Original Article

Bacterial and Fungal Study of 100 Cases of Chronic Suppurative Otitis Media

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ABSTRACT

Introduction: Chronic Suppurative Otitis Media is a major health problem in developing countries because of poor nutrition, improper hygiene and lack of health education. Due to advent of newer and sophisticated antibiotics, the microbiological flora is changing constantly. This requires a reappraisal of the flora in Chronic Suppurative Otitis Media and their in vitro antibiotic sensitivity pattern. In cases of CSOM, which do not respond to local antibiotics, superimposed fungal infection should be suspected. The present study was aimed to identify Bacterial and Fungal isolates associated with Chronic Suppurative Otitis Media and their antibiogram pattern in patients attending ENT OPD at Maharaja Agrasen Medical College, Agroha, Hisar.

Materials and Methods: The study included 100 patients of Chronic Suppurative Otitis Media attending the ENT OPD at Maharaja Agrasen Medical College, Agroha, Hisar. The samples were immediately sent to the microbiology laboratory for fungal and bacterial studies. The standard method of isolation and identification was followed. Antimicrobial susceptibility of the bacterial isolates was performed by Kirby- Bauer's disc diffusion method.

Results: Analysis of bacterial flora of the present study showed predominance of gram negative bacilli (59.74%). The highest incidence (45.5%) was that of Pseudomonas aeuroginosa followed by Staphylococcus aureus (37.7%). Of the 15 fungal isolates, 9 (60%) were Candida species (Candida albicans). Aspergillus was isolated in 6(40%) with maximum 3 (20%) strains of Aspergillus fumigatus. Amikacin was found to be the most effective drug.

Conclusion: The study suggests that the common etiological agents for Chronic Suppurative Otitis Media were Pseudomonas aeruginosa followed by Staphylococcus aureus. Amikacin was found to be the drug of choice.

Key Words: Bacteria,fungus,CSOM

INTRODUCTION

Chronic suppurative otitis media (CSOM) is a persistent disease of the middle ear, which is capable of causing severe destruction sequelae with the manifestation of deafness, discharge and a permanent perforation (Shenoi1988) [1]. The incidence of chronic suppurative otitis media is higher in developing countries, especially amongst the lower and the middle socio-economic strata of the society (with an urban: rural ration of 1:2) because of poor nutrition, improper hygiene and lack of health education. The basic feature which is common to all the cases of chronic suppurative otitis media is the presence of a non-intact tympanic membrane. This disease is mainly classified into two types: tubotympanic and atticoantral, depending upon whether the disease process affects the pars tensa or the pars flaccida of the tympanic membrane. Typically, the disease follows viral infection of the upper respiratory tract, but it soon sets the conditions for the middle ear to be invaded by pyogenic organisms (Fliss) [2].

Many authors have focused their attention on the bacterial flora of chronic suppurative otitis media, but very little is known about the mycological aspects of these, the importance of which has been increasing in the recent years because of the excessive use of broad spectrum antibiotics, corticosteroids and cytotoxic chemotherapy and an increase in the number of immune deficiency conditions.

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 hay-hearted use of antibiotics and the poor follow up of the patients have resulted in the persistence of low grade infections. The changes in the microbiological flora following the advent of sophisticated synthetic antibiotics have increased the relevance of the reappraisal of the modern day flora in chronic suppurative otitis media 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 clinical assessment of the presenting ear in chronic suppurative otitis media requires a careful evaluation of the history and examination, both of which are essential in determining the type, state and the extent of the disease process, prior to the management strategy. The present series deals with the study of the bacterial and fungal flora in the 100 cases of chronic suppurative otitis media who attended the ENT Department of Maharaja Agrasen Medical College, Agroha (Hisar) during a period of two months.

AIMS AND OBJECTIVIES

This study was aimed to speculate the aetiological flora (bacterial and fungal) which were responsible for the cases of chronic suppurative otitis media who attended the ENT Department of Maharaja Agrasen Medical College, Agroha (Hisar) and to suggest a specific antibiotic to them.

