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Original article

## Does fungal infection is the main cause for persistent middle ear otorrhea?

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### ABSTRACT

**Objectives:** Chronic suppurative otitis media commonly caused by bacterial infection however with the commencement of antibiotics, the otorrhea would always resolved within a short period of time. The aim of this study was to look at the involvement of fungus in CSOM with persistent otorrhea and association between topical antibiotic eardrop with fungal infection in CSOM.

**Methods:** Sixty-two patients were included in this cross sectional study which was carried out in Otorhinolaryngology clinic Hospital Universiti Sains Malaysia. All CSOM patients with persistent otorrhea for at least two weeks were included in this study. Patient with otomycosis, intact tympanic membrane, otitis externa and cholesteatoma were excluded from the study.

The swab samples for bacterial and fungal culture were collected under aseptic precautions. Ofloxacin eardrop were prescribed to all patients for two weeks. The patients were advised to strictly clean the ear canal before applying the ear drops and to keep the ear dry. After two weeks, if there were persistent ear discharge, swab for fungal culture and bacterial study were repeated.

**Results:** The incidence of fungal infection was 6.4% (4/62). The fungi isolated were *Aspergillus*, *Candida* and *Penicillium* species. Majority cases of otorrhea cultured bacteria. There was no association of fungal infection and topical antibiotics instead we found ofloxacin to be an effective medication in treating otorrhea.

**Conclusion:** The incident of fungal colonization in persistent otorrhea is low (7%). The fungal isolated were *Aspergillus flavus*, *Candida parapsilosis* and *Penicillium* spp. Bacteria are still the most common microorganism in persistent otorrhea.

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### 1. Introduction

Chronic suppurative otitis media (CSOM) is one of the commonest diseases in many developing and over-populated countries of the world. The prevalence of CSOM was reported to be ranging from less than 1–46% with the highest prevalence in the inuits of Alaska, Canada, Greenland, Australia aborigines and certain North American natives.<sup>1</sup> Malaysia was reported to have a prevalence of 2% among the school children.<sup>2</sup> The incidence of CSOM appears to be higher in developing countries because of poor socio-economic status, poor nutrition and lack of health consciousness.

Lin et al. however reported that the prevalence of CSOM had dramatically decreased with the widely used of antibiotics.<sup>3</sup>

The most common organism involved in CSOM is bacteria. Verhoeff et al. reviewed 79 papers related to CSOM and they found that the most frequently isolated aerobic organisms were *Pseudomonas aeruginosa* (18–67%), *Staphylococcus aureus* (14–33%) and gram-negative organisms such as *Proteus* spp., *Klebsiella* spp., *Escherichia* spp. and *Haemophilus influenza* meanwhile the most frequently isolated anaerobic organisms were *Bacteroides* spp. (1–91%) and *Fusobacterium* spp.(4–15%).<sup>4</sup>

Brook reviewed studies on CSOM during the last 25 years and he found that anaerobes were picked up over half of the aspirated ears.<sup>5</sup> The main anaerobes reported were *Peptostreptococcus* spp., Anaerobic Gram negative bacilli (AGNB) and *Fusobacterium nucleatum*.

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Recently, fungus was thought to play part in CSOM especially in humid region. The concern regarding the superimposed fungal infection in prolonged otological antibiotics usage was then raised. A few studies had revealed *Aspergillus* and *Candida* spp as the predominant fungi.<sup>6,7</sup> Fungal is believed to flourish well in hot and humid environment like in Malaysia which is an equatorial country. The aim of this study was to look at the involvement of fungus in CSOM with persistent otorrhea.

## 2. Materials and methods

A cross sectional study was done involving patients with active ear discharge attending otorhinolaryngology (ORL) clinic in a tertiary hospital. All patients diagnosed as having CSOM with persistent ear discharge for two weeks or more were included in the study. Patient with otomycosis, intact tympanic membrane, otitis externa and cholesteatoma were excluded from the study.

History of ear symptoms such as otorrhea, ear fullness, tinnitus, otalgia, hearing impairment and past medical and surgical histories were documented. Otoscopic examinations were done. Nature of the discharge, types and area of tympanic membrane perforation were recorded.

The samples were collected under aseptic precautions from over the perforated tympanic membrane using sterile cotton wool tipped applicators. The specimens were sent for fungal culture and microscopic examination of bacteria.

