

A Study of Bacteriology in Chronic Suppurative Otitis Media with Cholesteatoma Cases

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ABSTRACT

Introduction: Chronic suppurative otitis media with cholesteatoma is typically a persistent disease. Insidious in onset, often capable of causing severe destruction and irreversible sequela and clinically it manifests with aural discharge and deafness. Current study aimed to see the microbial flora and sensitivity pattern of growth from culture of aural swab of patient diagnosed as case of chronic suppurative otitis media with cholesteatoma posted for mastoid surgery.

Material and Methods: 80 cases admitted as chronic suppurative otitis media of attic-antral type for mastoid surgery were included in the study. Each patient had essential work up which included detailed history, clinical examination, investigations, Otoscopic examination and examination under microscope of the ear and culture/sensitivity of the discharge.

Results: The present study consists of 80 patients who underwent mastoid surgery for chronic suppurative otitis media with cholesteatoma. Most common bacteria isolated were staphylococcus aureus 17.5%, pseudomonas aeruginosa 27.5%. Mixed growths were isolated from 13 cases (16.25%) of aural swab culture and 8 cases (10%) of cholesteatoma matrix culture.

Conclusion: The antibiotic sensitivity study shows emerging resistant strain for the commonly used antibiotics including gentamycin which formed the drug of choice of earlier studies. It is probably due to the indiscriminate use of antibiotics.

Keywords: Chronic Suppurative Otitis Media, Cholesteatoma, Bacteriology

INTRODUCTION

Chronic Suppurative Otitis Media (CSOM) is a prevalent middle ear pathology that constitutes of tympanic membrane perforation together with a chronically inflamed middle ear mucosa. CSOM can occur with or without cholesteatoma which is an in-growth of eardrum skin into the middle ear cavity.¹ CSOM is the leading cause of conductive hearing impairment in adults which is secondary to damage of the ear drum and middle ear ossicles induced by chronic inflammation present in the tympanic cavity. Various bacterial species have been found to be associated with chronic suppurative otitis media leading on to persistence of infection. They belong to both aerobic and anaerobic variety. The proportions of various organisms isolated vary from study to study. But Pseudomonas aeruginosa, Proteus species, Staphylococcus aureus and Escherichia coli predominate.^{2,3} The role of anaerobes in chronic suppurative otitis media has been the subject of speculation. Bacteroides melaninogenicus, Bacteroides fragilis and other species has been isolated.⁴ Organisms cultured from the discharge

in an infected cholesteatoma are similar to those found in chronic suppurative otitis media without cholesteatoma. The commonest organisms found are Gram negative pseudomonas aeruginosa and proteus species.⁵ In Approximately 50 percent of infected cholesteatomas a mixture of aerobic and anaerobic organisms can be identified.⁶ In cholesteatoma, a role of anaerobic and aerobic bacteria in the destructive process has been suggested. In a study, staphylococcus aureus was isolated in cholesteatoma ears more frequently than pseudomonas aeruginosa and followed by Proteus.⁷ Study aimed to record the microbial flora and sensitivity pattern of growth from culture of aural swab of patient diagnosed as case of chronic suppurative otitis media with cholesteatoma posted for mastoid surgery.

MATERIAL AND METHODS

The materials for the present study were collected from cases of chronic suppurative otitis media with clinical diagnosis of cholesteatoma who were admitted and underwent mastoidectomy operation in a tertiary care hospital. 80 cases admitted as chronic suppurative otitis media of attic-antral type for mastoid surgery were studied and a complete clinical examination of ear, nose and throat was carried out. Radiological investigation of mastoid was also done and pus obtained during aural toilet was also sent for bacteriological and antibiotic sensitivity studies. A few cases of tubo tympanic type of chronic suppurative otitis media which turned out to contain cholesteatoma on mastoid exploration were also included in the study and cholesteatoma matrix sent for bacteriological study.

Statistical analysis

Microsoft office 2007 was used for the analysis. Descriptive statistics were used to interpret the results.

