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Microbiologic Findings in Patients with Chronic Suppurative Otitis Media

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The aim of this study was to determine the microbiology of CSOM in patients diagnosed with chronic otitis media referred to Otorhinolaryngology Clinic. Samples for culture were taken from 50 patients with CSOM. The samples were cultured on enriched differential and selective media and kept in both aerobic and anaerobic conditions. Conventional biochemical tests were then performed on isolated colonies. Drug susceptibility testing was done according to standard protocol. Forty one (82%) of the middle ear cultures were positive. The most common isolated aerobe was *Staphylococcus aureus* (32.4%) followed by *Pseudomonas aeruginosa* (21.6%). In the anaerobic group (12%), the peptococcus species was most prevalent. The most effective antibiotic in the aerobic isolates was ofloxacin. According to the results of drug susceptibility test, 95.5% of strains including all the *S. aureus* isolates were sensitive to ofloxacin. The present study was one of the extensive reports on both aerobic and anaerobic bacteria in CSOM. Knowledge of the pathogens, responsible for CSOM and choose suitable antibiotics according to susceptibility tests should guide the management of disease treatment and reduces intracranial and extra cranial complications with CSOM.

Key words: Chronic suppurative otitis media, microbiology, aerobic, anaerobic, susceptibility testing

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INTRODUCTION

Otitis media is a complex and multifactorial condition with four defined stages: myringitis, acute otitis media, secretory otitis media and chronic otitis media (Bluestone, 2004). Chronic suppurative otitis media (CSOM) is a perforated tympanic membrane with persistent drainage from the middle ear. It is defined as chronic otorrhea (i.e., >6-12 weeks) through a perforated Tympanic Membrane (TM). Chronic suppuration can occur with or without cholesteatoma (Brook *et al*., 2000). The microbiological flora of the middle varies and depends on the type of otitis media. In acute form of the disease, the major organisms present are *Haemophilus influenzae*, *Streptococcus pneumoniae* and *Moraxella catarrhalis*. In chronic otitis media these organisms plus *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeroginosa* and anaerobic bacteria are all prevalent (Bluestone, 2004; Poorey and Lyer, 2002; Albert *et al*., 2005).

CSOM has received considerable attention, not only because of its high incidence and chronicity, but also because of issues such as bacterial resistance and ototoxicity with both topical and systemic antibiotics (Haynes, 2002).

Since chronic suppurative otitis media is a disease can cause significant morbidity, a knowledge of the pathogens responsible for CSOM can assist in the selection of the most appropriate treatment regimen and can minimize complications that may require surgery. The aim of this study was to determine the aerobic and anaerobic organisms and effective antibiotics in patients with CSOM.

MATERIALS AND METHODS

In this prospective study, 50 patients with CSOM attending the ear, nose and throat Ward of Imam Khomeini Hospital, Ahwaz, Iran between September, 2005 to February, 2006 were studied. None of them had received topical or systemic antibiotics for earlier 14 days. The secretions were collected from the middle ear of patients through the perforated tympanic membrane by sterile swabs for aerobic and anaerobic organisms. Thioglycollate broth media containing ear swabs were taken to the microbiology laboratory for bacteriologic processing.

Conventional bacteriologic screening: The material was inoculated on duplicate blood agars, chocolate agar, McConkey's agar and Mannitol salt agar for aerobic and anaerobic bacteria. One of blood agar plates were placed in anaerobic Jar. The cultures were kept up to 24-48 h at 37°C. Gram stain for morphological studies were done for the organisms isolated from the culture. The organisms were then identified by culture characters, morphology and conventional biochemical tests (Forbes *et al*., 2007). The antimicrobial susceptibility testing was performed using an agar disk diffusion method according to the guidelines of Clinical and Laboratory Standards Institute (CLSI, M100-S12 document).

RESULTS AND DISCUSSION

In this study, 54% of patients were males and 46% were females. Patients ranged in age from 10 to 65 years with majority of them (80%) belonged to 16-60 years of age. Fifty two percent of patients had no previous visit and regular treatment. Figure 1 represents the most prevalent symptoms of CSOM in studied patients.

