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A Clinicopathological and Microbiological Study of Active Chronic Suppurative Otitis Media

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ABSTRACT

This study aims to identify the microorganisms responsible for chronic suppurative otitis media (CSOM) through ear swab cultures and sensitivity testing, followed by appropriate treatment based on the culture results. The effectiveness of the treatment is subsequently evaluated. The findings indicate that the predominant organism isolated was Pseudomonas aeruginosa, accounting for 41.07% of cases, followed by Staphylococcus aureus at 26.79%, Klebsiella at 8.93% and Escherichia coli at 5.36%. Notably, 8.93% of samples exhibited no growth, while commensal organisms were identified in 1.8% of ear discharges. The majority of infections in the study population were classified as Tubo-Tympanic disease (71.42%), with Attico-Antral disease following at 23.21%. Gram-negative organisms constituted 60.7% of the isolates, whereas gram-positive organisms represented 28.57%. Additionally, 13% of infections showed no microbial growth. The majority of Pseudomonas infections presented with mucopurulent discharge (50%), while S. aureus infections were characterized by a similar discharge in 33.3% of cases. Mucoid discharge was predominantly observed in Pseudomonas (27%) and Klebsiella (16.6%). The study revealed that gram-negative organisms exhibited high sensitivity to cefoperazone (Cf), gentamicin (G) and amikacin (Ak). Specifically, P. aeruginosa demonstrated the highest sensitivity to Cf (91.3%), followed by G (82.6%), ceftriaxone (Ce) (73.9%), and Ak (65.2%). Klebsiella showed complete sensitivity to Cf and G (100%), with Ak and Ce at 80%. Proteus also exhibited 100% sensitivity to Cf and G, followed by Ak and Ce (66.6%). E. coli showed full sensitivity to Ak, Cf, G and Ce. S. aureus had a high sensitivity to Ak (80%), with G, Ce and Cf all at 66.6%. Acinetobacter demonstrated 100% sensitivity to Ak, Cf and G. The study concludes that P. aeruginosa, S. aureus, Klebsiella and E. coli are the primary pathogens associated with CSOM, with the recommended antibiotics being Cf, G, Ak and Ce. So it becomes very important that each case of CSOM should be studied bacteriologically so as to prevent administration of unwanted antibiotics. This certainly will help in achieving dry ear and preventing complications.

OPEN ACCESS

Key Words

Cholesteatoma, tympanic membrane, chronic suppurative otitis media, escherichia coli, cefoperazone

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INTRODUCTION

The assessment and management of CSOM presents many challenging and fascinating problems. The state of individual ear involved in chronic disease represents the balance established at a particular time between the progression of the disease process on one hand and the healing response within the middle ear cleft on the other[1-3]. Accordingly the manifestations of CSOM are extremely variable and there may be any lesion from a small healed deformity of the Tympanic Membrane(TM), to a cholesteatoma infiltrating widely throughout the temporal bone. CSOM is a disease of multiple aetiology and is well known for its persistence and recurrence inspite of treatment. CSOM is a name given to a long standing inflammatory disease affecting mucoperiosteal lining of the middle ear. It is a destructive and persistent disease with irreversible sequelae and can proceed to serious intra and/or extra cranial complications[4]. CSOM is divided into two types according to presence or absence of cholesteatoma. Bacteriologically and etiologically both types are different. Noncholesteatomatous type is usually resulting of incompletely treated acute suppurative otitis media or recurrent suppurative otitis media. Important feature of this type of disease is the presence of central perforation., however, in cholesteatoma type perforation is either marginal or attic[5-7]. The wide spread use of antibiotics has precipitated the emergence of multiple resistant strains of bacteria which can produce both primary and post-operative infections. The indiscriminate, haphazard and half treated use of antibiotics and poor follow up of patients have resulted in persistence of low grade infections. Changes in the microbiological flora following the advent of sophisticated synthetic antibiotics increase the relevance of reappraisal of the modern day flora in CSOM and their in vitro antibiotic sensitivity pattern is very important for the clinician to plan a general outline of treatment for a patient with a chronically discharging ear. The incidence of CSOM appears to depend on race and socio-economic factors[5-7]. Socio-economical factors such as poor living conditions and over crowding, poor hygiene and nutrition have been suggested as a basis for the wide spread prevalence of CSOM. The present study is aimed at finding the organisms responsible for CSOM by taking the ear swab for culture an FFd sensitivity and by treating the patient according to culture report. The response to the treatment is studied and analyzed.

MATERIALS AND METHODS

The present study was conducted in the Department of Otorhinolaryngology. 50 patients with CSOM of all age groups attending the were selected randomly for the study.

