

ORIGINAL RESEARCH

Assessment of predictors of ossicular dysfunction in cases of mucosal Chronic Suppurative Otitis Media (CSOM): A Cohort Study**¹Dr. Abhiniti, ²Dr. Pawan Kumar Lal**

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Abstract

Background: Chronic Suppurative Otitis Media (CSOM), which manifests as recurrent ear discharge or otorrhea through a rupture/perforated tympanic membrane for intervals ranging from six weeks to three months despite medical therapy, is caused by chronic inflammation of the middle ear cleft.

Aim & objectives: The present study was conducted to evaluate predictors of ossicular dysfunction in cases of mucosal CSOM.

Materials & Methods: 65 cases of mucosal chronic suppurative otitis media of both genders underwent a detailed clinical examination which included otoscopy, assessment of hearing using tuning fork tests, pure tone audiogram using Goodman scale and otoendoscopic examination. Cases underwent tympanoplasty or cortical mastoidectomy with tympanoplasty under general anaesthesia based on the disease condition. Patients were divided into 2 groups. Group I patients had intact ossicles and group II had ossicular erosion.

Results: Side was right in 30 and 7 and left in 20 and 8 in group I and II respectively. Duration of disease was <10 years in 28 and 9 and >10 years in 22 and 6, size of perforation was large in 3 and 2, medium in 45 and 3 and small in 2 and 10 patients respectively. Mucosal status was normal in 25 and 3, oedematous in 15 and 3 and pale in 10 and 9. Middle ear granulation was seen in 8 and 11 patients respectively. The difference was significant ($P < 0.05$). Hearing loss (dB) was normal in 7 and 0, mild in 14 and 3, moderate in 26 and 4, moderately-severe in 3 and 7 and severe in 0 and 1 in group I and II respectively. Air-bone gap (db) was <40 dB in 48 and 11 and >40 dB in 2 and 4 patients in group I and II respectively. The difference was significant ($P < 0.05$).

Conclusion: This study's independent preoperative observations on ossicular erosion were accurate indicators. During surgical intervention, prior awareness of ossicular dysfunction and its likely cause in situations of CSOM will always be beneficial.

Keywords: Chronic Suppurative Otitis Media, Mucosal, audiogram

Introduction

Childhood otitis media (OM) is a frequent illness. Chronic Suppurative Otitis Media (CSOM), which manifests as recurrent ear discharge or otorrhea through a rupture/perforated tympanic membrane for intervals ranging from six weeks to three months despite medical therapy, is caused by chronic inflammation of the middle ear cleft.¹ CSOM has been a significant source of middle ear illness. Its frequency is largely influenced by socioeconomic and racial characteristics.² The two primary symptoms of CSOM are otorrhea and deafness, which are frequently linked to a conductive form of hearing loss. The less prevalent otologic symptoms of vertigo, earaches, and distortion of the mouth's angle are more suggestive of complications from

CSOM. In general, the CSOM has been categorized as Tubotympanic Disease (TTD) and atticoantral disease.³

Ossicular erosion can occur in both safe and unsafe types of CSOM, however it is more prevalent in the atticoantral kind.⁴ Ossicular erosion is exclusively observed in surgical cases. High-resolution computed tomography can be used to diagnose it, although this is not always the case in cases of CSOM without cholesteatoma. Ossicular discontinuity cannot usually be definitively diagnosed preoperatively in situations of tubotympanic CSOM.⁵ Prior knowledge of the patient's ossicular state may be crucial for developing the surgical plan, carrying it out under the proper anesthesia, and determining what supplies could be required for ossiculoplasty. In accordance with that, the necessary consents can also be acquired.⁶ The present study was conducted to evaluate predictors of ossicular dysfunction in cases of mucosal CSOM.

Aims and objectives

The present study was conducted to evaluate predictors of ossicular dysfunction in cases of mucosal CSOM.

Materials and Methods

The prospective longitudinal cohort study was conducted on 65 cases of mucosal chronic suppurative otitis media of both genders at the Department of Otorhinolaryngology (ENT), Sri Krishna Medical College & Hospital, Muzaffarpur, Bihar, India. All participants gave written consent after being made aware of the study. The study was approved by the Institutional Ethics Committee. The duration of the study was from February 2019 to July 2019. A treatment chart and patient data collection form with demographic details such as name, age, gender, etc., complete medical, surgical, and drug histories, laboratory data, and imaging results were recorded.

Inclusion criteria

- Patients who give written informed consent.
- Patients with CSOM of mucosal type are diagnosed clinically and further confirmed by otoendoscopic examination.
- Patients of either sex aged between 10 and 60 years
- Available for follow-up.