The most common type of tympanic membrane perforation was marginal (48%) followed by attic (28%) and then central perforation (24%).

Forty one out of 50 (82%) of the middle ear aspirate cultures were positive. We recovered 84 strains with 15 ears having two or more different aerobe and anaerobe bacteria identified, of which 74 (85.7%) were aerobes and 10 (14.3%) were anaerobes. Anaerobes were isolated in specimens with mixed infection. The most prevalent aerobic bacteria were *S. aureus* (24) and *P. aeroginosa* (16). In Fig. 2, the percentage of bacterial isolates are shown.

Antimicrobial profile of tested microorganisms revealed that the most sensitive antibiotic was ofloxacin and 95.5% of strains were found to be sensitive to that, whereas isolates of *P. aeruginosa* and *Kelebsiella* sp. showed resistance to ofloxacin.

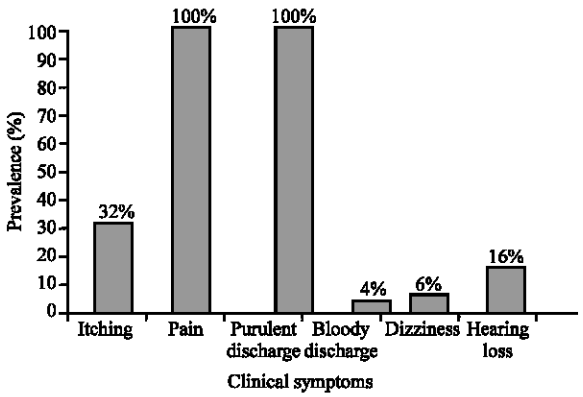

Fig. 1: Prevalence of clinical symptoms among CSOM patients

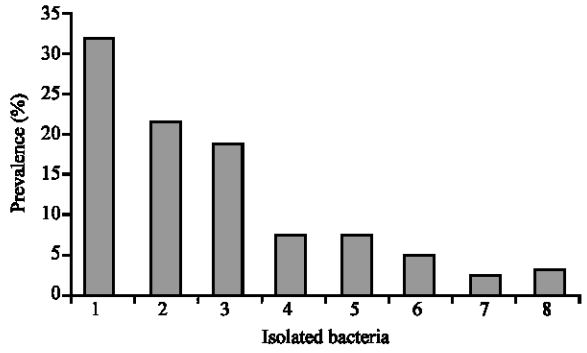

Fig. 2: Isolated bacteria from middle ear pus discharges of CSOM patients. 1: *S. aureus*, 2: *Pseudomonas aeruginosa*, 3: *Enterobacter* spp., 4: *Proteus mirabilis*, 5: *Diphtheroid*, 6: *Klebsiella* spp., 7: E. coli and 8: *Citrobacter* spp.

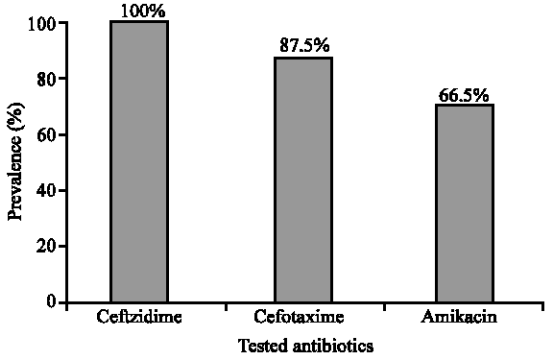

Fig. 3: Antibiotic susceptibility profile of *Staphylococcus aureus* isolated in present study

S. aureus isolates were fully sensitive to ofloxacin. Seventy five percent of gram negatives were sensitive to ceftazidime, cefotaxime, colistin and 61.36% of them were sensitive to gentamicin. All of the *P. aeruginosa* were resistant to cefotaxime and 81.2% of them were resistant to ceftazidime (Fig. 3).

