BACTERIOLOGICAL STUDY OF CHRONIC SUPPURATIVE OTITIS MEDIA IN TERTIARY CARE CENTRE

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ABSTRACT

Introduction: Chronic suppurative otitis media (CSOM) is a middle ear inflammation characterised by discharging the ear for at least a month due to tympanic membrane rupture or involvement of the attic or antral parts. The inflammation is caused by the underlying infection, which causes the mucosa of the middle ear to become irritated, resulting in discharge and tympanic membrane disease. Aim: To study the microbial flora from ear discharge in mucosal and squamosal chronic suppurative otitis media. Materials and Methods: This study comprised 100 ears with mucosal or squamosal CSOM. Aural suctioning/cleaning using a bull’s eye lamp was performed on patients who presented to the OPD with a discharging ear. Following the cleansing of the external auditory canal, a sterile aural speculum was inserted into the EAC to create a sterile conduit. Following that, sterile cotton swabs were used to capture middle ear fluid or discharge surrounding the tympanic membrane, then sent to the laboratory for bacteriological testing within 30 minutes. Results: Out of the 100 ear swabs, 6 had no growth, whereas Pseudomonas aeruginosa was most commonly isolated (36 swabs) in 22 squamosal CSOM and 72 swabs of squam mucosal CSOM, followed by Proteus mirabilis (23 swabs) in squamosal and mucosal CSOM. Conclusion: Pseudomonas aeruginosa is the commonest bacteria isolated in mucosal CSOM and also for squamosal CSOM.

KEYWORDS Mucosal, Squamosal, chronic otitis media, Swabs, culture tests, ear discharge, ear swabs

Introduction

Chronic suppurative otitis media is an infection and inflammation of the middle ear characterized by the persistent discharge from tympanic membrane perforation or due to involvement of the attic or antral part for over a month1–3. CSOM has received attention due to its high incidence and chronicity and bacterial resistance to topical and systemic antibiotics7. Therefore, a study of microbial flora in CSOM has gained importance.

The types of CSOM are:
• Mucosal CSOM: or safe disease4, characterized by a perforated pars tensa, and called ‘safe’ since due to minimal chances of developing complications5 and chronic inflammation of middle ear mucosa and mastoid causing oedema, inflammatory infiltrates and fibrosis. Active mucosal CSOM can be associated with ossicular destruction. It is accepted that viral infection of the upper respiratory tract precedes bacterial AOM6.
• Squamosal CSOM: or atticoantral (unsafe) CSOM. Any attic or antral part involvement can cause cholesteatoma and bone destruction. In addition, negative middle ear pressure can retract the tympanic membrane, leading to retraction.
discharge is important to study microbial flora causing CSOM. The discharge can be:

1. profuse, mucoid, non-foul smelling and non-blood-stained discharge suggestive of
2. Scanty, purulent, foul-smelling, blood-stained discharge associated with pain point towards squamousal/unsafe disease. This is due to osteitic changes in the mastoid and middle ear.

In a study conducted by Sweeney G et al., Proteus spp. was the commonest infective agent in both squamosal and mucosal CSOM. In contrast, Pseudomonas aeruginosa was least commonly found in squamousal disease.

Knowing the polymicrobial infection, in particular, the extent of anaerobic involvement is limited due to the differences in the collection and method of culture. Complications of CSOM were frequently seen before antibiotics. However, after the antibiotic era, clinicians have been provided with a tool to be used even without a causative diagnosis. Also, the irrational use of antibiotics has led to the emergence of multi-drug resistant strains, causing disease complications.

**Materials and methods**

Patients with chronic otitis media from September 2019 to August 2021 were studied in the Otorhinolaryngology Department at Dr D.Y. Patil Medical College & Hospital in Pune, Maharashtra. It was decided to take a sample of 100 ears. A total of 100 ear swabs from patients aged 10 to 60 years old who visited the ENT outpatient department were included in the study. The following patients were left out of the study:

1. Patients with concomitant conditions like diabetes or hypertension.
2. Patients with mucosal/squamosal chronic otitis media were already on antibiotic ear drops and/or systemic antibiotics.
3. Age groups of less than ten years and more than sixty years
4. Patients with superadded otomycosis were not allowed to participate in the trial.
5. The refusal of the patient.
6. CSOM that develops after surgery
7. External otitis
8. a traumatic event

Patients who presented to the OPD with a discharged ear were given an aural cleaning with the assistance of a bull’s eye lamp. Following the cleansing of the external auditory canal, a sterile aural speculum was inserted into the EAC to create a sterile conduit. Following that, sterile cotton swabs were used to capture middle ear fluid or discharge surrounding the tympanic membrane, which was then sent to the laboratory for bacteriological testing within half an hour.

Sample collection and processing: All samples were collected under stringent aseptic conditions, transported in sterile containers, and processed as soon as possible according to standard procedures. Isolates were identified using a standard isolation and identification process that included a thorough understanding of colony appearance and biochemical responses.

Clinical samples were processed in various media according to our laboratory’s protocol, such as blood agar and Mac Conkey agar for pus samples. When special media was required, it was used.

Growth and colony properties were observed after 24 hours of aerobic incubation at 37°C.

