

Evaluation of bacteriology of middle ear in early quiescent stage of chronic otitis media

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Abstract

Objectives

The objectives of this study were to determine whether any organism does exist in middle ear cavity during the early quiescent stage of chronic otitis media and to isolate their types.

Materials and methods

Forty-seven patients of age 13 years and above with diagnosis of chronic otitis media mucosal type in early quiescent stage were included. Swab was collected from middle ear cavity for culture and sensitivity in operation theatre prior to middle ear surgery and brought to microbiology laboratory within half an hour to inoculate in Blood agar, Chocolate agar and Mac Conkey agar. The isolates were identified with the use of standard bacteriological technique.

Results

Aerobic bacteria were isolated from 15 cases (31.9%). *Staphylococcus aureus* isolated in 12(80%), *Pseudomonas aeruginosa* in 2(13.3%) and *E. coli* in 1(6.7%).

Conclusion

Aerobic bacteria were isolated from middle ear cavity in quiescent stage of chronic otitis media in 15(32%) cases. *Staphylococcus aureus* was the most common organism.

Key words: Bacteriology, chronic otitis media, quiescent stage, wet ear.

Introduction

Mucosal type of Chronic Otitis Media (COM) is a common disease worldwide. There is no uniformity regarding nomenclature of this disease. Terms like Chronic suppurative otitis media-tubotympanic or non-cholesteatoma type are also used synonymously.¹ The disease may pass through acute, inactive, quiescent or

healed stage. There is discharge in middle ear & external auditory canal with congestion of middle ear mucosa in acute stage. Absence of otorrhoea and normal looking middle ear mucosa are seen in inactive stage. Quiescent is that period within 6 week of cessation of frank otorrhoea where the middle ear inflammation has not yet settled completely. During its natural course, quiescent stage may convert to inactive or return to active stage as determined by various

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factors. Early quiescent stage is hereby defined within two weeks after cessation of frank otorrhoea.

Monobacterial or mixed growth is isolated from ear discharge. *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Bacillus*, *E.coli*, *Haemophilus influenzae*, *Peptostreptococcus*, *Bacteroids* are common bacterial organism isolated from ear discharge. Regarding the role of anaerobic organism found in COM is controversial.² Active stage is converted to quiescent stage after medication so early quiescent stage is a relatively sterile condition. So, this study was undertaken with the aims of assessing the middle ear of its bacteriological status so that it would help to select proper antibiotics. .

Materials and methods

This is a prospective study conducted in Man Singh Memorial Academy of ENT and Head And Neck Studies and Department of Microbiology, Tribhuvan University Teaching Hospital, Institute of Medicine, Maharajgunj, Kathmandu Nepal from 1st October 2007 to 30th April 2009 (19 months) .Consent was taken prior to the procedure . Ethical clearance was received from Institute Review Board .Age greater than thirteen year; all gender and patient in early quiescent stage of chronic otitis media were included. Frank otorrhoea, patient receiving antibiotics within 72 hour before surgery and revision surgery cases were excluded. Non probability convenient sampling method was applied.

Preoperative work up was done with detail history, general physical examination, ear examination with otoscope and microscope if needed; tuning fork test