MATERIALS AND METHODS

One hundred clinically diagnosed cases of chronic suppurative otitis media formed the subject matter of our study. The ear

discharge from each diseased middle ear was collected separately in a sterilized vial (by using a long lumbar puncture needle after creating negative pressure) and in some patients, it was collected with the help of sterile culture swabs. Only those cases were selected, who had not taken any treatment, either systemic or local, in the form of ear drops, for the last seven days. The samples were immediately sent to the microbiology laboratory for fungal and bacterial studies.

In the laboratory, the ear discharges were collected and examined microscopically (in 10% potassium hydroxide) for the presence of epithelial cells, pus cells, budding yeast cells, fungal hyphae and spores, etc. For bacterial isolation, the samples were inoculated on Blood agar, MacConkey's agar and Chocolate agar media and were incubated at 37°C for 24 hours. A part of the discharge was cultured on Sabouraud's dextrose agar slant (with chloramphenicol 0.05) and was examined for gross and the microscopic morphology of the fungi. The organisms were identified by using a standard procedure (Collee et al, 1996) [3]. The antimicrobial susceptibility of the bacterial isolates was assessed by the Kirby- Bauer's disc diffusion method.

OBSERVATION AND RESULTS

Amongst the 100 cases of chronic suppurative otitis media which were studied, 47 were positive in the second and third decades of life and 17 were positive children below the age of 10 years [Table/Fig-1]. Here, a positive case referred to a case in which either the bacterial or fungal isolate was obtained on culturing. There was a predominance of males over females (ratio 3:2). The male predominance may have been because of the more exposed way of life of the males. The disease was found to be more common in the lower and the middle socio-economic strata of the society with an urban: rural ration of 1:2. Almost all the cases presented with more than one symptom (otorrhoea, diminution of hearing and otalgia) and a history of local treatment in the form of antibiotics and steroid ear drops.

The results of the mycological and the bacteriological studies on the 100 cases [Table/Fig-2] showed that positive fungal cultures were obtained in 15% of the cases, that they were present alone in 9% of the cases and that they were present in combination with various bacteria in 6% of the cases. Bacteria alone were present in 69% of the cases. 16% cases were negative for both fungi and bacteria. The corresponding figures which were reported by Sen Gupta et al (1978) [4] were 24.8%, 11.2%, 13.6%, 66.4% and 8.6% respectively. Aslam et al (2004) [5], in their study on 142 samples, revealed that 76% of them were pure and that 23.9% were mixed cultures. There were 97.8% aerobes, nil anaerobes

S. No.	Age (In Years)	No. of Cases	No. of positive cases
1	<1	1	1
2	1–10	19	17
3	11–20	35	30
4	21–30	28	24
5	31–40	7	6
6	41–50	3	2
7	51–60	3	2
8	61–70	2	1
9	71–80	2	1
	Total	100	84

[Table/Fig-1]: Showing Age Distribution

Results of Bacterial and Fungal Cultures	
Bacterial positive and fungal Negative	69
Fungal positive and Bacterial Negative	9
Bacterial and fungal positive	6
Bacterial and fungal Negative	16
Total cases	100

[Table/Fig-2]: Culture Results of 100 Cases of Chronic Suppurative Otitis Media

and only 2.1% fungi. The other difference could have been due to the difference in the patient population which was studied and geographical variations. The bacterial isolates (69%) in our country were comparable to those which were quoted in a study by Oguntibeju OO et al (66%) [6].