RESULTS

The present study consists of 80 patients who underwent mastoid surgery for chronic suppurative otitis media with cholesteatoma. Of this 47 (58.75%) cases were males and 33 (41.25%) were females. All the 80 patients complained of aural discharge, 66 patients complained of loss of hearing,

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	Total	Ampicillin	Gentamycin	Cotrimoxazole	Ciprofloxacin	Cefotaxime	Doxycycline	Cephalexin	Ceftriaxone	Amikacin
Staphylococcus aureus	14	5 35.71%	9 64.28%	3 21.42%	14 100%	14 100%	17.14%	10 71.42%	14 100%	1 7.14%
Staphylococcus epidermidis	11	R	R	R	3 27.27%	5 45.45%	R	R	2 18.18%	R
β-hemolytic streptococci	3	1 33.33%	2 66.66%	1 33.33%	3 100%	3 100%	R	2 66.66%	3 100%	R
α-hemolytic streptococci	1	R	R	R	1 100%	1 100%	R	R	1 100%	R
Pseudomonas aeruginosa	22	4 18.18%	20 90.90%	4 18.18%	6 27.27%	20 90.90%	R	16 72.72%	22 100%	22 100%
Klebsiella pneumoniae	7	R	6 85.71%	4	6 85.71%	7 100%	R	2 28.57%	7 100%	7 100%
Proteus mirabilis	2	R	1 50%	1 50%	2 100%	2 100%	R	1 50%	2 100%	2 100%
Citrobacter	2	R	R	R	R	R	R	R	R	R
Escherichia coli	5	R	5 100%	R	4 80%	5 100%	R	4 80%	5 100%	5 100%
Mixed	13	R	11 84.61%	12 92.30%	9 69.23%	11 84.61%	R	10 76.92%	13 100%	13 100%

Table-1: Antibiogram of isolates of aural swab culture

	Total	Ampicillin	Gentamycin	Cotrimoxazole	Ciprofloxacin	Cefotaxime	Doxycycline	Cephalexin	Ceftriaxone	Amikacin
Staphylococcus aureus	13	5 38.46%	8 61.53%	2 15.38%	13 100%	13 100%	1 7.69%	11 84.61%	13 100%	13 100%
Staphylococcus epidermidis	10	R	R	1 10%	8 80%	10 100%	R	8 80%	10 100%	R
β-hemolytic streptococci	1	1 100%	R	R	1 100%	R	R	R	R	R
α-hemolytic streptococci	0	-	-	-	-	-	-	-	-	-
Pseudomonas aeruginosa	25	3 12%	22 88%	5 20%	24 96%	20 80%	2 8%	22 88%	25 100%	25 100%
Klebsiella pneumonia	11	2 18.18%	9 81.81%	2 18.18%	9 81.81%	8 72.72%	1 9.09%	6 54.54%	11 100%	11 100%
Proteus microbalis	4	3 75%	3 7%	1 25%	2 50%	4 100%	1 25%	3 75%	4 100%	4 100%
Citrobacter	2	R	R	R	R	R	R	R	R	R
Escherichia Coli	6	0	4 66.66%	1 16.66%	5 83.33%	6 100%	R	4 66.66%	6 100%	6 100%
Mixed	8	R	2 25%	2 25%	3 37.5%	4 50%	R	2 25%	4 50%	5 62.5%

Table-2: Antibiogram of isolates from cholesteatoma matrix culture

followed bleeding from ear in 8 patients and vertigo in one patient 3 patients presented with aural polyps. Among the gram positive organisms isolated from aural swab culture, staphylococcus aureus formed the majority 17.5%, staphylococcus epidermidis 13.75%, -hemolytic streptococci 3.75% and α-hemolytic streptococci 1.25%. Among the gram negative organism isolated from aural swab culture, pseudomonas aeruginosa formed the majority 27.5%,

followed by Klebsiella 8.75%, Escherichia coli 6.25%, proteus mirabilis and Citrobacter each 2.5%, mixed growths were isolated from 13 cases 16.25%. Among the gram positive organisms isolated from aural swab culture, staphylococcus aureus formed the majority 17.5%, staphylococcus epidermidis 13.75%, β-hemolytic streptococci 3.75% and α-hemolytic streptococci 1.25%. Among the gram negative organisms isolated from the cholesteatoma matrix culture,