CSOM is a chronic infection of the middle ear cleft including Eustachian tube, middle ear and mastoid that is defined by three elements: tympanic membrane perforation due to acute infection or tympanotomy tube, discharge from the middle ear and prolonged duration (Bluestone and Klein, 1999). The disease is considered to be a major problem in the developing world with a relatively high morbidity and mortality. The overall prevalence of CSOM in these countries ranges from 5-10% (Erramouspe and Heyneman, 2000).

Based on results from present study, the most common aerobic organisms of CSOM were *S. aureus*, *P. aeruginosa*, *Enterobacter* sp., *P. mirabilis*. and peptostreptococci was the most prevalent anaerobe. Present findings was in agreement with earlier studies on the microbiology of CSOM which have revealed that the most frequently isolated bacteria were *P. aeruginosa*, *S. aureus*, *Proteus* sp. and *Klebsiella* sp. (Attallah, 2000; Smith and Danner, 2006). Similarly, *P. aeroginosa* was the most prevalent organism followed by *S. aureus*, isolated from CSOM cases reported in several studies (Maji *et al*., 2007; Yeo *et al*., 2007; Nwabuisi and Ologe, 2002).

In general 5 to 10% of infections are poly microbial in etiology, often demonstrating a combination of gram-negative organisms and *S. aureus*. The anaerobes (*Bacteroides*, *Peptostreptococcus*, *Peptococcus*) and fungi (*Aspergillus* and *Candida*) complete the spectrum of colonizing organisms in this disease. The anaerobes make up (20-50%) of isolates in CSOM and tend to be associated with cholesteatoma (Loy *et al*., 2002).

In present study, about anaerobes were comprised about 12% of total organisms isolated with *peptococcus* as the most prevalent isolated organism.

The diversity of causative anaerobe organisms was more noted in the studies regarding microbiology of CSOM. *Bacteroides* spp. (Maji *et al*., 2007) and *Peptostreptococcus* spp. and *Prevotella melaninogenica* were among the most prevalent organisms isolated (Saini *et al*., 2005).

With the development and widespread use of antibiotics, the types of pathogenic microorganisms and their resistance to antibiotics have changed (Yeo *et al*., 2007). Knowledge of the species and resistance rates of current pathogens is important for determining the appropriate antibiotics for patients with chronic suppurative otitis media.

Conservative medical management of CSOM is an important step in achieving a dry ear. Topical antibiotic ear drops and aural toilet form the mainstay of medical management of noncholesteatomatous CSOM (Loy *et al*., 2002). The first- line treatment for CSOM is topical therapy. A topical antibiotic is initiated empirically on the basis of known bacteriology identified in earlier study. Cultures are rarely obtained unless there is a failure to respond to topical therapy. Neomycin/polymyxin B/hydrocortisone otic suspension is one of the more widely prescribed eardrops in the United States (Brook, 2003).

Present findings from susceptibility test revealed that the most effective antibiotic against *S. aureus, P. aeroginosa* and *Klebsiella* sp. was ofloxacin. In study of Maji *et al*. (2007) the most effective antibiotic was amikacin followed by gentamicin and cefotaxime in both isolates namely *Pseudomonas* sp. and *S. aureus*. In a

similar study undertaken in Nigeria, the recommended antibiotics for prevention of emergence of resistant strains in CSOM cases, were ofloxacin and erythromycin based on their survey (Nwabuisi and Ologe, 2002). Their results were in agreement to findings in present study. The gram negative isolates in this study showed 75% sensitivity to third generation of cephalosporines including cefotaxime except for *P. aeroginosa* which was fully resistant to that. In agreement to ours, in study of Saini *et al.* (2005) the isolated gram negatives showed high susceptibility of 95-100% to ceftriaxime.

CONCLUSION

In conclusion, the present study was one of the extensive reports on both aerobic and anaerobic bacteria in CSOM. Knowledge of the pathogens, responsible for CSOM and choose suitable antibiotics according to susceptibility tests should guide the management of disease treatment and reduces intracranial and extra cranial complications with CSOM.

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