Exclusion criteria

- Patients do not give written, informed consent.
- Patients of either sex aged < 10 years or > 60 years
- All patients who had a previous history of ear surgery in the same ear, sensorineural hearing loss, congenital ear deformities, and atticoantral variety of CSOM were excluded from the study.
- Not available for follow-up.

Procedure

All cases underwent a detailed clinical examination, which included otoscopy, assessment of hearing using tuning fork tests, a pure tone audiogram using the Goodman scale, and an otoendoscopic examination. Cases underwent tympanoplasty or cortical mastoidectomy with tympanoplasty under general anaesthesia based on the disease condition.

Patients were divided into two groups:

Group I – 50 patients had intact ossicles, and

Group II- 15 patients had ossicular erosion.

The association between ossicular erosion and factors such as age, sex, duration of disease, size of tympanic membrane perforation, tympanosclerosis, condition of the middle ear mucosa, and presence of granulation in the middle ear was recorded.

Statistical Analysis

The data thus obtained were subjected to statistical analysis. The data was analysed using descriptive statistics such as mean, standard deviation, percentages, and proportions. The Chi-square test with Yates continuity correction was used to assess categorical data, whereas the Analysis of Variance (ANOVA) was used to examine means. The findings were obtained by

using suitable statistical tests utilising Microsoft Excel and the Statistical Package for Social Sciences (SPSS). A P value < 0.05 was considered significant.

Results

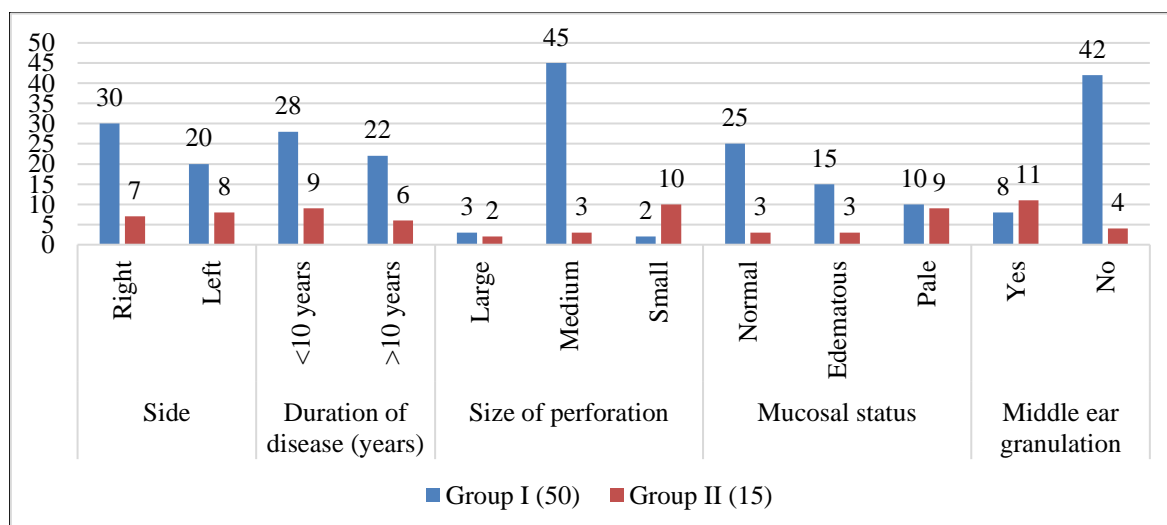
The mean age group in the present study was 33±9 years. The age group of 31-40 years had 11 cases (73.33%) and the least common age group was 21 -30 years having three cases of ossicular erosion (20%) (p-value =0.01)[Table 1].

Table 1: Age and gender wise distribution of the study patients

Age (years)	Group I (n=50)/ Intact ossicles		Group II (n=15)/ Ossicular erosion		p value
	Male	Female	Male	Female	
10-20	3	10	0	0	0.01
21-30	2	6	1	2	
31-40	8	12	2	9	
41-50	2	4	0	1	
51-60	1	2	0	0	
Total	16	34	3	12	

Table 2: Assessment of Findings observed on otoendoscopy

Parameters	Variables	Group I (50)	Group II (15)	P value
Side of affected ear	Right	30	7	0.01
	Left	20	8	
Duration of disease (years)	<10 years	28	9	0.05
	>10 years	22	6	
Size of perforation	Large	3	2	0.03
	Medium	45	3	
	Small	2	10	
Mucosal status	Normal	25	3	0.04
	Oedematous	15	3	
	Pale	10	9	
Middle ear granulation	Yes	8	11	0.02
	No	42	4	



