

Otitis Externa-The Clinical Pattern in a Tertiary Institution in Singapore

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Abstract

Otitis externa is a common condition in the tropics. Most of the data related to the condition have arisen from Western sources. Locally, the aetiology and the pathogens identified have not been systematically studied. A prospective study involving 107 patients was conducted. Otomycosis was frequently encountered. Coagulase negative Staphylococcus and Aspergillus niger were the most common bacteria and fungus cultured respectively. Gentamicin and polymyxin B were the most effective topical agents against Pseudomonas aeruginosa. Self-cleaning of the ears was the most common predisposing factor.

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Introduction

Although otitis externa is a common otological condition, the literature pertaining to it is sparse in contrast to the vast amounts of articles that have been published on otitis media. Indeed, the exact pathogens involved in the local community have not been documented. This study aims to describe the clinical pattern of otitis externa in Singapore, in particular the pathogens cultured and their susceptibility to topical medications.

Materials and Method

The study involved 107 patients from April 1993 to October 1995 who were referred to the Department of Otolaryngology, National University Hospital. The diagnosis of otitis externa was made clinically. In particular, a detailed history of certain social habits of the patients was recorded. After having removed debris from the ear canal to prevent contamination, samples were then obtained by mopping a sterile cotton stick against the inflamed external auditory canal. This was then transported in Amies transport media to the microbiology laboratory on the same day for culture. The swabs were applied to horse blood, chocolate, McConkey and Sabouraud's agar. Bacterial cultures were then ob-

tained after 3 days. Fungal cultures were incubated for 14 days before they were considered to have no organisms present.

Results

A total of 107 patients, comprising of 47 males and 60 females, were studied. There were 64 Chinese (59.8%), 14 Malays (13.1%), 18 Indians (16.8%) and 11 classified under "others" (10.3%). The ages of the patients ranged from 1 year to 82 years. The highest incidence was in the fifth decade (21.5%). There were 83% who had unilateral disease while 17% were bilateral. Virtually all (96%) were permanent residents in the tropics. The most common factor that predisposes to the development of otitis externa was self-cleaning of the ears (Table I). Of the 67 patients who practiced self-cleaning, 86.6% used cotton bud applicators, while 9% used fingers for picking the ears. None of the patients had malignant otitis externa. The commonest symptoms were otalgia and itch (Table II).

A random survey of a population of 100 patients with regards to their social habits was conducted concurrently at the A & E service. This showed that 37% engaged in regular swimming while 30% practiced self-

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TABLE I: NUMBER/PERCENTAGE OF PATIENTS ACCORDING TO PREDISPOSING FACTORS

Predisposing factors	Yes	No
Diabetes mellitus	7 (6.5%)	100 (93.5%)
Radiotherapy treatment	3 (2.8%)	104 (97.2%)
Dermatological disease	3 (2.8%)	104 (97.2%)
Regular swimming	32 (29.9%)	75 (70.1%)
Self-cleaning of ears	67 (62.6%)	40 (37.4%)

TABLE II: DISTRIBUTION OF PATIENTS ACCORDING TO SYMPTOMS

Symptoms	Yes	No
Otalgia	75 (70.1%)	32 (29.9%)
Itch	65 (60.7%)	42 (39.3%)
Discharge	40 (37.4%)	67 (62.6%)
Deafness	35 (32.7%)	72 (67.3%)
Fullness	24 (22.4%)	83 (77.6%)

cleaning of the ears. This is in contrast to the higher rate (62.6%) of self-cleaning amongst the patients in our series.

The total number of patients who had a positive culture was 93 (86.9%). Of the patients with positive cultures, 47 (50.5%) had single organisms while the remaining 46 (49.5%) had 2 or more organisms. There were 58 patients who had fungus cultured, while 82 patients had bacteria present. The pathogens cultured are shown in Table III.

Within the group of patients who gave a history of swimming regularly, the most common bacteria isolated was *Pseudomonas aeruginosa*, in contrast to coagulase negative *Staphylococcus* in the overall study. The most frequent fungus isolated in swimmers remained *Aspergillus niger*. Of the patients who self-clean the ears regularly, the pattern of bacterial and fungal cultures were similar to the overall study.