DISCUSSION

The analysis of the bacterial flora [Table/Fig-3] in the present study showed a predominance of gram negative bacilli (59.74%). The highest incidence (45.5%) was that of Pseudomonas aeuroginosa, followed by Staphylococcus aureus (37.7%). The other bacterial isolates were Klebsiella (9.1%), β haemolytic Streptococci and Citrobacter [2.9% (each)] and Proteus mirabilis and E. coli [1.9% (each)]. In a Nigerian study on 569 cases of otitis media, Osazuwa F et al (2011) [7] found that Pseudomonas aeruginosa (28.3%) was the predominant bacteria isolate which caused otitis media, followed by Staphylococcus aureus (21.0%), Klebsiella sp (8.9%), Proteus sp (8.2%), Alkaligenes spp (4.3%), Streptococcus pneumoniae (3.9%), Escherichia coli (3.0%) and Citrobacter freundi (1.7%). In accordance with our study, Sharma et al (2004) [8], in eastern Nepal, found a predominance of Pseudomonas aeruginosa (36.4%), followed by Staphylococcus aureus (30.2%) from a total of 322 aural swab cultures, while in contrast, Ojala et al (1981) [9] reported the isolation of 10% pseudomonas and 22% Staphylococcus aureus strains in their study. The increased rate of isolation of Pseudomonas aeruginosa has its own implications, as this organism is an important cause of nosocomial infections and has developed resistance to even many potent antibiotics.

Of the 15 fungal isolates [Table/Fig-4], 9 (60%) were Candida species (Candida albicans). Aspergillus was isolated in 6 cases (40%),

Bacterial Isolate	No.	Percentage
Pseudomonas Aeuroginosa	35	45.5
Staphyclococcus arreus	29	37.7
Klebsiella	7	9.1
β haemolytic Streptococci	2	2.9
Citrobacter	2	2.9
Proteus mirabilis	1	1.3
Escherichia Coli	1	1.3
Total	77	100

[Table/Fig-3]: Various Bacteria Isolation in Chronic Suppurative Otitis Media

Fungal Isolate	No.	Percentage
Candida albicans	9	60
Aspergillus flavus	1	6.7
Aspergillus fumigatus	3	20
Aspergillus niger	2	13.3
Total	15	100

[Table/Fig-4]: Various Fungi Isolated in Chronic Suppurative Otitis Media

the maximum number [3 (20%)] of strains of Aspergillus being Aspergillus fumigatus. In accordance with our study, Proctor et al (1973) [10] studied 215 cases and obtained a maximum growth of Candida in 42.8% cases and a maximum growth of Aspergillus in 30.9% cases, while in a Singapore study on 90 patients of otitis media, Loy et al (2002) [11] found that fungi accounted for 8.8% of the isolates and that the fungal organisms which were commonly isolated were Aspergillus sp (33.3%), followed by Candida sp (22.2%). This may be attributed to the environmental effect (hot and humid) on the cases of otitis media which were studied in this area.

Bacteria	No.	Percentage
Pseudomonas aeuroginosa + Staphylococcus aureus	1	50
Pseudomonas aeuroginosa + β haemolytic Streptococci	1	50
Total	2	100

[Table/Fig-5]: Association of Two Bacteria Causing Chronic Suppurative Otitis Media

Pseudomonas showed an association with Staphylococcus aureus and β haemolytic Streptococci in 50% of the cases (each).

Bacteria + Fungi	No	Percentage
Pseudomonas aeuroginosa+ Candida albicans	1	16.7%
Klebsiella + Candida albicans	1	16.7%
Staphylococcus aureus + Candida albicans	1	33.3
Staphylococcus aureus + Aspergillus fumigatus	1	16.7%
Staphylococcus aureus + Aspergillus niger	1	16.7
Total	5	100

[Table/Fig-6]: Association of Bacteria and Fungi Causing Chronic Suppurative Otitis Media

Of the 5 bacterial and fungal isolates, Candida albicans was found to be associated with bacteria in 66.7% of the cases and Aspergillus fumigatus and Aspergillus niger were associated with bacteria in 16.7% cases (each).

A= Amikacin, C= Ciprofloxacin, P.T. Piperacillin/ Tazobactum, C.C.A. Ceftazidime Clavulanic acid, P= Piperacillin, M= Meropenem, E= Erthromycin, C.F. = Ceftazidime, L= Linezolid, V= Vancomycin, C.t= Cepotaxime, M.I. = Methicillin, CT = Co- Trimoxazole.

