Original Research Article

Clinical and microbiological profile of active tubotympanic disease

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Abstract

Background: Tubotympanic disease is characterized by perforation in pars tensa. As it follows a more benign clinical course, the term `safe' is applied to it, though it is not always true. It is called active when in addition to tympanic membrane defect, middle ear mucosa is inflamed and edematous with the production of excess mucus or mucopus. Even with newer antibiotics being licensed for use almost every year, chronic suppurative otitis media largely remains unconquered and continues to be one of the major causes of otologic morbidity. Its clinical significance is particularly related to its propensity to cause infectious complications as acute and chronic mastoiditis, petrositis, intracranial infections, and non-infectious sequel as chronic perforation of the tympanic membrane, ossicular erosion, labyrinthine erosion, tympanosclerosis, which are the major causes of hearing loss throughout the world.

Aim of the study: To study the clinical profile of active tubotympanic chronic otitis media cases. To assess the prevalence and distribution of bacterial and fungal organisms in CSOM. To analyze antibiotic sensitivity and resistance pattern of bacterial isolates causing Chronic Suppurative Otitis Media (CSOM).

Materials and methods: This study was done at the Department of Otorhinolaryngology, Govt. Kilpauk Medical College and Hospital, Chennai. 100 cases of active Tubotympanic Chronic Suppurative Otitis Media were studied by systemic random sampling method, during the period January 2016 to June 2016.

Results: The majority of cases were unilateral (79%). In all patients with otorrhea, the next common symptom was hard of hearing. Mean pure tone average, was 40, No significant sensory neural hearing loss detected among the 100 cases. Pseudomonas aeruginosa was the most common isolate. Klebsiella and acinetobacter showed an increased incidence of 13% and 11% in this study. 30% of cases showed positive results with a fungal culture i.e. one in 3 patients may have superimposed fungal infections in active chronic suppurative otitis media. Most common fungal isolate was Candida Species. Antibiotic

with maximum sensitivity to all isolates was cefoperazone –sulbactam. Ofloxacin and amikacin also showed remarkable sensitivities (more than 90%) to all isolates. Most of the isolate found to be resistant to commonly used antibiotics as cefotaxime, gentamicin.

Conclusion: The importance of dry mopping in the treatment of CSOM is stressed. Dry mopping along with culture-directed antibiotics for the optimum duration, with regular assessment of clinical response to treatment, is advisable. Indiscriminate use of broad-spectrum over-the-counter (OTC) to topical preparations with or without steroids for a prolonged period is to be avoided.

Key words

Clinical and Microbiological Profile, Active Tubo Tympanic Disease, CSOM.

Introduction

Chronic suppurative otitis media and its complications are among one of the most common conditions seen by otorhinolaryngologists, pediatrician, and general practitioners. It is a disease of multiple etiology and is well known for its persistence and recurrence despite treatment [1]. Chronic suppurative otitis media is a long-standing inflammation of the middle ear cleft. From the early days of otology, it is divided into two clinical types: Tubotympanic and atticoantral disease [2]. Tubotympanic disease is characterized by perforation in pars tensa. As it follows a more benign clinical course, the term `safe' is applied to it, though it is not always true. It is called active when in addition to tympanic membrane defect, middle ear mucosa is inflamed and edematous with the production of excess mucus or mucopus [3]. Even with newer antibiotics being licensed for use almost every year, chronic suppurative otitis media largely remains unconquered and continues to be one of the major causes of otologic morbidity [4]. Its clinical significance is particularly related to its propensity to cause infectious complications as acute and chronic mastoiditis, petrositis, intracranial infections, and non-infectious sequels chronic perforation of the tympanic membrane, ossicular erosion, labyrinthine erosion, tympanosclerosis, which are the major causes of hearing loss throughout the world [5]. Management of CSOM begins with accurate documentation of tympanic membrane defect, preferably with an operating microscope. Assessment of hearing loss by tuning fork test and pure tone audiometryis necessary as most patients have associated conductive hearing loss. Appropriate therapy for otorrhea involves the identification of offending organisms using culture and sensitivity of middle ear discharge [6]. Almost all aspects of the disease have been well studied over the past few decades, butan exhaustive review of the available literature shows many authors focused their attention primarily on bacterial flora, with comparatively few erreports on mycological aspects, the importance of which has been increasing in recent years because of excessive use of broad-spectrum antibiotics, corticosteroids, and immune deficiency states [7]. The number of Indian reports on this aspect has been meager. Causative bacterial flora and their sensitivity patterns are also subjected to change from time to time with the emergence of multiple drug-resistant strains. As for the selection of first-line therapy, it must be made by an individual physician based on regional susceptibility data of bacterial pathogens [8].

