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Original Research Article

Changing Pattern of Cholesteatoma and Granulation Tissue in CSOM with Its Relation to Complications

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Conflict of interest: Nil

Abstract

Introduction: CSOM is a very common disease in lower socioeconomic people of our country. Two varieties of CSOM are mucosal type and Squamosal type. The squamosal type is associated with either cholesteatoma or granulation tissue.

Aims: Among patients undergoing mastoid exploration, histopathological examination confirmed cholesteatoma in a higher proportion of ears compared to granulation tissue, and cholesteatoma cases were associated with more complications—such as ossicular erosion, labyrinthine fistula, and facial nerve involvement—than those with granulations in CSOM.

Materials & Methods: This is an observational cross-sectional study conducted over 12 months in the Department of Otorhinolaryngology and Head & Neck Surgery at IPGMER-SSKM, Kolkata. A total of 150 symptomatic CSOM patients were enrolled as the study sample.

Result: In our study the 150 patients, 40 (47.1%) in the cholesteatoma group and 10 (15.4%) in the granulation group experienced complications, while 45 (52.9%) and 55 (84.6%), respectively, had no complications. Overall, complications occurred in 50 patients (33.3%) and were significantly more frequent in the cholesteatoma group compared to the granulation group ($p < 0.001$).

Conclusion: We concluded that in this study of 150 CSOM patients, histological investigation revealed a higher prevalence of cholesteatoma compared to granulation tissue. Patients with cholesteatoma were considerably older, suggesting a link with advancing age, though gender distribution did not differ significantly.

Keywords: CSOM, Granulation tissue, Ear surgery, Temporal bone and Labyrinthine fistula.

Introduction

CSOM is a very common disease in lower socioeconomic people of our country. Two varieties of CSOM are mucosal type and Squamosal type.

The squamosal type is associated with either cholesteatoma or granulation tissue. With increasing use of antibiotics CSOM cases are gradually declining. It is also true in cases of squamosal variety of CSOM and its two subtypes- Attico antral disease and postero superior marginal disease. In spite of these facts CSOM still causing many mortalities and morbidities in developing countries like India. We are still in the dark about the prevalence of granulations and cholesteatoma in squamosal variety of csom cases. We also have deficient knowledge about association of intracranial and extracranial complications with cholesteatoma and granulation tissue in csom. With literature review very few studies have highlighted about this matter. Chronic suppurative otitis media (CSOM) is defined as persistent or recurrent inflammation of the middle ear and/or mastoid cavity, characterized by a perforated tympanic membrane and chronic otorrhoea lasting weeks to months [1].

The worldwide burden of CSOM remains substantial, especially in low- and middle-income countries, where poor socioeconomic conditions,

overcrowding, inadequate hygiene, and recurrent upper respiratory infections contribute as risk factors [2].Within CSOM, pathological changes in the middle ear cavity may manifest as either cholesteatoma — an abnormal growth of keratinizing squamous epithelium in the middle ear/mastoid space — or as inflammatory changes leading to mucosal hyperplasia, granulation tissue formation, and occasionally polyp formation [3]. Traditionally, cholesteatoma has been regarded as the more "dangerous" or "destructive" pathology, while granulation tissue has been seen as part of a chronic inflammatory response [4].Recent studies suggest a shifting pattern in the relative incidence of these two pathological entities in CSOM. A study from India found that among patients undergoing mastoid exploration, intraoperative granulation tissue was seen in 55.07 % of cases, cholesteatoma alone in 21.73 %, and both cholesteatoma with granulations in 23.18 % [5]. Study aims among patients undergoing mastoid exploration, histopathological examination confirmed cholesteatoma in a higher proportion of ears compared to granulation tissue, and cholesteatoma cases were associated with more complications—such as ossicular erosion, labyrinthine fistula, and facial nerve involvement—than those with granulations in CSOM.

Materials and Methods

Type of Study: Observational cross sectional study

Place of Study: Department of Otorhinolaryngology and Head and Neck Surgery at IPGMER-SSKM, Kolkata.

Study Duration: 12 months.

Sample Size: 150 symptomatic CSOM patients.

Inclusion Criteria:

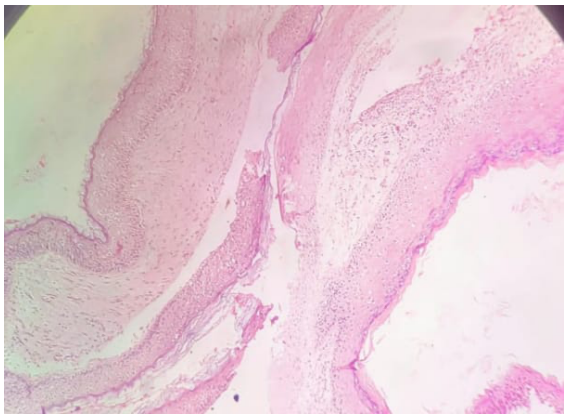
- Age > 5 years
- CSOM with attic disease, postero-superior marginal