Pseudomonas aeruginosa formed the majority 31.25% followed by *Klebsiella* 13.25%, *Escherichia coli* 7.5%, *Proteus* 5%, *Citrobacter* 2.5%, mixed growth 10%. Single pathogens were isolated from 67 of aural swab culture (83.75%) 72 cases of cholesteatoma matrix culture (90%). Mixed growths were isolated from 13 cases (16.25%) of aural swab culture and 8 cases (10%) of cholesteatoma matrix culture. The same organism was identified from the cultures of both aural swab and cholesteatoma matrix in 68 cases. In some showed mixed growth with another organism. In 5 patients aural swab culture showed gram positive pathogen whereas cholesteatoma culture showed gram negative pathogen. In 10 patients of gram negative pathogens from culture of cholesteatoma and aural swab were different. In 13 of the culture of aural swab and 8 of the culture of cholesteatoma matrix mixed growths were seen. *Staphylococcus aureus* was found more often in mixed growth than as a single pathogen. *Staphylococcus aureus* from cultures of aural swab and cholesteatoma matrix are more sensitive to cefotaxime, cephalixin, and ciprofloxacin. They are more resistant to ampicillin, doxycycline, amoxicillin. β -hemolytic streptococci are more sensitive to ampicillin, ciprofloxacin, cefotaxime. α -hemolytic streptococci are sensitive to ampicillin and ciprofloxacin. *Pseudomonas aeruginosa* is more sensitive to gentamycin, cefotaxime, ciprofloxacin and ceftriaxone. They are resistant to ampicillin, doxycycline and cephalixin. *Citrobacter* species resistant to all routine antibiotics in the study cases. *Escherichia coli* and *Proteus* are more sensitive to gentamycin, ciprofloxacin and cefotaxime and amikacin, ceftriaxone. *Klebsiella* are more sensitive to gentamycin, ceftriaxone, amikacin and they are resistant to doxycycline and ampicillin. The most common gram negative organism obtained from aural swab culture *Pseudomonas aeruginosa* 27.5%, *Klebsiella* 8.75%, *Escherichia coli* 6.25%, *Proteus* 2.5%, *Citrobacter* 2.5% and those obtained from culture of cholesteatoma matrix are *Pseudomonas aeruginosa* 31.25%, *Klebsiella* 13.75%, *Proteus* 5%, *Escherichia coli* 7.5%, *Citrobacter* 2.5%, mixed growth was obtained from 16.25% cases of aural swab cultures and 10% cases of cholesteatoma matrix culture. Thus mixed growth is more common in culture of aural swab. Ceftriaxone and cefotaxime shows a much better sensitivity near 100% and 93% respectively against these organism. Most of the organisms were resistant to doxycycline.

DISCUSSION

In the study by Itzhak Brook and Bethesda⁸ on the bacteriology of cholesteatoma, they have reported that *Staphylococcus aureus* was the predominant gram positive pathogen (5 in 24 patients) and *Pseudomonas aeruginosa*, the most predominant gram negative organism (9 in 24 patients) followed by *Proteus mirabilis* (5), *Klebsiella pneumoniae* (5) and *Escherichia coli* (4). They have also reported the presence of mixed growth in 8 patients.

In another study by L.A. Harker and F.P. Koontz⁹ on the bacteriology of cholesteatoma. They have reported that

in 57% of cases more than one organism was identified and *Pseudomonas aeruginosa* was the most frequent gram negative organisms identified followed by mixed flora of enteric organisms.

In a study by B.N. Rao and M.K.Reddy¹⁰ on the 'bacteriology of aural swab culture' of 120 cases in 1994, they have reported that *Staphylococcus aureus* formed the predominant pathogen (42.5%) followed by *Pseudomonas aeruginosa* (21.6%), *Proteus* (18.35%), *Escherichia coli* (10.83%) and *Klebsiella* species (10%). A single pathogen was isolated from 68.52% and mixed growth was isolated from the remainder. The antimicrobial sensitivity of the isolates showed that ciprofloxacin formed the drug of choice for treating cases due to either gram positive or negative organisms which showed a high rate of activity against *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Proteus* species with sensitivity incidence of 92.15%, 84.61% and 90.9% respectively followed by cefotaxime, ceftriaxone and amikacin.