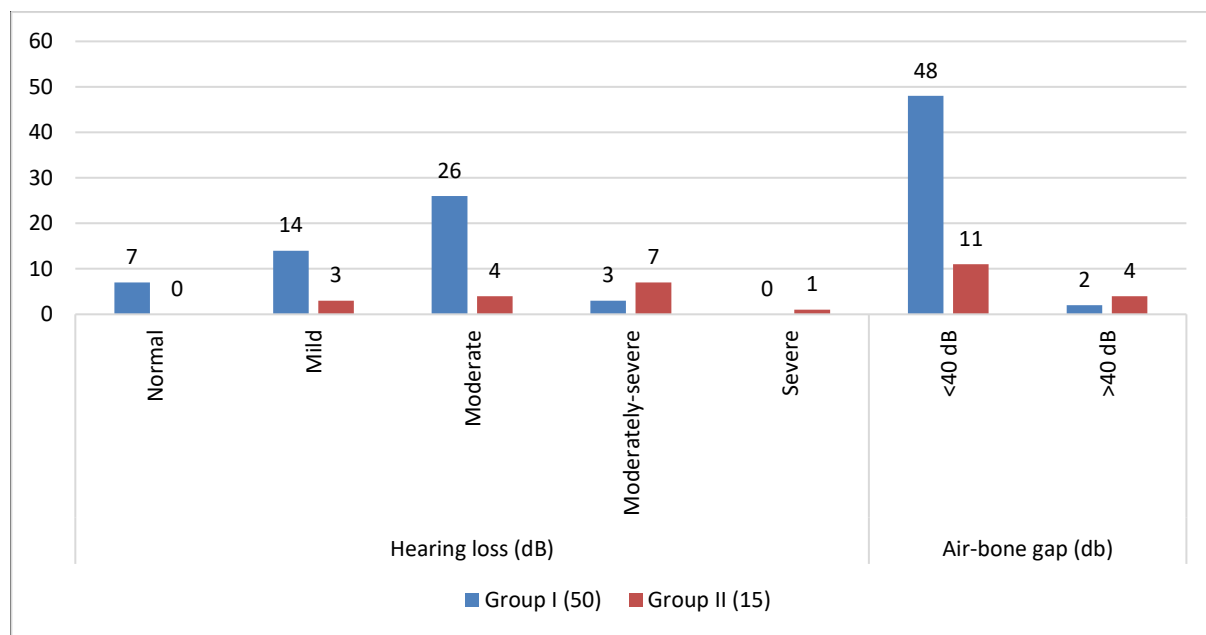
Graph I: Assessment of Findings observed on otoendoscopy

Table 2 and Graph I shows that side was right in 30 and 7 and left in 20 and 8 in group I and II respectively. Duration of disease was <10 years in 28 and 9 and >10 years in 22 and 6, size of perforation was large in 3 and 2, medium in 45 and 3 and small in 2 and 10 patients respectively. Mucosal status was normal in 25 and 3, oedematous in 15 and 3 and pale in 10 and 9. Middle ear granulation was seen in 8 and 11 patients respectively. The difference was significant ($P < 0.05$).

Table 3: Assessment of intraoperative findings

Parameters	Variables	Group I (50)	Group II (15)	P value
Hearing loss (dB)	Normal	7	0	0.05
	Mild	14	3	
	Moderate	26	4	
	Moderately-severe	3	7	
	Severe	0	1	
Air-bone gap (db)	<40 dB	48	11	0.01
	>40 dB	2	4	

Table 3 and Graph II shows that hearing loss (dB) was normal in 7 and 0, mild in 14 and 3, moderate in 26 and 4, moderately-severe in 3 and 7 and severe in 0 and 1 in group I and II respectively. Air-bone gap (db) was <40 dB in 48 and 11 and >40 dB in 2 and 4 patients in group I and II respectively. The difference was significant ($P < 0.05$).



Graph II: Assessment of intraoperative findings

Discussion

Avascular necrosis or a rise in osteoclastic activity, or bone resorption, are features of active suppurative OM of the mucosal or squamous type.⁷ The elevated osteoclastic activity in CSOM is caused by a state of persistent inflammation and granulation.⁸ The ossicles and other impacted middle ear bone components exhibit hyperaemia-like characteristics, including a proliferating capillary network and conspicuous histiocytes.⁹ In the sequence and frequency mentioned above, the long processes of the incus, stapes crura, body of incus, and manubrium are implicated.¹⁰ The present study was conducted to evaluate predictors of ossicular dysfunction in cases of mucosal CSOM.