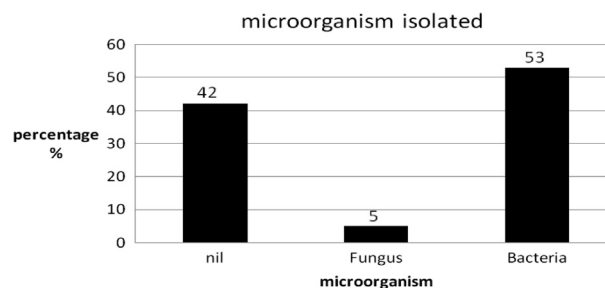
After taking the ear swab, dry mopping and suction clearance were done. Empirical otic ofloxacin three drops thrice a day were prescribed to all patients for two weeks regardless of previous topical eardrop used. The patients were advised to strictly clean the ear canal before applying the ear drops and to keep the ear dry. After two weeks, if there were persistent ear discharge, swab for fungal culture and bacterial study were repeated.

## 3. Result

Sixty-two patients participated in the study. The mean age was 29.9 years old (SD = 24.5). About 52% of patients were below 20 years old with peak incidence in age group of 1–10 years old. There were 42 (67.7%) female and 20(32.3%) male. The ratio of female to male was 2:1 (Table 1).

**Table 1**  
baseline characteristics.

Characteristic of the CSOM patients	
Number	62
Mean age	29.9 years old (SD 24.5 years old)
<b>Gender</b>	
Male	20 (32.3%)
Female	42 (67.7%)
<b>Duration of CSOM</b>	
More than a year	48 (78%)
Less than a year	12 (19%)
Less than a months	2 (3%)
<b>Size of Perforation</b>	
Less than 25%	17 (27%)
26–50%	30 (49%)
51–75%	4 (6%)
More than 75% (subtotal)	11 (18%)
<b>Type of otorrhea</b>	
Mucoid	13 (21%)
Mucopurulent	43 (69%)
Purulent	6 (10%)
<b>Otological medication used (prior to study)</b>	
Yes	46 (74%)
No	16 (26%)



**Fig. 1.** Result of microorganism isolated from middle ear discharge.

**Table 2**  
The outcome of treatment intervention.

Organism n (%)	Post intervention			P value*
	Resolved	Persistent otorrhea		
Pre intervention	No otorrhea	Fungus	Bacteria	
No growth	22(84.6)	1(3.8)	3(11.5)	0.007
Fungus	3(100.0)	0(0.0)	0(0.0)	
bacteria	21(63.6)	0(0.0)	12(36.4)	

\* McNemar test P value: 0.007.

**Table 3**  
The effect of antibiotic eardrop on fungal infection.

Medications	Fungus n (%)		p value*
	Nil	Yes	
No	15(24%)	1(2%)	0.356
Yes	43(69%)	3(5%)	

\* Stata SE 11.0.

Forty-three (69.0%) patients had mucopurulent discharge, thirteen (21.0%) had mucoid discharge and only 6(10.0%) had purulent discharge. Tinnitus was present in 28(45.2%) whereas 38(61.3%) patients had ear blockage sensation. Pruritus was also a complaint in 14(22.6%) patients in this study. Forty-six patients had been on antibiotic eardrops. Sixteen patients had never applied any medications (Table 1).

The incidence of the bacterial isolated was 33(53.0%). There was three (5.0%) fungal culture positive and 26(42.0%) patients had no growth as shown in Fig. 1. The fungal isolated were *Aspergillus flavus*, *Candida parapsilosi* and *Penicillium* spp. Bacterial cultured were positive in 33 samples in which 80.0% were Gram negative bacilli (GNB), 16.0% were Gram positive cocci (GPC) and 4.0% were mixed growth.

After two weeks of intervention, 46 (74.0%) patient responded to treatment. Out of 16 patient that still having ear discharge, fungal was isolated in one (2.0%) patients and bacteria isolated in 15 (24.0%) patients (Table 2).

Comparing the result of pre and post intervention by using Mc Nemar test, it showed a significant improvement of middle ear otorrhea (p value 0.007) as shown in Table 2. The effect of antibiotic and antibiotic-steroid eardrops on the incidence of fungal infection was not proven in our study as it showed that there was no association of fungal infection with the usage of otological eardrops with p value of 0.356 (Table 3).

## 4. Discussion

The peak incidence of otorrhea was noted in age group of 1–10 years old. It was similar to a study by Khanna et al. 6. It could

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