The results obtained from the present study also concur with the data obtained from their other studies. The most gram positive organism obtained from aural swab culture in the present study is *Staphylococcus aureus* 17.5% followed by *Staphylococcus epidermidis* 13.75% β -hemolytic streptococci 3.75%, α -hemolytic streptococci 1.25% whereas those obtained from cholesteatoma matrix are *Staphylococcus aureus* 16.75%, *Staphylococcus epidermidis* 12.5%, β -hemolytic streptococci 1.25%.

In the present study, ciprofloxacin shows a high rate of activity against *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Escherichia coli* *Klebsiella* and *Proteus* with sensitivity index of 91.35%, 82.75%, 81.63%, 73.66% and 54.72 respectively among the oral antibiotics.

Thus we can see the result of the present study concurring with the result of previous studies and also the sensitivity pattern of antimicrobial agents including gentamycin changing slowly due to the emergence of resistance probably due to indiscriminate use of antibiotics and mixed growth of organisms.

Ciprofloxacin has now emerged as the drug of choice with high degree of sensitivity against both gram positive and negative organisms among oral available antibiotics.

CONCLUSION

Culture of aural swab and cholesteatoma matrix demonstrates the polymicrobial bacteriology consisting of both gram positive and gram negative pathogens. Gram negative pathogen form the majority of aural swab and cholesteatoma matrix but the percentage is more in cholesteatoma matrix cultures. Mixed growth is more common in culture of aural swab the cholesteatoma matrix cultures probably due to contaminant of infection from external auditory canal, ascending infection via Eustachian tube and indiscriminate use of antibiotics. The antibiotic sensitivity study shows emerging resistant strain for the commonly used antibiotics including gentamycin which formed the drug of choice of earlier studies. It is probably due to the indiscriminate use

of antibiotics. Even though the treatment for cholesteatoma is primarily surgical, because the elimination of pathogens depends upon the eradication of cholesteatoma, the knowledge of pathogens and their sensitivity will help in choosing the appropriate antibiotics during the post operative period which will prevent the development of resistant strain and complications.

REFERENCES

1. Anglitoiu A, Balica N, Lupescu S, Vintila R, Cotulbea S. Ossicular chain status in the otological pathology of the Ent Clinic Timisoara. *Medicine in Evolution* 2011; 17: 344-351.
2. Ahmed A, Usman J, Hashim R. Isolates from chronic suppurative otitis media and their microbial sensitivity. *Pak Armed Forces Med J.* 1999;49;82-5.
3. Mansoor T, Munsani MA, Khalid G, Kamal M. *Pseudomonas aeruginosa* in chronic suppurative otitis media; sensitivity spectrum against various antibiotics in Karachi. *J Ayub Med Coll Abbottabad.* 2009;21:120-3.
4. Bansal S, Ojha T, Kumar S, Singhal A, Vyas P. Changing microbial trends in cases of Chronic suppurative otitis media patients. *Int J Current Res Rev.* 2013;5:76–80.
5. Ludman H. *Diseases of the ear.* London [u. a.]: Arnold; 1998.
6. Karma P, Jokipii L, Ojala K, Jokipii AMM. Bacteriology of the chronically discharging middle ear. *Acta otolaryngologica (Stockholm)* 1978; 86:110-114.
7. Khemani A, Ali AA, Sheikh RB. Bacteriology and its effects on clinical presentation and treatment results of chronic suppurative otitis media (CSOM) *Med Channel* 1999; 5: 35-8.
8. Itzhak Brook, Bethesda – Aerobic and anaerobic bacteriology of cholesteatoma – *The laryngoscope* 91: 1981, 250-253.
9. Harkar LA, Koontz FP: The bacteriology of cholesteatoma – In McCabe BF, Sade I, editors *Cholesteatoma – first international conference* New York, 1977, 264-267.
10. B.N. Rao, M.S.Reddy – Chronic suppurative Otitis media – A prospective study. *Indian Journal of otolaryngology and head and neck surgery.* 1994;3:72-77.

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