We found that side was right in 30 and 7 and left in 20 and 8 in group I and II respectively. Duration of disease was <10 years in 28 and 9 and >10 years in 22 and 6, size of perforation was large in 3 and 2, medium in 45 and 3 and small in 2 and 10 patients respectively. Mucosal status

was normal in 25 and 3, oedematous in 15 and 3 and pale in 10 and 9. Middle ear granulation was seen in 8 and 11 patients respectively. Mannuru et al¹¹ found that out of the 64 cases, 15 (23.4%) had ossicular erosion. Bivariate analysis showed a positive association for middle age group between 31-40 years, long-duration of disease, polypoidal middle ear mucosa, granulations in the middle ear and also when the incudostapedial joint was exposed through the subtotal perforation. On audiological evaluation moderate to moderately severe hearing loss (41-70 dB HL) and air-bone gap >40 dB were associated with incus erosion. Intraoperative findings like aditus block mastoid granulations were also found to be significant risk factors associated with incus erosion. We found that hearing loss (dB) was normal in 7 and 0, mild in 14 and 3, moderate in 26 and 4, moderately-severe in 3 and 7 and severe in 0 and 1 in group I and II respectively. Air-bone gap (db) was <40 dB in 48 and 11 and >40 dB in 2 and 4 patients in group I and II respectively. Jayakumar et al¹² found that incidence of ossicular necrosis was 23 %. The incus was most frequently eroded followed by malleus and then stapes. On bivariate analysis patients age above 30 years ($p = 0.05$), duration of CSOM more than 10 years ($p = 0.02$), presence of granulation ($p < 0.05$), absence of tympanosclerosis ($p = 0.01$), moderately severe (45–60 dB) hearing loss ($p = 0.01$) and an air bone gap of more than 55.7 dB in the right ear and 63.95 dB in the left ear was found to be statistically significant ($p < 0.05$). On multivariate analysis only presence of middle ear granulation tissue was found to be the significant predictor [$p = 0.005$], OR 14.37, 95 % CI 2.26–90.0]. The presence of granulation tissue and a wide air bone gap on pure tone audiometry were the best indicators of ossicular necrosis. Preoperative identification of these indicators can help the surgeon to be better prepared for the surgery.

Limitation of the study

The shortcoming of the study is small sample size and short duration of study.

Conclusion

Authors found that this study's independent preoperative observations on ossicular erosion were accurate indicators. During surgical intervention, prior awareness of ossicular dysfunction and its likely cause in situations of CSOM will always be beneficial.

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References

1. Jareen E, Vedantam R. Preoperative predictors of incudal necrosis in chronic suppurative otitis media. *Otolaryngol Head Neck Surg.* 2010;142:415-20.
2. Hazarika P, Dr Nayak, R Balakrishnan. *Textbook of Ear, Nose, Throat and Head Neck Surgery clinical and practical*, CBS publisher & distributors pvt., Ltd.
3. Rout MR, Das P, Mohanty D, Rao, Susritha K, Jyothi BE. Ossicular chain defects in safe type of chronic suppurative otitis media. *Indian J Otol.* 2014;20:102-05.
4. Chole RA, Sudhoff HH. Chronic Otitis Media, Mastoiditis, and Petrositis. In: Niparko JK, eds. *Cummings Otolaryngology Head and neck surgery.* 5th edn. Elsevier Mosby. 2010:1964-78.
5. Rasheed RA, Mubeena, Somayaji KSG. Pre-operative predictors of ossicular necrosis in chronic otitis media-mucosal type. *Int J Otorhinolaryngol Head Neck Surg.* 2019;5:396- 99.
6. Jeng FC, Tsai MH, Brown CJ. Relationship of pre-operative findings and ossicular discontinuity in Chronic Otitis Media. *Otology and Neurotology.* 2003;24:29-32.
7. Bluestone CD, Gates GA, Klein JO, Lim DJ, Mogi G, Ogra PL, et al. Definitions, terminology and classification of Otitis Media. *Annals of Otolaryngology and Laryngology.* 2003;111:08-18.
8. Mansour S, Magnan J, Nicolas K, Haidar H. Chronic Suppurative Otitis Media (CSOM): A middle ear

- mucosal disease. In *Middle Ear Diseases*. 2018 (pp. 205- 274). Springer, Cham.
9. Rupa V. When to suspect complicated suppurative otitis media. In: *Advanced Therapy of Otitis Media*, Alper CM, Bluestone CD, Hamilton, Ontario. BC Decker, 2004:312-317.
 10. Browning GG, Scott-Brown's Otolaryngology, Head and Neck Surgery. In: *chronic otitis media (7th ed.)*, Great Britain, Butterworth & Co. Pp. 3395.
 11. Mannuru KB, Havle AD, Vihapure GM, Shedge SA, Prabhune SC, Ahmed K, Yarlagadda LS. Otoendoscopy and Audiometry Findings as Predictors of Ossicular Dysfunction in Mucosal Chronic Suppurative Otitis Media: A Cohort Study. *Journal of Clinical & Diagnostic Research*. 2021 Dec 1;15(12).
 12. Jayakumar CJ, Inbaraj LR, Pinto GJ. Preoperative predictor of ossicular necrosis in chronic suppurative otitis media. *Indian J Otolaryngol Head Neck Surg*. 2016;62(5):01- 06.