Inclusion Criteria: All cases of middle ear discharge for >3 months.

Exclusion Criteria:

- Condition which mimic CSOM like.
- Otitis externa.
- Acute suppurative otitis media.
- Complications of CSOM.

History Taking and Examination: A proforma (Annexure-I) was filled for each patient documenting age, sex, address and clinical information, including chief complaints, duration of symptoms, predisposing factors and any previous history of treatment. Other medical history like diabetes mellitus, hypertension and tuberculosis, etc were noted. Examination under microscope was done and patients were categorised into tubotympanic and Atticoantral type of CSOM and ear discharge was collected.

Collection of Sample: Ear discharge was collected under aseptic precautions in clinically diagnosed cases of CSOM. Excess discharge was mopped out from external auditory canal and it was cleaned with betadin. Then with the sterile swab, specimen was collected and sent immediately to Microbiology Department with a requisition for culture and sensitivity.

Direct Smear Examination: In Microbiology Department, a thin smear was made on a clean glass slide and was fixed with 95% methanol, by pouring one or two drops on the smear and allowed to act for a minimum of 2 minutes or until the methanol dries on the smear. Gram staining was done for the smears so made and was examined under oil immersion objective to note the various morphological types of bacteria, their number, Gram reaction, presence or absence of inflammatory cells and also to note the numbers of squamous epithelial cells in the sample.

Aerobic Culture: The discharge was used for inoculation on blood agar, nutrient agar and Mac Conkey agar plates. All plates were incubated aerobically at 370C and evaluated at 24 hours, 48 hours and 72 hours and the plates were discarded if there was no growth. The specific identification of bacterial pathogens was done based on microscopic morphology, staining characteristics, cultural and biochemical properties using standard laboratory procedures. Antimicrobial susceptibility of the bacterial isolates to the commonly used antibiotics was done by Kirby-Bauer disc effusion method.

RESULTS AND DISCUSSIONS

Some patients had more than one ear discharge which was taken separately for bacterial analysis where we found that P. aeruginosa was the commonest bacterial infection (41.07%) among the patients. Second most common organism is S. Aureus (26.79%), Acinetobacter was minimum (1.79%) among the bacterias. It is interesting to know that around 8% didn't have any pathological bacteria in the discharge.

Table 1: Showing Types of Organisms Found in Ear Discharge

Organisms	Number of discharge	Percentage
P.aeruginosa	23	41.07
S. aureus	15	26.79
Klebsiella	5	8.93
E. Coli	3	5.36
Proteus	3	5.36
Acinetobacter	1	1.79
No growth	5	8.93
Commensal	1	1.79
Total	**56**	**100**

Majority of the organisms were Gram negative organisms (60.71%) compared to gram positive organisms (28.57%). Around (8%) had no growth. Majority of pseudomonas infection showed mucopurulant type of discharge (50%) followed by S. aureus (33.33%). Purulent discharge was common in Pseudomonas (37.5%) and S. Aureus (37.5%). Mucoid discharge was common in Klebsiella (16.67%) followed by pseudomonas (27.78%) infection. Pseudomonas has maximum sensitivity to Cf (91.3%) and high sensitivity for G. (82.6), Ce (73.9%), Ak (65.2%). High resistance was found for Cu (34.7%) and Of (38.5%). S. aureus has high sensitivity for Ak (80%), high resistance was found for cotrimoxazole (Co) (46.6%). Klebsiella has high sensitivity to Cf and G. (both being 100%), also Ak and Ce had sensitivity (both being 80%). Moderate resistance was found for cephalexin (Cn) (40%). Acinetobacter has 100% sensitivity to Ak, Cf, G. High resistance to Cu. Proteus showed 100% sensitivity to Cf and G., high sensitivity to Ak and Ce (66.6%). Resistance was found to Cn and Cu (33.3%). E. coli had 100% sensitivity to Ak, Cf, G. and high resistance to Cu.

Table 2: Comparison of Organisms vs Antibiotic Resistance

	Cu	Of	Co	Cn
Pseudomonas	8 (34.7 %)	6 (26.08%)	0 (0%)	0 (0%)
S. aureus	0 (0%)	0 (0%)	7 (46.6%)	0 (0%)
Klebsiella	0 (0%)	0 (0%)	0 (0%)	2 (40%)
E.coli	0 (0%)	1 (33.3%)	1 (33.3%)	0 (0%)
Proteus	1 (33.3%)	0 (0%)	0 (0%)	1 (33.3%)
Acinetobacter	1 (100%)	0 (0%)	0 (0%)	0 (0%)