Isolation and identification of organisms: Bacteria were isolated and submitted to biochemical processes for speciation after gramme staining. Plates were incubated at 37°C for 18-24 hours before being analysed. Plates were checked to assure growth before findings.
with individual discs were read. The inhibitory zone’s diameter was measured in millimetres. The interpretation was made following the CSLI rules for 2018.11

**Observation and results**

**Distribution based on the type of CSOM:** Of the 100 years included in the study, most cases were mucosal CSOM, with a preponderance of 77 cases, while the number of patients who had squamous CSOM was 23. (Table 1)

**Distribution based on bacterial isolate:** The study comprised 100 patients with CSOM, all of whom had ear discharge as a presenting complaint. Following aural cleansing, the middle ear discharge or discharge around the tympanic membrane (as in squamous CSOM) from either ear was sent for microbiological analysis and culture media growth. The majority of the organisms identified were Pseudomonas aeruginosa, with Pseudomonas fluorescens and Citrobacter freundii being the least isolated. Six of the swabs sent for culture and sensitivity revealed no signs of growth. (Table 2)

**Organisms causing mucosal and squamous CSOM:** Out of the 94 organisms isolated in this study, most organisms isolated were Pseudomonas aeruginosa in mucosal and the same in squamous ears. (Table 3)

**Discussion**

Our study was done to isolate different microorganisms in patients CSOM. After implementing inclusion and exclusion criteria, the patients were subjected to aural cleaning and swab of ear discharge, and the results were obtained.

Out of 77 patients in this study with mucosal CSOM, 29 isolates (37.66%) were Pseudomonas aeruginosa, 19 were (24.67%) Proteus mirabilis, 5 were (6.49%) MSSA, 4 were (5.19%) MRSA, 4 were (5.19%) Streptococcus pyogenes, 3 were (3.90%) E. coli, 3 were (3.90%) Staphylococcus epidermidis, 2 were (2.60%) Citrobacter freundii, 2 were (2.60%) Pseudomonas fluorescens, and 1 was (1.30%) Klebsiella pneumonia. Out of 23 patients included in this study with squamous CSOM, 22 swabs came positive for isolates. Out of these isolates in squamous CSOM, 7 isolates (31.81%) were Pseudomonas aeruginosa, followed by 4 Proteus mirabilis isolates (18.18%), 4 Klebsiella pneumonia isolates (18.18%), followed by 3 Staphylococcus aureus (13.63%), including 2 MRSA isolates (9.09%), and 1 MSSA isolate (4.54%), followed by Staphylococcus epidermidis (13.63%), followed by 1 Streptococcus pyogenes isolate (4.54%).

Our study demonstrates that Pseudomonas aeruginosa is the most common causative agent in squamous and mucosal CSOM, with other commonly isolated microbes being Proteus mirabilis, Klebsiella pneumonia, Staphylococcus aureus, and Staphylococcus epidermidis.

Beta haemolytic streptococci, i.e., Streptococcus pyogenes, is a rare causative agent in squamous CSOM but is mostly associated with mucosal CSOM.

**Conclusion**

**Pseudomonas aeruginosa** is the dominant bacteria isolated in chronic suppurative otitis media, **Proteus mirabilis** and **Staphylococcus aureus** preceding it.

**Pseudomonas aeruginosa** and **proteus mirabilis** are common bacteria isolated in mucosal CSOM.

**Pseudomonas aeruginosa**, **Klebsiella Pneumoniae**, and **Proteus mirabilis** are predominant bacteria isolated in squamous CSOM.

**Abbreviations**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>CSOM</td>
<td>Chronic suppurative otitis media</td>
</tr>
<tr>
<td>H. influenzae</td>
<td>Haemophilus influenza</td>
</tr>
<tr>
<td>S. pneumonia</td>
<td>Streptococcus pneumonia</td>
</tr>
<tr>
<td>P. aeruginosa</td>
<td>Pseudomonas aeruginosa</td>
</tr>
<tr>
<td>E. coli</td>
<td>Escherichia coli</td>
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<tr>
<td>MSSA</td>
<td>Methicillin sensitive Staphylococcus aureus</td>
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<tr>
<td>MRSA</td>
<td>Methicillin-resistant Staphylococcus aureus</td>
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<tr>
<td>CLSI</td>
<td>Clinical and laboratory standards institute</td>
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<tr>
<td>MHA</td>
<td>Mueller Hinton Agar</td>
</tr>
<tr>
<td>OPD</td>
<td>Outpatient department</td>
</tr>
<tr>
<td>IPD</td>
<td>Inpatient department</td>
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<tr>
<td>EAC</td>
<td>External auditory canal</td>
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**Table 3 Organisms causing mucosal and squamous CSOM**

<table>
<thead>
<tr>
<th>TYPE OF CSOM</th>
<th>Mucosal</th>
<th>Squamosal</th>
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<tbody>
<tr>
<td>Proteus mirabilis</td>
<td>19</td>
<td>4</td>
</tr>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>29</td>
<td>7</td>
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<tr>
<td>MSSA</td>
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<td>2</td>
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<tr>
<td>Staphylococcus epidermidis</td>
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<td>3</td>
</tr>
<tr>
<td>E.Coli</td>
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<td>0</td>
</tr>
<tr>
<td>Klebsiella pneumonia</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Pseudomonas fluorescens</td>
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<td>0</td>
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<tr>
<td>Streptococcus pyogenes</td>
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</tr>
<tr>
<td>Citrobacter freundii</td>
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<td>0</td>
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</table>
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Conflict of interest
There are no conflicts of interest to declare by any of the authors of this study.

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6. Mahmood F Bhatta, Ruth B Thornton, and Micheal T Cheeseman in understanding the aetiology and resolution of chronic otitis media from animal and human studies in 2017