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Original Research Article

A Prospective Study of Clinicopathological Correlation in Patients with Chronic Suppurative Otitis Media in Vindhya Region

Yasmeen Siddiqui[1], Pallavi Indurkar[2], Surendra Singh Maupachi[3], Arshi Ishteyaq[4]

[1]Assistant Professor, Department of ENT, Shyam Shah Medical College, Rewa, Madhya Pradesh

[2]Assistant Professor, Department of ENT, Shyam Shah Medical College, Rewa, Madhya Pradesh

[3]Professor and Head, Department of ENT, Shyam Shah Medical College, Rewa, Madhya Pradesh,

[4]Senior Resident, LN Medical College and Research Centre, Bhopal, Madhya Pradesh

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Corresponding author: Dr. Yasmeen Siddiqui

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Abstract

Background: Chronic suppurative otitis media (CSOM) is characterized by permanent perforation in the tympanic membrane and ear discharge, the most common reason for preventable hearing loss. Histopathological changes in the middle ear and mastoid can assist the physicians in deciding the surgical procedure and outcome of the disease.

Aims and objectives: To evaluate the relationship between clinical features and the histopathological findings of CSOM and determine the treatment protocol.

Materials and Methods: Hundred patients diagnosed with CSOM were studied at the ENT Outpatient Department of SSMC, Rewa, Madhya Pradesh. A histopathological examination was performed on the mucosa of the middle ear. Patients undergoing surgery were followed up every week for six months. Any post-operative aural discharge and graft condition was assessed, and PTA for hearing evaluation was done after a month.

Results: In most cases, histopathological examination showed changes that correspond to chronic inflammation with lymphoplasmacytic infiltrations in the majority. Few cases showed granulation tissue which is associated with mucopurulent discharge. Ossicular necrosis is common in patients with granulation tissue.

Conclusion: There is a need for comprehensive management of CSOM. Various clinical and pathological features should be considered when deciding the management strategies. The size of perforation is associated with the amount of hearing loss. Understanding the clinical and pathological course of CSOM helps rationalize the treatment protocol and plan surgical procedures, which improves patient outcomes.

Keywords: Measles, Vaccine, Antibody, Vaccination, Malnourished, Anthropometry.

Introduction

The perforation in the tympanic membrane characterizes chronic suppurative otitis media (CSOM). Recurrent ear discharge and otorrhoea are the most common symptoms[1]. For children, it is a major cause of acquired hearing impairment and a significant cause of preventable hearing loss in the developing world. The prevalence of CSOM is higher in developing countries and rural areas, but it is much less common in the developed world[2].

While CSOM incidence ranges from 0.5 to 2 percent in developed countries, it ranges from 3 to 57 percent in developing countries. CSOM can affect up to 30% of Indians, with prevalence rates in urban and rural areas of 16 and 46 per 1,000 people, respectively[3].

Middle-ear and mastoid changes in CSOM can occur histopathologically. Infection and inflammation cause some changes, but the body's immune system also plays a role. These changes contribute to the development of CSOM symptoms and play a significant role in the success or failure of tympanomastoid surgery for CSOM.

As a result of this study, the clinician's diagnostic and therapeutic capabilities can be improved by allowing more rational decisions regarding selecting cases and surgical techniques for optimal control of disease and hearing restoration. The microbiological flora that causes CSOM has also been considered in the study.

Materials and Methods

A prospective study was performed on 100 patients with CSOM in the Department of ENT of Shyam Shah Medical College, Rewa, Madhya Pradesh (Vindhya region). Institutional Ethics Committee approval was obtained before starting the study.

Patients who attended OPD and were admitted to the ward were considered for the study after obtaining written informed consent regarding their willingness to participate in the study for six months.

Patients who did not return to the OPD for a follow-up appointment were excluded from the study.

To determine the presence of CSOM, a thorough history, physical examination, and a battery of specialized tests were performed (microscopic examination, pure tone audiogram, X-ray mastoids, and HRCT temporal bone, CT scan of the brain if necessary). All of these patients' middle ear mucosa was removed and sent to a lab for histological analysis. The OPD was used to collect mucosa from individuals who were unable or unwilling to undergo surgery. Only one biopsy was collected during myringoplasty/tympanoplasty under local anesthesia under an operating microscope or from material received at polypectomy in CSOM instances that were considered safe. Attic, antrum, and mesotympanic polyps were removed during mastoid probing in hazardous CSOM cases.

An aural toilet, antibiotics, steroids at the site of the infection, and antihistamine tablets were prescribed to patients who were not having surgery. As a precaution, patients were told to keep water out of their ears.

Before enrolling patients in the trial, any known factors such as a deviated nasal septum, adenotonsillitis, and sinusitis were addressed. Preoperative pure tone audiometry and intraoperative verification of ossicular chain continuity were used to evaluate osseous chain status.