Materials and methods

This study was done at the Department of Otorhinolaryngology, Govt. Kilpauk Medical College & Hospital, Chennai during the period January 2016 to June 2016. 100 cases of active Tubotympanic Chronic Suppurative Otitis Media by systemic random sampling method were selected.

Inclusion criteria: Adult patients with active tubotympanic type of CSOM i.e. Chronic (more than 3 months) continuous or intermittent

otorrhea through a permanent defect in Pars tensa, with inflamed and edematous middle ear mucosa producing excess mucus or mucopus. Perforation should be moderate/ large sized. History of partial or no response to prior treatment with commonly used topical agents like gentamicin, Neomycin, Polymyxin, Ciprofloxacin, before the consultation.

Exclusion criteria: Age group – less than 15 years. Clinically unsafe ears – i.e. with cholesteatoma granulations or aural polyps. Overt clinical evidence of otitis externa with CSOM i.e. external canal congested, inflamed, with otomycotic debris, Tragal tenderness. Discharging ear through a pinhole perforation. Cases have undergone previous ear surgeries. Suspected complications of CSOM. Patients with clinical evidence of chronic sinusitis chronic tonsillitis. Known or treated cases of pulmonary tuberculosis. Known immune deficiency states – Diabetes mellitus, AIDS, renal diseases, bronchiectasis.

All patients were evaluated by detailed history and examination. Initially, collected discharge in the external canal was cleaned by dry mopping method using sterile cotton wool tipped applicators. Otoscopic examination was done, findings were documented. Audiologic evaluation was done by Tuning fork tests and pure tone audiometry. Pure tone average and bone conduction at 4 kHz recorded. Under aseptic precautions, ear discharge through the perforation was collected using sterile speculum thus minimizing external canal contamination by three separate sterile cotton wool tipped swab sticks which were then kept in sterile culture tubes.

Statistical analysis

Statistical testing was conducted with the Statistical Package for the Social Sciences system version SPSS 17 (SPSS Inc., Chicago, USA). For all statistical tests, a $P < 0.05$ will be taken to indicate a significant difference.

Results

Out of the 100 cases studied, the age distribution was such that 58% of cases in 15-30 years, 34% in 31-45 years, 6% in 46-60 years, and 2 cases above 60 years. An apparent decrease in incidence as age advances can be noted. According to western literature population prevalence of adult otitis media does not vary with age. Age distribution among as 0-15 year-44.17%;15-20 yrs-25%; 3-45 years- 19.17%; 46-60 years- 9.16%; 60 and above2.5%.Gender distribution shows 1:1 male/ female ratio (48% and 52% respectively). It was similar to earlier studies. CSOM has no sex preponderance. Duration of symptoms was more than 2 years in the majority of patients (77%) as per **Table - 1**.

Table – 1: Age and sex distribution.

Age in Years	Male		Female		Total	
	Number	%	Number	%	Number	%
15-30	28	28%	30	30%	58	58%
31-45	18	18%	16	16%	34	34%
36-60	2	2%	4	4%	6	6%
Above60	Nil	-	2	2%	2	2%
Total	48	-	52		100	

On analyzing symptomatology, obviously all patients presented with otorrhea. Hard of hearing was the next predominant symptom (28%). Itching was present in 16% of cases. Tinnitus in 17%, the pain was the least mentioned complaint (7 and 4% respectively). Pain as the next common symptom to otorrhea (15%) followed by itching, hearing loss, and tinnitus 97.5%, 5.8 and 0.8% respectively (**Table - 2, 3**).

Table – 2: Duration of symptoms.

Duration	No.	%
3-6 Months	2	2%
6 Months – 2 Years	21	21%
More than 2 years	77	77%

Table – 3: Symptomatology.

