NM. Otomycosis: A common problem in North Iraq. *J Laryngol Otol* 1990;**104**:387–9

10 Paulose KO, Al-Khalifa S, Shenoy P, Sharma RK. Mycotic infection of the ear (otomycosis): A prospective study. *J Laryngol Otol* 1989;**103**:30–5

11 Bassiouny A, Kamel T, Moawad MK, Hindawy DS. Broad spectrum antifungal agents in otomycosis. *J Laryngol Otol* 1986;**100**:867–73

12 Stern CS, Lucente FE. Otomycosis. *Ear Nose Throat J* 1988;**67**:804–10

13 Manning SC. Mycoses. In: Paparella MM, Shumrick DA, Gluckman JL, Meyerhoff WL, eds. *Otolaryngology*, 3rd edn. Philadelphia: WB Saunders, 1991:589–96

Address for correspondence:
K. Murat Ozcan, M.D.,
Yucetepe sit. A blok. 59/6
06580 Anittepe,
Ankara,
Turkey.

E-mail: mugeozcan@yahoo.com

Dr K. Murat Ozcan takes responsibility for the integrity of the content of the paper.
Competing interests: None declared