Due to changing pattern of bacteriological profile of otitis media and sensitivity of microorganisms towards antibiotics, it has become very important to find out the organism causing the disease[3]. In the present study the prevalence of CSOM was higher in the age group of 21-30 years (23.2%), followed by 11-20 years (17.8%). According to study of Poorey V.K., Iyer, a common age group was first and second decades of life, among them 1-10 years age group was more common (46%), which differ from our study[1]. In the present series of 56 ears of CSOM, we found that P.aeruginosa 23 (41.07%) was the commonest organism followed by S. aureus 15 (26.79%), Klebsiella 5 (8.93%), E. Coli 3 (5.36%), Proteus 3 (5.3%) and Acinetobacter 1 (1.79%). No growth was found in 5 (8.9%) and commensal in 1 (1.8%). In the present study, majority of Pseudomonas infection (50%), S.aureus (33.3%) showed mucopurulent type of discharge. Mucoid discharge was common in and Pseudomonas (27%), Klebsiella (16.67%). In our series 100% of no growth had mucoid discharge. In the present study, Pseudomonas was highly sensitive to Cf (91.3%) and G. (82.6%), followed by Ce (73.9%), Ak (65.2%), Pseudomonas showed maximum resistance to Cu (34.7%) followed by Of (26.08%). According to the study by Vijaya[8], P. aeruginosa showed maximum sensitivity to Ak and Norfloxcin (Nx) (68.1% each), followed by G. (50%) and Cn (45.4%), which differ from our study. In our study, S.aureus had maximum sensitivity to Ak (80%), followed by Ce (66.6%), Cf and G. High resistance was found for Co (46.6%). In our study Klebsiella showed high sensitivity to Cf and G. (both being 100%), followed by Ak and Ce (both being 80%). Moderate resistance was found for Cn (40%). In our study, Acinetobacter had 50% sensitivity to Ak, Cf, G. and Ce. It showed 100% resistance to Cu. Proteus species 100% sensitivity to Cf and G. High sensitivity to Ak, Ce (66.7%). Resistance was found to Cu and Cn (33.3%). In present study, E. coli had 100% sensitivity to Ak, Cf, G. and Ce 50% of them had resistance to Co and Of. According to Vijaya D in 2000, E. coli had 33.3% sensitivity to Ak, G. and Chloromycetin, which differ from our study. According to Moorthy[9], there were 192 bacterial isolates comprising mainly Staphylococcus aureus (36%), Proteus species (32%), Pseudomonas aeruginosa (24%) and coagulase-negative Staphylococcus (20%) this differs from the present study. Among the topical antibiotics, ciprofloxacin had the highest susceptibility rate (89%) for all the isolates tested followed by gentamicin (76.5%) and chloramphenicol (59.3%) which correlates to our present study. According to Vishwanath[10], out of the 100 samples, 62 were culture positive where Pseudomonas aeruginosa was the most common pathogen followed by Staphylococcus aureus. Most of the cultured organisms in our study were sensitive to drug Ciprofloxacin which correlates to our present study. According to Kumar[11], the most common causal organisms isolated were Pseudomonas aeruginosa 80

(45.9%) followed by Staphylococcus aureus 46 (26.4%) amongst the 167 (87.9%) bacterial isolates (including 10 isolates of MRSA) which correlates to our study. Fungi accounted for 7 (3.7%) of the isolates while 16 (8.4%) were culture negative isolates. The antimicrobial profile of the major isolates i.e. Pseudomonas and Staph. Aureus revealed maximum sensitivity to Piperacillin/Tazobactum against 90% isolates which differs from our study. According to Suneer[12] Culture of aural swab demonstrate the polymicrobial bacteriology consisting of both gram positive and negative pathogens, while gram negative pathogens form the majority of both tubotympanic and atticoantral disease. Mixed growth is more common in attico-antral disease. In our study, Ciprofloxacin and Cefotoxime has found out to be the drug of choice for both tubotympanic and atticoantral disease with high sensitivity which correlates to our present study.

CONCLUSION

- Cf was the most effective antibiotic followed by Ak, G, Ce.
- In both TTD, AAD, No anaerobic organisms were cultured.
- In the present era of antibiotics, the emergence of antibiotic resistance is becoming more common. The most important factor responsible for the development of antibiotic resistance is human negligence. As soon as, symptoms subside, patients stop taking antibiotics before completion of therapy and allow partially resistant microbes to flourish. Such practice should be discouraged and patients should be educated to avoid the same.
- So it becomes very important that each case of CSOM should be studied bacteriologically so as to prevent administration of unwanted antibiotics. This certainly will help in achieving dry ear and preventing complications.

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