Patients who underwent surgery were monitored weekly for the first three weeks, then every other week for the next month, and then once a month for six months. Their hearing and graft condition were checked after one month of follow-up visits during their post-operative appointments.

All the data analysis were performed using IBM SPSS ver. 25 software. Frequency distribution was performed to prepare the tables. Data are expressed as number of patients and percentages.

Results

The majority of the patients with CSOM were female (54%) than the males (46%).

Table 1: Showing distribution of CSOM patients according to age and sex

Age group (years)	Male	Female	Total
11-20	19	23	42
21-30	17	19	36
31-40	6	8	14
>40	4	4	8
Total	46	54	100

The majority of the patients had disease duration between 10-20 years (35%), followed by 29% who had disease duration between 1-5 years, and 26% had between 5-10 years. There were 4% who had a disease duration of more than 20 years, and 10% had less than one year.

Most of the CSOM cases were tubotympanic type (90%), followed by atticoantral type (10%). The most common clinical symptoms of CSOM were ear discharge (52%), hearing loss (41%), tinnitus (22%), and vertigo (5%). Sixty-five percent of patients had a history of mucopurulent discharge, 32% had mucoid discharge, and 12% had 3% had a blood-stained discharge.

Otoscopic examination revealed that 52% of patients were congested, and 42% had healthy middle ear mucosa with central perforation. Cholesteatoma in 10% and granulations and polypoidal changes in 16% of patients.

In 50% of the patients, large central perforation was reported, 22% showed a subtotal perforation, and 16% and 10% had Small central and attic perforations.

Microbiologically on obtaining a swab and culture of the ear discharge, *Staphylococcus aureus* was isolated in 40% of cases, coagulase-negative Staphylococcus was seen in 16% cases, Pseudomonas was isolated in 22% cases, Klebsiella was seen in 18% cases, Escherichia coli was seen in 4% cases.

Pure tone audiometry was used to measure hearing loss, which was conductive in most cases of mild to severe hearing loss, depending on the size of the perforation (Table 2).

Based on the findings, those who did not respond to medical treatment were taken for appropriate surgery. Intraoperatively, the necrosed ossicular chain was seen in 22% of cases, congested and oedematous mucosa in 64% of patients, and cholesteatoma and granulations were found in 10% and 46% of cases, respectively. The intact ossicular chain was the most common finding (78%).

Depending on the clinical scenario, operative techniques ranged from tympanoplasty to a Modified Radical Mastoidectomy (MRM) (Table 3). The histopathological findings are enlisted in (Table 4).

Table 2: Degree of hearing loss depending on the size of perforation.

Type of perforation	Percentage of cases	Range of hearing loss
Subtotal	22	40-56 dB
Large central	50	30-48 dB

Small central	16	28-30 dB
Attic	10	48-76 dB

Table 3: Types of procedures performed

Procedure	No of patients	Percentage
Tympanoplasty	56	56.0
Canal wall up and type I tympanoplasty	28	28.0
Canal wall up and type III tympanoplasty	4	4.0
Canal wall up and type III tympanoplasty	2	2.0
MRM and type III tympanoplasty	10	10.0

Table 4: Histopathological changes among the patients

Types of histopathological findings	No. of patients	Percentage
Non-keratinized squamous epithelium	34	34.0
Keratinized squamous epithelium	8	8.0
Respiratory epithelium	8	8.0
Cuboidal cells	24	24.0
Low columnar cells	8	8.0
Granulation tissue	32	32.0
Lymphocytes	94	94.0
Plasma cells	90	90.0
Histiocytes	52	52.0
Neutrophils	24	24.0
Macrophages	8	8.0
Fibrocollagenous tissue	54	54.0
Eosinophils	20	20.0
Oedematous submucosa	12	12.0
Polypoidal changes in mucosa	2	2.0
Cystic changes	14	14.0
Chronic mastoiditis	18	18.0
Chronic nonspecific inflammation	30	30.0
No opinion possible	6	6.0

Discussion

One of the most common causes of preventable hearing loss is CSOM, characterized by permanent tympanic membrane perforation and ear discharge. As part of CSOM treatment, observing histopathological changes in the middle ear and mastoid in patients with CSOM is essential.

In the present study, the majority of the CSOM patients had an age between 11 to 30 years, with a female preponderance. Varshney S et al.[4] agrees with their findings. The early presentation may be due to increased awareness of health issues and difficulty in hearing that affects work efficiency, leading patients and parents to seek early medical intervention. Wang HM and colleagues reported similar findings[5]. Another study by Lasisi et al. concluded that poor socioeconomic status, overcrowding and close contact with children with upper respiratory tract infections, and higher incidences of CSO during pregnancy could be the reasons for a higher female preponderance[6]. El-Sayed Y's study correlated with the

duration of the disease at OPD presentation[7].

