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OTOMYCOSIS IN IMMUNOCOMPETENT AND IMMUNOCOMPROMISED PATIENTS

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Otomycosis in Immunocompetent and Immunocompromised patients

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Abstract

Background: Otomycosis has typically been described as fungal infection of the external auditory canal with infrequent complications involving the middle ear. Fungi causes about 10% of all cases of otitis external. The aim of current study is to detect the most common causative fungi in immunocompetent and immunocompromised patients and the role of local treatment versus systemic treatment.

Patient and Methods: This study is a prospective study. Among many patients presented in Al-Azher university hospitals, 125 patients were selected in this study. The patients were divided into two groups. Group A immunocompetent patients and group B immunocompromised patients.

Results: The results of clinical feature show that the symptoms in the two groups were matched except the ear discharge was significantly higher in group B more than group A. The microbiological results of fungal infection show that the majority of microbiological findings was Aspergillus flavus in 13(29.5%) patients in group A and 27 (37.5%) patients in group B. Treatment used in the two studied groups, the first line of treatment was clearance of fungal mass, the local antifungal was used in 47 patients (94.0%) of the patients in group A, while only 3 patients was treated with systemic antifungal. In group B, 61 patients (81.3%) treated by local antifungal, while 14 patients (18.7%) treated by systemic antifungal.

Conclusion: Otomycosis may affect both immunocompetent and immunocompromised patient, caused mainly by was Aspergillus flavus, standard of care is local antifungal however systemic antifungal may be used in selected patients especially those who are immunonocompromised.

Key words: Otomycosis; Immunocompetent; Immunocompromised..

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INTRODUCTION

The immune system is a network of cells, tissues, and organs that work together to defend the body against attacks by "foreign" invaders. These are primarily microbes, infection-causing organisms such as bacteria, viruses, parasites, and fungi. Because the human body provides an ideal environment for many microbes, they try to break in. It is the immune system's job to keep them out or, failing that, to seek out and destroy them.[1]

Otomycosis is fungal infection of the external auditory canal, its associated complications sometimes involving the middle ear. Usually occurs as a result for loss of the protective lipid/acid balance of the ear. Fungi cause around 10% of all cases of otitis externa. In recent years, opportunistic fungal infections have gained greater importance in human medicine, this may explained by the increasing number of immunocompromised patients. However, such fungi may also produce infection in immunocompetent hosts and immunocompromised patients; treatment of otomycosis should be vigorous to prevent complications especially hearing loss and invasive temporal bone infection. Its prevalence is greatest in hot humid and dusty regions of the tropics and subtropics. Fungal infections of the ear firstly were described by Andrall and Gaverret; although a wide spectrum of fungi are involved, Aspergillus and Candida are the most common species encountered.[2]

The aim of study is to detect the most common causative fungi in immunocompetent and immunocompromised patients and the role of local treatment versus systemic treatment.

PATIENTS AND METHODS

Data were documented after a written informed consent was obtained from all patients enrolled in the study. Among many patients presented in ENT clinics of Al-azhar university hospitals, 125 patients with otomycosis were selected to be enrolled in this study. This study was submitted prospectively on the patients during the period from 2014 till 2019.

The selected patients were divided into two group; Group A: Consisted of 50 (40%) immunocompetent patients with otomycosis, and Group B: Consisted

of 75 (60%) immunocompromised patients with otomycosis**.** Group B was sub-divided into 5 subgroups as following**:** Uncontrolled Diabetic patients (n=15; 20%), patients with long use of or mega dose steroid administration (n=15; 20%), Patients receiving chemotherapy (n=15; 20%), Patients with malignancy (n=15; 20%), and Patients complaining of renal failure (n=15; 20%).

We included patients diagnosed clinically as otomycosis, age from 20-70 years, and patients with past history of ear surgery. We excluded Patients under the age of 20 years and above 70 years, HIV patients, and terminal stage of immunocompromised patients.