Items	Discharge	Hard of Hearing	Tinnitus	Itching	Pain
Number	100	28	17	16	4
%	100%	28%	17%	16%	4%

Table – 4: Audiogram findings.

Age in Year	Pure Tone Average	Bone Conduction at 4 KHz
15-30	36	21
31-45	40	21
45-60	40	20
Above 60	43	22

Table - 5: Culture results.

Items	Single infection	Mixed infection	Sterile
Number	52	38	10
%	52%	38%	10%

Table – 6: Bacterial isolates.

Organisms	No.	%
Pseudomonas aeruginosa	38	38%
Staphylococcus aureus	22	22%
Klebsiella	13	13%
Aceinetobacter	11	11%
Coagulase-negative staph	7	7%
Proteus species	5	5%
Escherchia coli	2	2%

Table – 7: Fungal isolates.

Organisms	No.	%
Candida species	12	40%
Aspergillus niger	8	26.6%
Aspergillus flavus	7	23.3%

On studying audiometry findings, the pure tone average was around one conduction at 4 kH_z as a measure of sensory neural component involvement showed no significant sensory neural hearing loss. These levels did not vary among age groups. Most of the literature shows there is a correlation between sensory neural hearing loss and chronic ear disease (**Table – 4, 5**).

Analysis of culture results showed monomicrobial infection in 52% (Pure bacterial 50%, pure fungal 2%) polymicrobial 38% were polymicrobial and 10% were sterile cultures. The

difference could be due to differences in the patient population studied and geographic variations. The most common organism isolated in the present study was pseudomonas aeruginosa (38%) followed by staphylococcus aureus (22%), Klebsiella (13%), Acinetobacter (11%), coagulase-negative staphylococci (7%), Proteusspecies (5%), and Escherichia coli (2%). A remarkable feature of this study in comparison to studies done elsewhere is the increased isolation of Klebsiella (13%) and acinetobacter. Observed that when the weather is warmed, frequency of isolation of enteric bacteria was increased significantly. So, the higher incidence of Klebsiella in this study may be positively correlated with the comparatively hot humid climate of the particular geographic area (Chennai) where the study was conducted. Higher isolation rates in this study may again be attributed to geographical variations and different lines of antimicrobials routinely used in different parts (**Table – 6, 7, 8**).

Table – 8: Antibiotic sensitivity pattern of isolates.

Antibiotic Tested		Psudomonas	Staphylococci	Klebsiella	Aceinetobacter	Cons	Proteus
Gentamicin	No.	25	13	8	2	7	5
	%	65.7%	59%	61.5%	18.1%	100%	100%
Amikacin	No.	35	21	13	8	7	5
	%	92.1%	95.4%	100%	72.7%	100%	100%
Ciprofloxacin	No.	30	17	12	8	6	5
	%	78.9%	77.2%	92.3%	72.7%	85.7%	100%
Ofloxacin	No.	37	20	12	10	7	5
	%	97.4%	90.9%	92.3%	90.9%	100%	100%
Cefotaxime	No.	12	12	11	2	5	2
	%	31.5%	54.5%	84.6%	18.1%	71.4%	40%
Cefoperazone Sulbactam	No.	37	22	13	11	7	5
	%	97.4%	100%	100%	100%	100%	100%

Discussion

Chronic suppurative otitis media (CSOM) is defined as chronic inflammation of the middle ear and mastoid cavity that may present with recurrent ear discharges or otorrhoea through a tympanic perforation. Incidence of this disease is higher in developing countries especially among low socio-economic society because of malnutrition, overcrowding, poor hygiene, inadequate health care, and recurrent upper respiratory tract infection [8]. CSOM is usually classified into two types, tubotympanic and attico-antral depending on whether the disease process affects the pars tensa or pars flaccida of the tympanic membrane (TM) [9]. Tubotympanic is called a safe type or benign type as there is no serious complication whereas, attico-antral is called the unsafe or dangerous type because of associated complications and may be life-threatening at times. Infection can spread from the middle ear to vital structures such as mastoid, facial nerve, labyrinth, lateral sinus, meninges, and brain leading to a mastoid abscess, facial nerve, paralysis, deafness, lateral sinus thrombosis, meningitis, and intracranial abscess [10]. Of all the complications, hearing loss associated with chronic ear discharge is nearly always significant, reported in 50% of cases and tending to be more severe than those reported in other types of otitis media [11]. Complications associated with CSOM were frequent in the pre-antibiotic era, however, the introduction of antibiotics gave clinicians a tool to be used even without the precise etiological diagnosis, and the irrational use of antibiotics led to the emergence of multi-drug resistant bacterial strains and disease complications in return [12]. Changes in bacterial flora in CSOM in the last decade have been confirmed and described by various authors [13]. The treatment of CSOM is controversial