Exclusion Criteria:

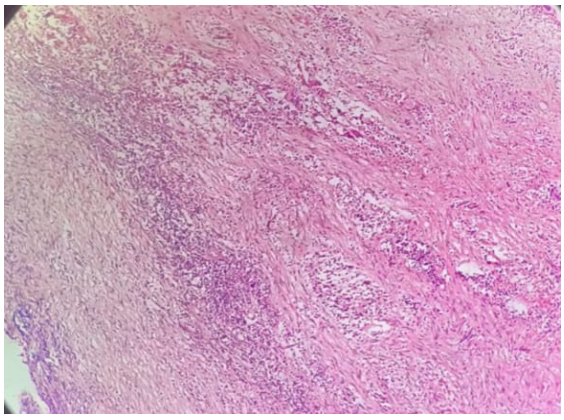
- Patients with a history of previous ear surgery.
- Patients with congenital ear anomalies.
- Patients with immunocompromised states or uncontrolled systemic illnesses.
- Patients unwilling to provide informed consent.
- Patients with acute ear infections requiring immediate medical management rather than elective

Study Variables:

- Age
- Gender
- Duration of symptoms (hearing loss, ear discharge, otalgia, tinnitus)
- Laterality
- Type of tympanic membrane perforation



Keratinizing stratified squamous epithelium (Cholesteatoma matrix)



Inflammatory infiltrate in Cholesteatoma

Figure 1:

Statistical Analysis: Data were entered into Excel and subsequently analyzed using SPSS and GraphPad Prism. Continuous variables were summarized as means with standard deviations, while categorical variables were presented as counts and percentages. Comparisons between independent groups were performed using two-sample t-tests, and paired t-tests were applied for correlated (paired) data. Categorical data were compared using chi-square tests, with Fisher's exact test applied when expected cell counts were small. A p-value of ≤ 0.05 was considered statistically significant.

Result

Table 1: Age: mean (SD) and comparison

Group	Mean age (years)	SD	p- value
Cholesteatoma	34.2	12.5	0.024
Granulation	29.8	11	

Table 2: Sex distribution

Sex	Cholesteatoma	Granulation	Total	p-value
Male	50(58.8%)	30(46.2%)	80(53.3%)	0.169
Female	35(41.2%)	35(53.8%)	70(46.7%)	
Total	85(100%)	65(100.0%)	150(100.0%)	

Table 3: Any Complications

		Cholesteatoma	Granulation	Total	p-value
Outcome	**Any complication Yes**	40 (47.1%)	10 (15.4%)	50(33.3%)	<0.001
	Any complication No	45 (52.9%)	55 (84.6%)	100(66.7%)	
	Total	85(100.0%)	65(100.0%)	150(100.0)	

Table 4: Hearing Loss

Hearing status	Cholesteatoma	Granulation	Total	p-value
Normal / near-normal	5(5.9)	10(15.4)	15(10.0)	0.002
Mild	15(17.6)	25(38.5)	40(26.7)	
Moderate	40(47.1)	20(30.8)	60(40.0)	
Severe	25(29.4)	10(15.4)	35(23.3)	
Total	85(100)	65(100)	150(100.0)	

Table 5: Laterality

Laterality	Cholesteatoma	Granulation	Total	p-value
Unilateral	70(82.4)	55(84.6)	125	0.883
Bilateral	15(17.6)	10(15.4)	25	
Total	85(100.0)	65(100.0)	150	