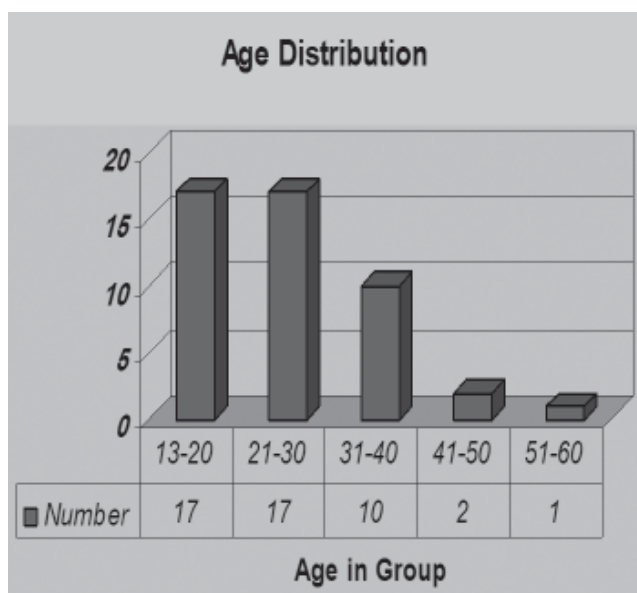
with 500 Hz was done. Discharge seen in external auditory canal (EAC) was marked as frank otorrhoea. Capsule Amoxycillin (30 mg/kg/day) and ear drop Betamethasone combined with Neomycin were prescribed. Patient was asked for follow up in ENT OPD two times in a week so that exact day of stoppage of otorrhoea could not be missed. Patient was planned for surgery within 2 weeks counted from the day of stoppage of frank otorrhoea. Patient was sedated with injection Pethidine 50 milligram (mg) intramuscular and injection Promethazine 25 mg intramuscular in gluteal region half an hour before surgery. Patient was kept in supine position. Ear canal was packed with sterile cotton pledget in 3 layers, and then painting was done using Povidine Iodine 5% solution. Appropriate sized sterile metallic aural speculum was inserted in external auditory canal. Operating microscope was used to visualize the perforated tympanic membrane through which small cotton ball held by crocodile forceps were left in middle ear cavity for some time and the swab was taken. Swab was kept in sterile vial and inoculated within half an hour in culture medium in Microbiology Laboratory. Swab was inoculated in Blood Agar, Mac Conkey Agar and Chocolate Agar at 37° C in aerobic condition for 48 hours. Isolation and identification was done by standard technique.³ Bacterial growths was identified by morphology, culture character, pigment production, haemolysis, motility, conventional biochemical tests, Gram staining if necessary. Antibiotic sensitive test was performed by disc diffusion method for following antibiotics: Amoxycillin, Ciprofloxacin, Cloxacillin, Cotrimoxazole, Chloramphenicol, Gentamicin, Amikacin, Ceftazidime, Cefotaxim, Ceftriaxone, Erythromycin, Vancomycin. Data analysis

was performed with help of SPSS 14.5 software package.

Results

Total number of patients enrolled for the study was 47. Age distribution is mentioned in Fig I.

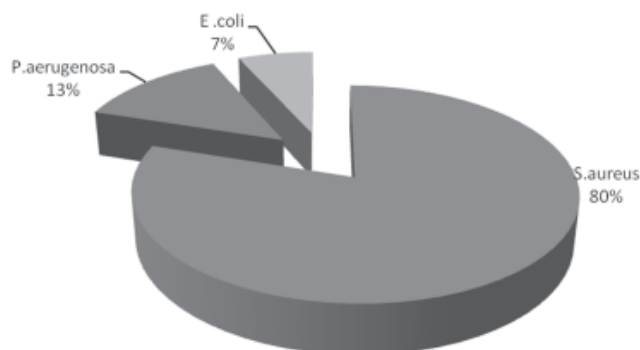
Figure I: Age distribution of the patients (n=47)



Male were 23 and female were 24 with Male: Female ratio 1:1.04

The minimum and maximum days required to stop otorrhoea after prescribing oral antibiotics and ototopical medication were 5 days and 18 days respectively with mean duration of 11.8 days. Aerobic bacteria were isolated from 15 cases (31.9%), out of which *S aureus* in 12 patients(80%) , *P aeruginosa* in 2 patients(13.3%) and *E.coli* in 1 patient(6.7%) as shown in Table1. *S aureus* and *P aeruginosa* were sensitive and resistant to receiving antibiotics in equal number and *E.coli* was resistant to the receiving antibiotics.

Table 1. Frequency and type of aerobic bacteria isolated from middle ear (n=15)



Among the patients having middle ear discharge at surgery only 14 (32.5%) showed growth and 29(67.5%) showed no growth at all. Similarly out of four patients having no middle ear discharge only 1 patient showed growth and culture was negative in the rest three patients as shown in Table2.