The samples of 125 cases were collected from the external auditory canals as follow**:** One hundred thirteen cases from the external auditory canal, nine cases from tympanic membrane, three cases from tympanic cavity of the middle ear or mastoid cavity. Samples collected by sterile cotton swabs and sterile forceps, brought to mycology laboratory and processed immediately to have the exact nature of fungal flora involved in the disease.

Each obtained swab was exposed for direct microscopic examination and next for culture examination. The presence of fungal structures is seen in potassium hydroxide (KOH) wet mounts and culture on Sabouraud's Dextrose Agar medium. The diagnosis of otomycosis was made on the basis of the recognizable and characteristic appearance of fungal debris and fruiting bodies under microscope. The microscopic examination shows discrete clumps of hyphae with conidiophores.

Treatment used in the two studied groups as follow**:** The first line of treatment was clearance of fungal mass then with the local antifungal (Clotrimazole, fluconazole, nystatin or Miconazole), If no response patient treated with systemic antifungal (fluconazole and Voriconazole).

Statistical analysis:

Recorded data were analyzed using the statistical package for social sciences, version 20.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed as mean ± standard deviation (SD). Qualitative data were expressed as frequency and percentage. Unpaired-samples t-test was used when comparing between two independent means. The paired sample t-test was used when comparing two related means. The Chi-square test was used to compare two proportions. The confidence interval was set to 95%, and the margin of error accepted was set to 5%.

RESULTS

The age in group A was ranged from 21-62 years with a mean of 36.8±12.6 years, while in group B the age ranged from 22-65 years with a mean of 39.2±11.7 years, there was no significant difference between the two studied groups regarding age. The majority of the patients in the two groups was males 32 (64%) patients in group A and 51 (68%) patients in group B, and on comparing the two studied groups it was found that there was no significant difference between the two groups. The laterality distribution in group A, the right side was in 25 (50%) of the patients, while 19 (38%) of the patients in the left side, the bilateral was found in 6 (12%) of the patients. In group B, 37 (49.3%) of the patients the affected side was right, while 31 (41.3%) in the left side, and 7 (9.3%) of the patients was bilateral.

Regarding the occupation, the majority of the patients in the two groups was farmer 16 and 30 (32.0, 40.0%) in the two groups respectively, followed by employee 15 and 18 patients (30.0% and 24.0%) in the two groups respectively. The symptoms in the two groups were matched except the ear discharge was significantly higher in group B more than group A ($p < 0.05$), while the hearing loss, itching, ear pain and ear block in the two groups show the same percent without significant difference. However the most frequent symptom was ear discharge and the least frequent symptom was hearing loss in both groups .

Otoscopic examination revealed the presence of clinically based characters of otomycosis with varying degree of severity and presentation. The severity was more noticed in immunocompromised patients. Also seven cases had previous past history of ear surgery, two of them had history of tympanoplasty and the rest five cases had history of canal wall down mastoidectomy .Two cases of the previously operated patients were immunocomptent patients (one tympanoplasty and one mastoid surgery), while the other five were immunocompromised patients (one tympanoplasty and four mastoid surgery).The five cases of previous mastoid surgery needed revision surgery, where granulation tissues were removed in all cases ,and residual cholesteatoma matrix were found and removed in three cases with a little amount of pus.
Also there was eleven cases with tympanic membrane perforation including the previously operated cases. Five cases of the tympanic membrane perforation were attic and marginal type, while the remaining six cases had central perforation of different size and location.

In those who diagnosed clinically with otomycosis, the positive Otomycosis in microbiological assessment was found in 44 patients (88%) in group A and in 72 patients (96%) in group B. There was a significant increase in Otomycosis in group B more than group A.

Table (1): shows the microbiological results of fungal infection, the majority of microbiological findings was Aspergillus flavus in both groups 13 and 27 (29.5% and 37.5%) respectively in the two groups and show insignificantly difference in the two groups, Aspergillus fumigates, Aspergillus Niger, Candida albicans, Aspergillus species and Candida species, Penicilium species and Fusarium species show insignificant difference between the two groups.