Most CSOM patients reported otorrhoea or hearing loss as their primary ailment. It was found that these characteristics were similar to those studied by Kumar N et al.[8]. In terms of clinical features, hearing loss was the second most common one. As the perforation size increased, so did a person's hearing loss. A correlation between the air-bone gap and the perforation size was found in studies by Merchant et al.[9] and Ahmed et al.[10].

According to a study by Nagle SK et al., central perforation was the most common finding, with small central perforation in 20% of cases, large central perforation in 23% of cases, and medium-sized perforation in 57% of patients[11]. There were 42% cases in the present study with healthy middle ear mucosa, which is similar to the study by Krishnan et al.[12]

Staphylococcus aureus was found in 48.69 percent of cases and Pseudomonas in 19.89 percent of patients in a study by Prakash R et al.[13] which is in agreement with to present study.

Ossicular necrosis was observed in 22% of cases intraoperatively, which is almost in agreement with a study by Haidar H et al. Of the 39 cases examined, 88% had an intact ossicular chain[14].

One study by Rout MR et al. showed that the long process of the incus was the most frequently necrosed, while seven cases had necrosed malleus and two cases had necrosed superstructure of the stapes[15]. Out of the 11 cases examined in this study, 10 had a long process of the incus necrosed. Incus necrosis coexisted with malleus necrosis in this case.

At least 10 percent of the patients had cholesteatomas found intraoperatively; 23 percent had mastoid antrum granulations.

Middle ear mucosa was persistently congested in these cases, even after topical and systemic antibiotics treatment, indicating that the antral pathology is mirrored in the middle ear. Grains were found in 57% of cases in a study by Rickers J et al.[16]

Twenty-four tubotympanic CSOM cases with active middle-ear mucosa improved in 16% of patients by reducing congestion, while 32% did not respond to medical treatment.

The majority of cases showed histopathological changes consistent with chronic inflammation, with lymphoplasmacytic infiltration in most cases and granulation tissue in 34% of the patients.

According to the ossicular chain status study results, ossicular necrosis was found in 22%. Incus necrosis occurred in 10 of the 11 cases, while malleus necrosis occurred in seven. Necrosis of the malleus was associated with incus necrosis.

In two cases, the Stapes superstructure was observed. Following the malleus and the stapes, the incus was the most commonly necrosed ossicle in this study. Tos M found that necrosis of the incus and stapes was more common[17]. Only 56 of the 674 cases he examined had necrosis of the long process of the incus or 8.3%. Only two incus bodies and fifteen stapes superstructures were eroded. Sade J and his colleagues found that both malleus and the incus were affected by hearing loss[18].

In 32% of the cases, ossicular necrosis was linked to the presence of granulation tissue in our research. This was discovered to be critical. Ossicular resorption is known to occur in patients with middle ear granulations. There is evidence that if perforation edges adhere to the promontory, granulation tissue and inflammatory products are trapped in small dead spaces of the middle-ear cleft, leading to significant bone erosion over time. Ossicular necrosis has been linked

to granulation tissue in other studies as well[19].

Ossicular necrosis patients had an average PTA threshold of 54.36 dB. Ossicular discontinuity was more likely when the Air Bone Gap (ABG) was greater than 30 dB at 2kHz and greater than 40 dB at 4kHz[20]. According to the literature, having a PTA average threshold of 41-70 dB is associated with incus necrosis[21].

The tympanoplasty procedure was performed in 56% of CSOM patients. The success of graft take-up after surgery was 92%, with graft failure occurring in 8% of those cases. Nearly identical results were found in the study by Kamath MP and colleagues on the success rate of graft take-up[22]. As evidenced by post-operative PTA reports, hearing improvement was seen in about 80% of cases following surgery.

Of 56% of tubotympanic CSOM cases with active middle ear mucosa, 16% of these cases improved after receiving medical treatment. This 16% of patients underwent tympanoplasty, while the remaining patients underwent Canal Wall Up mastoidectomy and tympanoplasty, which revealed granulations in the mastoid antrum as indicated by preoperative X-ray mastoids showing sclerosis, emphasizing that middle ear pathology reflects mastoid antrum pathology.

Conclusion

Our research focuses on treating CSOM holistically by considering its clinical and pathological manifestations. Otoscopic findings of congested middle ear mucosa correlated with mastoid granulations in 60% to 70% of cases, indicating that mastoid antrum pathology is reflected in the middle ear pathology. There was necrosis in all instances of cholesteatoma and in approximately half of cases where granulation tissue was present, highlighting the importance of planning an additional tympanoplasty procedure if these conditions are present before/during the process.' An in-depth clinical examination, including determining the size and kind of perforation, the CSOM stage, and the condition of the mid-earing mucosa, will aid us in devising the most effective surgical procedures and provide the best possible outcomes for our patients.

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