All the pathogenic strains which were isolated in the present series were tested against various antibiotics. Amikacin was found to be the most effective drug, followed by ciprofloxacin, piperacillin, tazobacam, ceftazidime, piperacillin and co- trimoxazole. The comparatively newer antibiotics like ciprofloxacin and cefotaxime were more effective against all the isolated organisms (Table VII). Oguntibeju OO et al (2003) [6], in their study on 88 samples with regards to their antibiotic sensitivity patterns, found that the organisms showed the maximum degree of sensitivity to gentamicin among the different antibiotics which were used against them. In a sensitivity spectrum study on 275 bacterial isolates, Mansoor T et al (2009) [12] showed that amikacin was active against 96% of the isolates of Pseudomonas, followed by ceftazidime (89%). This result shows that the bacteriology and the antibiotic sensitivity pattern of chronic suppurative otitis media have been changing from time to time. The strains of yesterday, which were sensitive to streptomycin, tetracycline and chloramphenicol, no longer exhibit the old sensitivity pattern today. These drugs have been replaced by aminoglycosides, quinolones and cephalosporins.

CONCLUSION

Out of the 100 cases which were examined, pure bacterial growth was found in 69% cases, pure fungal growth was found in 9% cases, mixed growth was found in 6% cases and no growth was found in 16% cases. Only aerobic bacteria were isolated in the present series. Pseudomonas aeuroginosa was the most common organism which was isolated 46(45.5%), followed by Staphylococcus aureus 38 (37.7%), Klebsiella 9 (9.1%), β- haemolytic Streptococci and Citrobacter [3(2.9%) each], Proteus mirabilis and Escherichia coli [1 (1.3%) each]. Among the fungi, Candida albicans was the most common fungus which was isolated [9 (60%)], followed by Aspergillus fumigatus [3 (20%)], Aspergillus niger [2 (13.3%)] and Aspergillus flavus [1 (6.7%)].

The antimicrobial susceptibility studies showed amikacin as the most effective antibiotic, followed by ciprofloxacin, piperacillin-tazobactam and ceftazidime.

SUMMARY

The present study thus indicated that a regular laboratory examination with a definite search for fungi and bacteria is desirable in all the cases of chronic suppurative otitis media, since the prolonged use of broad spectrum antibiotics and/or steroid ear drops may cause suppression of the bacterial flora and the subsequent emergence of fungal flora.

Therefore, the routine use of topical antibiotics in chronic suppurative otitis media at the onset is not justifiable. These cases must be given a treatment after doing antimicrobial sensitivity tests and the underlying aetiology should be corrected. And moreover, the patient should be asked to take a complete course of treatment as

Sr.No.	Organism tested	Strains isolated	A	C	P.T.	C.C.A	P	M	E	C.F	L	V	C.t	M.I	C.T
1.	Pseudomonas aeuroginosa	35	28	27	26	24	18	18	1	17	–	–	2	–	1
2.	Staphylococcus aureus	29	26	20	2	1	1	2	20	1	21	10	4	10	5
3.	Klebsiella	7	6	7	7	6	7	2	–	3	–	–	1	–	–
4.	β Haemolytic streptococci	2	1	1	–	–	–	1	2	–	–	–	1	–	–
5.	Citrobacter	2	2	1	2	1	2	1	–	2	–	–	1	–	–
6.	Proteus mirabilis	1	1	1	1	1	1	–	–	–	–	–	–	–	1
7.	Escherichia Coli	1	1	1	1	1	1	–	–	–	–	–	1	–	1
8.	Total	77	65	58	34	30	24	23	23	23	21	10	10	10	7

[Table/Fig-7]: Antimicrobial Sensitivity Pattern of Bacterial Isolates

prescribed, because inadequate treatment may cause the emergence of resistant microorganisms

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DECLARATION ON COMPETING INTERESTS:

No competing Interests.

Date of Submission: **Jul 05, 2011**
Date of peer review: **Jul 10, 2011**
Date of acceptance: **Sep 13, 2011**
Date of Publishing: **Nov 11, 2011**