Table (2): show the distribution of sub group of group B regarding the microbiological results, the

majority of the patients in all sub groups had a microbiological types; Aspergillus flavus and Aspergillus Niger, on comparing the different sub groups regarding the microbiological results it was found that there was no significant difference between the sub groups.

Table (3): Treatment used in the two studied groups, the first line of treatment was clearance of fungal mass, the local antifungal was used in 47 cases (94.0%) of the patients in group A, while only 3 cases was treated with systemic antifungal. In group B, 64 patients (81.3%) treated by local antifungal, while 18.7% used treated by systemic antifungal, there was a significant increase in the number of patients in group B treated by systemic antifungal more than group A. That's mean the statistical difference between two groups (P= 0.012).

	Group A "n=50"		**Group B "n=75"**		**P**
	No.	**%**	**No.**	**%**	
Aspergillus flavus	13	29.5	27	37.5	0.064
Aspergillus Niger	9	20.5	13	18.1	0.421
Aspergillus fumigates	8	18.2	8	11.1	0.091
Candida albicans	4	9.1	11	15.3	0.31
Aspergillus species & Candida species	3	6.8	6	8.3	0.40
Penicilium species	5	11.4	4	5.6	0.113
Fusarium species	2	4.5	3	4.2	0.25
Total positive	44		72		

Table 1: Microbiological results of fungal infection.

	Diabetic Group		**Steroid administration Group**		**Undergoing chemotherapy Group**		**Malignancy**		**Renal failure**		**Total**
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	
A. flavus	*6*	*42.9*	*6*	*42.9*	*5*	*35.7*	*5*	*33.3*	*5*	*33.3*	27
A. niger	*2*	*14.3*	*4*	*28.6*	*2*	*14.3*	*3*	*20.0*	*2*	*13.3*	13
A. fumigatus	*3*	*21.4*	*1*	*7.1*	*2*	*14.3*	*1*	*6.7*	*1*	*6.7*	8
Candida albicans	*1*	*7.1*	*1*	*7.1*	*3*	*21.4*	*4*	*26.7*	*2*	*13.3*	11
Aspergillus & Candida	*1*	*7.1*	*1*	*7.1*	*1*	*7.1*	*2*	*13.3*	*1*	*6.7*	6
Penicilium	*1*	*7.1*	*1*	*7.1*	*0*	*0.0*	*0*	*0.0*	*2*	*13.3*	4
Fusarium	*0*	*0.0*	*0*	*0.0*	*1*	*7.1*	*0*	*0.0*	*2*	*13.3*	3
Total positive	14		14		14		15		15		72
X^2	1.72										
P	0.611										

Table 2: Distribution of sub group of group B regarding the microbiological results.

	Group A "n=50"		**Group B "n=75"**		**P**
	No.	**%**	**No.**	**%**	
clearance of fungal mass	50	100.0	75	100.0	-
local antifungal					
Clotrimazole	27	54.0	35	46.7	0.537
Fluconazole	11	22.0	11	14.7	0.208
Nystatin	6	12.0	7	9.3	0.320
Miconazole	3	6.0	8	10.7	0.210
systemic antifungal					
Fluconazole	1	2.0	10	13.3	0.012*
Voriconazole	2	4.0	4	5.3	0.365

Table 3: Treatment used in the two studied groups

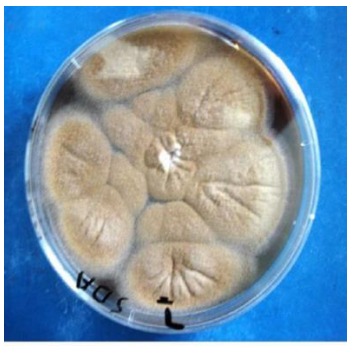

Fig (1): Morphology of *Aspergillus flavus* culture on Sabouraud's Dextrose Agar medium. (From diabetic patient).