Table 2. Middle ear discharge correlated with aerobic culture

Organism	No discharge	Discharge	Total
No growth	3	29	32
Growth	1	14	15
Total	4	43	47

Middle ear discharge was noticed in 43 ears (91.5%). No discharge was seen in 4 cases Bacteria were isolated from 15 quiescent ears .No growth was seen in 32 ears

Discussion

The objectives of this study were to find out the aerobic bacterial status of middle ear cavity at time of middle ear surgery during early quiescent stage of COM. This

is a prospective study. Inclusion criteria of age were kept above 12 years. Lower age group was excluded due to inconvenience to do the procedure under local anaesthesia. Patients receiving antibiotics within 72 hours before surgery were excluded from the study because it could affect culture of the organisms. Active discharging ear was converted to quiescent stage after oral and topical medication. Period of two weeks after stoppage of otorrhoea was defined as the early quiescent stage in this study. Patients were selected for procedure within either the first or second week of quiescent stage depending upon the availability in theatre. 68% samples were collected within the first week and 32% within second week. It took five to eighteen days to control frank otorrhoea after the start of oral and oto-topical medication. Mean duration was 11.8 days. Reports are not available in literature that quote the specific period needed for the similar purpose.

All the sample collection was done in quiescent stage which is that period within 6 week of stoppage of frank otorrhoea where the middle ear inflammation has not yet settled completely. Both gram positive and gram negative bacteria are responsible to infect respiratory tract and middle ear. Aerobic bacteria were isolated from only 31.9% of quiescent ears. *Staphylococcus aureus* was the most common organism (80%) isolated, followed by *Pseudomonas aeruginosa* (13.3%) and *E. coli* (6.7%). All the growths were as monobacterial. *Pseudomonas aeruginosa* was the most common organism isolated from chronic discharging ears in some of the studies^{4, 5, 6} while *Staphylococcus aureus* was the commonest organism isolated in studies done by others.^{7, 9} Polymicrobial infections including fungi are also isolated from chronic

otitis media as a symbiotic relation with aerobic organisms. Swab was inoculated within half an hour to preserve the fastidious organism like *H. influenzae*. Regarding sensitivity, *S aureus* and *P aeruginosa* were sensitive and resistant to receiving antibiotics in equal number and *E.coli* was resistant to the receiving antibiotics.

Aerobic bacteria like *staphylococcus*, *proteus*, *pseudomonas*, *E. coli* were reported from various studies with varying frequency from frank discharge before using any form of antibiotics.^{6,7,8} Varshney et al⁸ isolated *Pseudomonas aeruginosa* (35.71%), *Staphylococcus aureus* (19.52%), *E. coli* (5.74%) but Rao et al⁹ isolated *Staphylococcus aureus*(42.5%), *Pseudomonas aeruginosa*(18.33), and *E. coli*(10%). Prior use of antibiotics yields lower isolates. More resistant nature of *Staphylococcus aureus* to empirical therapy could be the one reason for most frequent isolate in our study. *Pseudomonas* does not normally inhabit the upper respiratory tract so its existence in middle ear cavity indicates possible invasion through perforated tympanic membrane in COM. It attaches with pilli , releases protease, lipopolysaccharide and other inflammatory enzymes preventing normal immunological defense and eroding bones in middle ear.

Presence of organism in middle ear during surgery may affect the outcome of surgery. Discharge seen in middle ear during surgery in quiescent stage is not always the source of infection. In our study, aerobic bacteria were isolated only from 15(31.9%) ears. This low yield may be due to oral antibiotics and ototopical medication used to make the ear quiescent. Our findings are different from those of Carlin et al¹⁰ who had observed

that out of 60 wet ears only in 11(18.3%) pathogens were actually present but condition of middle ear is different in our study. Retrospective study conducted in Korea by Ahn et al¹¹ for evaluation of pre, intra and post operative status of bacteria from middle ear revealed that no bacteria were observed in 34.1% of preoperative or 76.6% of intraoperative cultures. Patients preoperatively positive for coagulase-negative *Staphylococcus*, *S. aureus*, or *Pseudomonas aeruginosa* remained positive intraoperatively. Different types of bacteria isolated from middle ear intraoperatively, not seen preoperatively, methicillin-resistant *Staphylococcus aureus* (MRSA) being the most common preoperatively. Study from Nigeria in CSOM¹² showed *Escherichia coli* and *Streptococcus sp.* are the leading pathogenic organisms in their region.

Conclusion

It can be concluded that organisms were isolated in 31.9% of middle ear cavity at surgery in early quiescent stage of COM. Most common aerobic bacteria found in middle ear cavity in early quiescent stage was *Staphylococcus aureus* (80%), followed by *P. aeruginosa* and *E.coli* which were seen in 13.3% and 6.7% of cases respectively.

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