The only effective antibiotics for which *Pseudomonas aeruginosa* was susceptible were gentamicin and polymyxin B (Table IV). Gentamicin was effective against the

TABLE III: DISTRIBUTION OF TYPES OF BACTERIA AND FUNGUS CULTURED

Types of bacteria	Number (%) of bacterial cultures	Types of fungus	Number (%) of fungal cultures
Coagulase negative <i>Staphylococcus</i>	31(34.4%)	<i>Aspergillus niger</i>	21(35.0%)
<i>Pseudomonas aeruginosa</i>	27(30.0%)	<i>Candida parapsilopsis</i>	14(23.3%)
<i>Staphylococcus aureus</i>	14(15.6%)	<i>Candida spp</i>	10(16.7%)
<i>Peptostreptococcus</i>	3 (3.3%)	<i>Aspergillus terreus</i>	8(13.3%)
<i>Streptococcus spp</i>	2 (2.2%)	<i>Aspergillus clavus</i>	4 (6.7%)
<i>Enterococcus spp</i>	2 (2.2%)	<i>Candida krusei</i>	2 (3.3%)
<i>Proteus mirabilis</i>	2 (2.2%)	<i>Candida albicans</i>	1 (1.7%)
<i>Diphtheroids</i>	2 (2.2%)		
<i>Klebsiella pneumoniae</i>	2 (2.2%)		
<i>Enterobacter spp</i>	1 (1.1%)		
<i>Serratia marscesence</i>	1 (1.1%)		
<i>Serratia liquefacience</i>	1 (1.1%)		
<i>Citrobacter spp</i>	1 (1.1%)		
<i>Torulopsis glabrata</i>	1 (1.1%)		
Total	90(100%)	Total	60 (100%)

3 commonest bacteria cultured, in particular *Pseudomonas aeruginosa* (100%) and *Staphylococcus aureus* (85.6%). *Pseudomonas aeruginosa* has a susceptible rate of only 63% to neomycin.

Discussion

From the results, a notable finding was that the Indian ethnic group constituted 16.8% in our series. In the 1990 census of population in Singapore, the proportion of Indians in the population was 7.1%. However, this may not necessarily represent a racial predilection for the condition as other variables are involved. Indeed of the 18 Indian patients, 15 (83.3%) practiced self-cleaning of the ears, thus suggesting that this habit may also be responsible for the development of the condition. Trauma to the external ear is often the implicated factor in the development of otitis externa. The methods used in

TABLE IV: SUSCEPTIBILITY PATTERNS OF THE 3 COMMONEST BACTERIA CULTURED

Antibiotic	Coagulase negative <i>Staphylococcus</i>		<i>Pseudomonas aeruginosa</i>		<i>Staphylococcus aureus</i>	
	Sensitive	Resistant	Sensitive	Resistant	Sensitive	Resistant
Gentamicin	24 (77.4%)	7 (22.6%)	27 (100%)	0 (0%)	12 (85.7%)	2 (14.3%)
Neomycin	26 (83.9%)	5 (16.1%)	17 (63.0%)	10 (37.0%)	13 (92.9%)	1 (7.1%)
Chloramphenicol	28 (90.3%)	3 (9.7%)	0 (0%)	27 (100%)	11 (78.6%)	3 (21.4%)
Polymyxin B	NA	NA	27 (100%)	0 (0%)	NA	NA

NA: Susceptibility to polymyxin B was not tested against Gram-positive organisms as the drug has no *in vitro* action with Gram-positive bacteria.

"picking" of the ears may vary from using fingers to cotton buds as reported in this study. There is therefore, not surprisingly, strong evidence that damage to the natural skin barrier of the external auditory canal predisposes to invasion by the flora of the ear, which otherwise were merely commensals, leading to the subsequent process of inflammation and suppuration that is expressed clinically as otitis externa. Swimming per se did not appear to be an important predisposing factor as 70% of the patients in the series did not swim regularly. However, it predisposes to maceration of the ear canals and coupled with the habit of mopping with cotton bud applicators will certainly result in damage to the natural skin barrier. Adding to these factors is the humidity in the environment causing the production of sweat. These are multiple factors which forms the current concept of the pathogenesis of otitis externa.² As expected, otalgia and itch were the most common symptoms in this study.