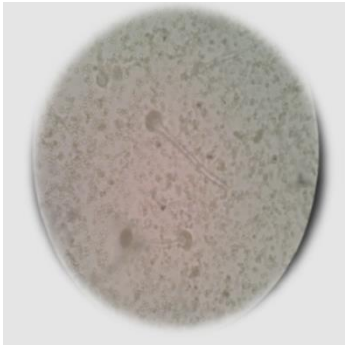

Fig (2): Microscopic appearance Aspergillus flavus (from renal failure patient)

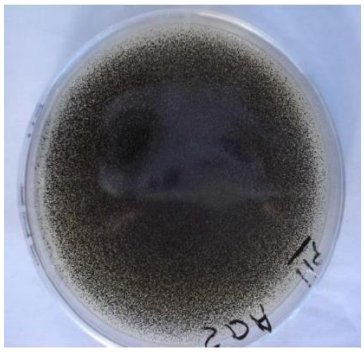

Fig (3): Morphology of Aspergillus Niger culture on Sabouraud's Dextrose Agar medium (from undergoing (chemotherapy patient

DISCUSSION

The results of our study show that the highest age group of patients in both studied groups was 26-40 years, our results was in agreement with Ho, et al study[3], where they study the Otomycosis in immunocompetent and immune-compromised patients, and they found that the highest incidence of otomycosis was seen in the age group of 21 to 30 years (48%).[3]

In this study, the unilateral incidence show a high percent of infection by otomycosis in both studied groups (88.0% in group A, and 75.0% in group B) respectively, while the bilateral incidence was 12.0% and 25.0% in the two groups, respectively, so the majority of the patients had unilateral infection, while the bilateral incidence was nearly the double in immunocompromised cases.

Study carried out by Anwar et al, on Clinic-mycological study of otomycosis in a hospital based study, it was founded that the unilateral involvement is commonly seen in otomycosis.[4] In our study, the majority of cases were unilateral in 44 (88%) and 68 (90.6%) patients in group A and group B respectively.

In the present study the most frequent symptoms was ear discharge followed by ear pain and itching, then ear blockage, where the hearing loss show the lowest frequent symptoms. In study carried out by Pradhan et al.[5] the predominant complaints were itching and ear discharge, followed by earache, ear blockage, hearing loss and tinnitus5. Twenty percent of the patients had all the symptoms, this results was in agreement with our study .

In the present study, the cultural documented incidence of otomycosis in both groups show that in immunocompetent group (A) the otomycosis was found in 44 (88%) of cases while in immunocompromised group (B) the otomycosis was found in 72 (96%), so there was a significant increase in number of otomycosis in group B more than group A ($p < 0.05$).Logically, it is more expected that an immunocompromised host is more susceptible to otomycosis, and at increased risk for potential complications from otomycosis.[6]

In this study the microbiological results of fungal infection show that the majority of microbiological findings was Aspergillus flavus in both groups 13 and 27 patients (29.5% and 37.5%) respectively in both groups and there was no significantly difference between the two groups, Aspergillus Niger was matched in both groups without significant difference, Aspergillus fumigatus was slightly higher in group A more than group B without significant difference. Aspergillus niger, Candida albicans, both Aspergillus species and Candida species, Penicilium species and Fusarium species show insignificant difference between the two groups. Infectious mould agents which are present in environment include: Aspergillus species, Penicillium, Scopulariopsis, Rhizopus, Mucor, etc.