and subject to change particularly in developing countries, the prevalence and antibiogram of these organisms have been reported to vary with time and geographical area as well as the continent to continent, probably due to indiscriminate use of the antibiotics [14]. Hence, the periodic update of prevalence and antibiogram of the etiological agents for CSOM would be helpful in therapy and management of patients [15]. Predominant bacterial etiology (aerobic) of CSOM in this region is *Staphylococcus aureus* (48.69%) and this observation was in line with the diversity of microbial flora of CSOM infection in colder regions as reported in studies Heinemann H.S., et al. from Iran (31.15%). In our study, we could isolate Pseudomonas in 38% of cases. Pseudomonas, however, is the predominant cause of CSOM in the tropical region does not usually inhabit the upper respiratory tract, its presence in the middle-ear cannot be ascribed to an invasion through ET and it should be considered as a secondary invader gaining access to the middle ear via a defect in TM. In 49% of patients, the decreased hearing was the main associated symptom. This is following the study by Parry, et al. It also shows that CSOM affects hearing to a large extent. In both types of CSOM, P. aeruginosa was the predominant microorganism isolated followed by S. aureus [16]. Although CoNS are generally considered non-pathogenic, their association in CSOM cases can be attributed to the extreme lowering of resistance in the middle ear due to invasion by other organisms. C. albicans was the predominant fungal isolate in tubotympanic CSOM [17]. Our study showed the predominant growth of C. albicans. Fungal culture positivity is most commonly seen in places where the weather conditions are hot and humid. In addition, prolonged use of topical antibiotics or antibiotic–steroid ear drops may cause suppression of bacterial flora and the subsequent emergence of fungal flora. Otologists should suspect mycotic otitis media in patients with continuous otorrhoea and who do not respond to the antibacterial treatment [18]. Anaerobes were not significant pathogens in our study. Similar results were seen in studies done by Brook et al. and Shareef, et al. Based on the antibiogram pattern in Gram-negative bacilli in both types of CSOM, P. aeruginosa showed 100% sensitivity to Imipenem and Meropenem followed by Piperacillin + Sulbactam (97.7%), Cefotaxime + Sulbactam (93.3%), Piperacillin (82.2%) and Amikacin (80%), but was found to be resistant to Ciprofloxacin (35.6%) and Cefotaxime (31.2%) and Gentamicin (28.9%). Other Gram-negative isolates showed a similar pattern. Similar findings were reported by KhannaV except for showing higher sensitivity for Ciprofloxacin of 90%–92% [19]. Sensitivity for quinolones was 60%–70% in our study. It is becoming less sensitive against commonly used antimicrobials, namely Ciprofloxacin and Gentamicin. S. aureus, the second most common isolate in both types of CSOM, showed maximum sensitivity to Vancomycin, Linezolid, Amikacin, and Erythromycin. All the isolates of Staphylococci were sensitive to methicillin. No MRSA was isolated. Maximum resistance was seen to Ampicillin and Cotrimoxazole (60%–80%) [20].

Conclusion

Poorly treated or untreated CSOM can lead to many complications such as mastoiditis, meningitis, and brain abscess. Our study showed a high prevalence of *P. aeruginosa* and *S. aureus* which were found to be sensitive to cefoperazone - sulbactam, ofloxacin, and Amikacin, resistant to quinolones, β-lactams, and other commonly used antimicrobials. The collection of a specimen of ear discharge through the perforation using sterile cotton swabs helped us to get a sample without contamination from external ear flora. As the microbial profile and antibiotic susceptibility pattern of the CSOM keep changing with the due course of time, evaluation of microbiological and antibiotic sensitivity patterns in local areas is necessary for prescribing empirical antibiotics for successful treatment of chronic otitis media and thus minimizing its complications and emergence of resistant strains.

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