Although bacteria (88.2%) was more frequently isolated than fungus (62.4%), this study further reflects the greater frequency of otomycosis in tropical countries in contrast to temperate regions where isolation of fungus is reported to be between 4% and 9.3%.^{3,4} Almost 50% of the cultures were polymicrobial. This appears to be a common feature in all studies on the microbial flora of otitis externa. It could be that the multiple flora conveys a greater virulence and imparts a more significant inflammatory reaction.

Coagulase negative *Staphylococcus* was the most common bacteria isolated. The microbial flora of the external ear canal is similar to the flora of the skin elsewhere. There is a predominance of *Staphylococcus epidermidis*, *Staphylococcus aureus*, *Corynebacteria spp* and to a lesser extent, anaerobes like *Propionibacteria acne*.⁵ Coagulase negative *Staphylococcus* includes certain groups of *Staphylococcus* species, e.g. *Staphylococcus epidermidis*. Often dismissed as contaminants or commensals, they can nevertheless cause serious opportunistic infection. It is likely that the practice of self-cleaning of the ears amongst the patients predisposes them to skin abrasions, allowing for the invasion and flourishing of these commensals. In contrast, *Pseudomonas aeruginosa* has always been identified in other series as the most common bacteria isolated.⁶⁻⁹ It may be argued that contamination may be the cause that coagulase negative *Staphylococcus* is commoner than *Pseudomonas aeruginosa* in our series but care had been taken in the sampling of the inflamed canal in order to obtain material from the affected area only. Nonetheless, *Pseudomonas aeruginosa* remains a frequently cultured bacteria in our series.

In other similar studies, the usual fungal isolates were *Aspergillus niger* and *Candida albicans*.¹⁰⁻¹⁴ As such, there does not appear to be much difference in the fungus cultured in our series when compared

to other studies. Nonetheless, it is worthwhile to note that in his review of the literature, Lucente¹⁵ found a predominance of *Aspergillus niger* in the studies conducted in tropical countries in contrast to *Candida* species being more frequently isolated in temperate countries.

An interesting finding was the greater frequency of *Pseudomonas aeruginosa* isolated in patients who swam regularly. This is in line with the findings in the Western literature in which swimming and *Pseudomonas aeruginosa* were frequently identified.^{8,16} There has been suggestions that *Pseudomonas aeruginosa* present in recreational fresh water lakes may increase the risk of developing otitis externa.¹⁷ In the context of our population, a more detailed analysis needs to be carried out before an association between swimming and *Pseudomonas otitis externa* can be made.

It is interesting to note that gentamicin is effective against most of the 3 bacteria commonly cultured. More importantly, gentamicin and polymyxin B are 100% effective against all the *Pseudomonas* strains cultured while conversely, chloramphenicol as expected was found to be totally ineffective. *Pseudomonas* showed a susceptibility rate of 63% to neomycin while the susceptibility rate of coagulase negative *Staphylococcus* and *Staphylococcus aureus* were 83.9% and 92.9% respectively. It would therefore imply that in *Pseudomonas* infections of the external ear, the choice of drugs would be topical gentamicin or polymyxin B. However, Dohar et al¹⁸ reported a susceptibility of *Pseudomonas aeruginosa* to gentamicin of only 79%, raising the possibility of resistant strains developing. There should be awareness that if gentamicin was used primarily in all cases of otitis externa, then the likelihood of resistant strains will be high. It may therefore be wise in clinical situations to initially use neomycin coupled with adequate aural toilet, reserving gentamicin for those strains that are resistant to neomycin.

Conclusions

Self-cleaning of the ears is an important predisposing factor in the pathogenesis of otitis externa in the local population. Together with other factors such as swimming regularly and the humidity of the environment, they predispose to the breakdown of the natural skin barrier, thus allowing for organisms to flourish and cause inflammation to set in. Otomycosis is commonly encountered, the most frequent fungus isolated being *Aspergillus niger*. The most common bacteria cultured was coagulase negative *Staphylococcus*. Gentamicin and polymyxin B are effective against *Pseudomonas aeruginosa*.

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