Several studies showed that Aspergillus niger is a major agents of otomycosis in Iran.[7] It was reported Aspergillus niger as a major etiologic agent of otomycosis in Turkey and Australia.[8]

In the present study Aspergillus flavus was the most common isolate, followed by Aspergillus nigar and Aspergillus fumigates, also shows that Candida species are responsible in of fungal infection similar to Araiza et al[9], although in Dorko et al, study Candida species were the main etiologic agents.[10] That is why Aspergillus infection should be considered part of the differential diagnosis of patients with mastoiditis who are relatively more in immunocompromised and who are not responding to antibiotic treatment regardless of complication. However a published report about a case of fungal mastoiditis highlights difficulty of diagnosis of invasive Aspergillosis, this report approved that deep tissues biopsy or isolation from blood culture is required for histopathological confirmation. In

immunocompromised patients, treatment of otomycosis should be vigorous to prevent complications such as hearing loss and invasive temporal bone infection.[11]

Isolated Candida species came in the second place in our series , 7 (15.9%) patients in group (A) and 17 (23.6%) patients in group (B), with total 24 isolate from our patients , in compare to other studies have shown that candida species was the mainly responsible for otomycosis, especially in immunocompromised hosts. However infection with candida can be more difficult to detect clinically because of its lake of characteristics appearance like Aspergillus which can be present as ottorhea not responding to antimicrobial. Otomycosis attributed to Candida was often identified by clinical data.[12] Among Candida species, Candida albicans was the main isolate type of candida species in our series. This give us a reasonable explanation why Candida albicans virulence has been debated for many years.[13]

Epithelial cells and immunity is well studied in many works, most of our patients with otomycosis had the bad habits of external ear manipulation which insult the epithelial lining of external auditory canal .Epithelial cells comprise mucosal surfaces and are usually the first line of defense against fungal pathogens. For example, in the vast majority of cases of Candida infection are superficial and restricted to mucosal surfaces, and it is only kept mucosal until surfaces are breached that systemic immunity comes in to play).[14]

According to results of our study, there was 7 cases out of the whole 125 patients had past history of ear surgery, 2 of them underwent failed tympanoplasty and the remaining 5 patients underwent canal down mastoidectomy.

Two failed tympanoplasty, were 1 immunocompetent and 1 immunocompromised patient. On the other hand, the 5 mastoid operation were 4 immunocompromised patients and 1 case immunocompetent patient.

The whole previous mastoid operation cases needed to do revision surgery. In three of them we detect residual cholesteatoma matrix with marked granulation tissues.[15]

Although fungal otitis externa is a well-established entity in tympanic membrane perforation due to fungal otitis externa as a clinical features is an infrequently reported complications, that physician find it as missed diagnosis.[3] Also there was 11 cases with tympanic perforations in our series, 5 of them were marginal and the other 6 were central in position. Three cases of these six underwent revision tympanoplasty, 2 cases healed spontaneously and one case persist perforation but refuse to do an operation. Tympanic membrane perforation and otitis media are not uncommon with otomycosis. The incidence of tympanic perforation in otomycosis was found to be 11% and perforation was more common with otomycosis caused by candida albican. Tympanic membrane perforation is seen more commonly in immunocompromised than immunocompetent patients, this may be due to the fact that majority of the cases of otomycosis in immunocompromised patient are caused by Candida albicans, Candida albican more common in patients with pervious tympanic membrane perforation.[16]

However, in our patients the fungus had probably entered the mastoid cavity through the marginal perforation induced by coexisting cholesteatoma. Other possible routes of the entry into the middle ear are the meningogenic pathway following fungemia, and spread through the Eustachian tube from the nasopharynx.[17]

Aspergillus and Candida species are the most commonly identified pathogens in otomycosis4 our results argue that the predominance of Aspergillus and candida species is related to the inflammatory process of the ear. Candida infection are acquired across the mucosa that it is why, of paramount importance to understand the basic biological mechanisms that normally restrict Candida species to mucosa surfaces.

In present study the treatment used in the two studied groups, the first line of treatment was clearance of fungal mass and use of topical antifungal. In group A the local antifungal was used in 47 (94.0%) cases, while only 3 (6%) cases was treated with systemic antifungal. In group (B), 61 (81.3%) cases treated by local antifungal, while 14 (18.7%) cases treated by systemic antifungal. In both groups In spite of most patients respond to topical treatment, systemic treatment is a considerable option especially in immunocompromised patients.

Local antifungal “Clotrimazole” used in the majority of patient 27 and 35 (54% and 46.7%) respectively in group A and group B other local treatment include Fluconazole, Nystatin and Miconazole . In systemic therapy we used Fluconazole and Voriconazole.

CONCLUSION

Otomycosis may affect both immunocompetent and immunocompromised patient, caused mainly by was Aspergillus flavus followed by Aspergillus Niger, Candida albicans is acosnsidarable causative agent in immunocompromised patients**.**

Though the disease can be diagnosed clinically, microscopic examination and fungal culture is required for confirmation of the diagnosis **.**
Standard of care is topical antifungal however systemic antifungal may be used in selected cases especially those who are immunonocompromised.

REFERENCES

1. Holmskov U, Thiel S, Jensenius JC. Collectins and ficolins: humoral lectins of the innate immune defense. Annu Rev Immunol 2003; 21:547–578 .
2. Satish S, Viswanatha. B. and Manjuladevi, A Clinical Study of Otomycosis. IOSR-JDMS. 2013; 5 (2): 57-62.
3. Ho T, Vrabec J, Yoo D. Otomycosis: Clinical features and treatment implications". Otolaryngology-Head and neck surgery 2006; 135: 787-791.
4. Anwar K, Muhammad G. Clinical features, predisposing factors and treatment implications". Pak Med Sci 2014; Vol.30 No 3:564-567.
5. Pradhan B, Tuladhar NR, Amatya RM. Prevalence of otomycosis in outpatient department of otolyryngology in tribhuvan university teaching Hospital, Kathmandu, Nepal". Ann Otol Rhinol Laryngol. 2003; 112(4): 384-387.
6. Calderon A. Candida and candidiasis, ASM Press, Washington, DC, USA, 2nd edition. 2002.
7. Zaei A. Mycological Studies in 15 cases of otomycosis. Pakistan Journal of Medical Sciences 2006; 22: 486-488.
8. Hurst B. Outcome of twenty two cases of perforated tympanic membrane caused by otomycosis".J Laryngol Otol 2001; 115(11):879-80
9. Araiza J, Canseco P, Bonifaz A. Otomycosis: clinical and mycological study of 97 cases". Rev LaryngoOtolRhinol (Bord). 2006; 127:251-4.
10. Dorko E, Jenca A, Orencák M, et al. Otomycoses of candidal origin in eastern Slovakia". Folia Microbiol (Praha) 2004; 49: 601-4.
11. Rutt L, Sataloff T. Aspergillus otomycosis in an immunocompromised patient" Ear Nose Throat journal 2008; 87(11):622-623.
12. Vennewald I, Schönlebe J, Klemm E. Mycological and histological investigations in humans with middle ear infections, Mycoses journal 2003; 46(1–2):12–18.
13. Moyes L, Murciano C, Runglall M, et al. candida albicans yeast and hyphae are discriminated by MAPK singling in vaginal epithelial cells,"PLoS ONE,vol.6,no.II,Article Ide.2011; 26580.
14. Moyes L,Murciano M, Runglall M, et al. Activation of MAPK/c-Fos induced responses in oral epithelial cells is specific to candida albicans and candida dubliniensis hyphae," Medical Microbiology and Immunology 2012; vol.201,no.1,pp.93-101.
15. Pontes Z, Silva A, Lima E, et al., . Otomycosis: a retrospective study" Braz J Otorhinolaryngol.2009; 75:367-70.
16. Viswanatha B, Naseeruddin K. Fungal infections of the ear in immunocompromised host" A review. Mediterr J Hematol Infect Dis2011; 3:e2011003.
17. Masafumi O, Ken I, et al., Fungal Mastoiditis in Immnocompetent Persons". Eur Arch Otolaryngol.2001; 258:106-108.