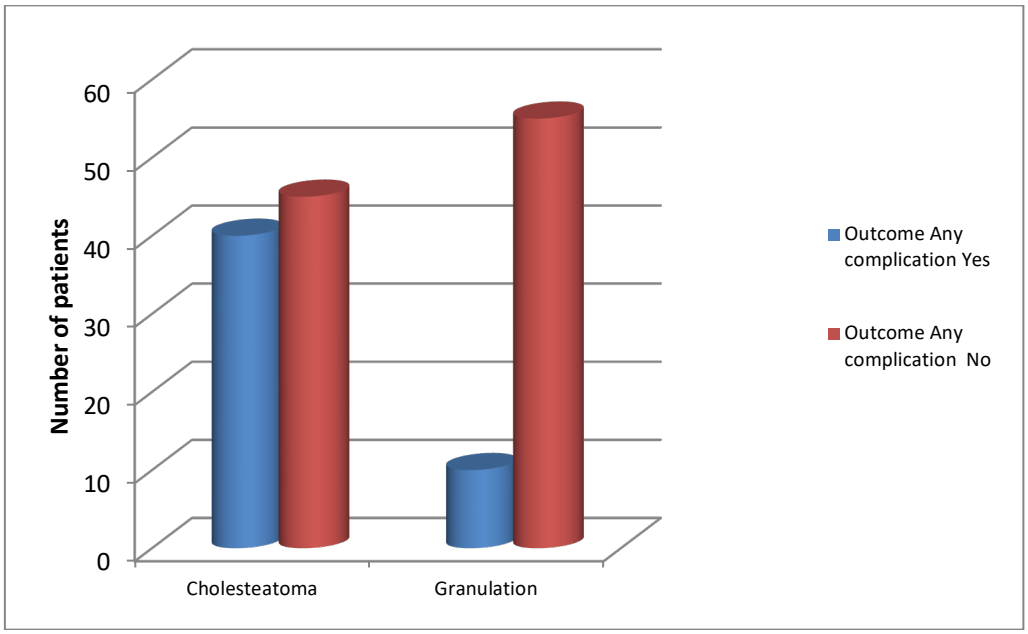


Figure 2: Complications

In this study, the mean age of patients with cholesteatoma was 34.2 ± 12.5 years, which was significantly higher than that of patients with granulation tissue (29.8 ± 11 years), with a p-value of 0.024. In the study population of 150 patients, males accounted for 50 (58.8%) in the cholesteatoma group and 30 (46.2%) in the granulation group, while females comprised 35 (41.2%) and 35 (53.8%), respectively. Overall, there were 80 males (53.3%) and 70 females

(46.7%) in the total population. The difference in sex distribution between the two groups was not statistically significant (p = 0.169). Among the 150 patients, 40 (47.1%) in the cholesteatoma group and 10 (15.4%) in the granulation group experienced complications, while 45 (52.9%) and 55 (84.6%), respectively, had no complications. Overall, complications occurred in 50 patients (33.3%) and were significantly more frequent in the cholesteatoma group compared to the granulation group (p < 0.001).

In terms of hearing status among the 150 patients, normal or near-normal hearing was observed in 5 (5.9%) patients with cholesteatoma and 10 (15.4%) with granulation. Mild hearing loss was seen in 15 (17.6%) and 25 (38.5%), moderate loss in 40 (47.1%) and 20 (30.8%), and severe loss in 25 (29.4%) and 10 (15.4%) patients, respectively. Overall, moderate hearing loss was the most common (40%), and the difference in hearing status between the two groups was statistically significant (p = 0.002). Among the 150 patients, unilateral involvement was observed in 70 (82.4%) patients with cholesteatoma and 55 (84.6%) with granulation, while bilateral involvement occurred in 15 (17.6%) and 10 (15.4%) patients, respectively. Overall, unilateral cases were more common (125/150), and there was no statistically significant difference in laterality between the two groups (p = 0.883).

Discussion

We observed that patients with cholesteatoma were, on average, older (34.2 ± 12.5 years, n = 85) than those with granulation tissue (29.8 ± 11 years, n = 65), indicating a significant association of cholesteatoma with increasing age.

Although the cholesteatoma group had a slight male predominance (50/85, 58.8%) and the granulation group had more females (35/65, 53.8%), this difference was not statistically significant. Complications were notably more frequent in the cholesteatoma group (40/85, 47.1%) compared to the granulation group (10/65, 15.4%), highlighting the more aggressive nature of cholesteatoma. Moderate-to-severe hearing loss was more common in the cholesteatoma group (moderate: 40/85, 47.1%; severe: 25/85, 29.4%), whereas normal or near-normal hearing was more frequent in the granulation group (10/65, 15.4%), demonstrating a significant impact of cholesteatoma on auditory function.

Unilateral involvement was predominant in both groups (cholesteatoma: 70/85, 82.4%; granulation: 55/65, 84.6%), and laterality did not differ significantly. This aligns with the large retrospective series by Akarcay et al. (2019), who reported ossicular chain erosion in 82% of cholesteatoma cases compared with 31.8% in granulation-only chronic otitis media (COM) cases [6]. Similarly, Doddamani SS and Yasha C (2018) found ossicular defects in 87% of cholesteatoma ears, with the incus most frequently involved, correlating with preoperative hearing impairment [7]. In a surgical cohort study of 166 patients (2003–2009), A prospective study by Kumar et al. (2025) reported ossicular erosion in 28 patients (93%), predominantly affecting the incus (86.7%), confirming the high prevalence of ossicular damage in cholesteatoma [8]. Furthermore, a study by Sharma et al. (2018,) demonstrated that ossicular chain erosion was more common when cholesteatoma or granulations were present, supporting the destructive potential of cholesteatoma and granulation tissue [9]. Taken together, these studies corroborate our findings that cholesteatoma — compared with granulation tissue — is significantly more likely to cause ossicular destruction.

Conclusion

We concluded that in this study of 150 CSOM patients, histological investigation revealed a higher prevalence of cholesteatoma compared to granulation tissue. Patients with cholesteatoma were considerably older, suggesting a link with advancing age, though gender distribution did not differ significantly. Cholesteatoma was connected to a considerably greater prevalence of sequelae, including ossicular erosion, labyrinthine fistula, and facial nerve involvement, demonstrating its more aggressive pathology.

Audiologically, moderate-to-severe hearing loss was more common in the cholesteatoma group, whereas normal or near-normal hearing predominated in granulation cases, indicating significant functional impairment. There was no discernible change in laterality between the two groups, and unilateral engagement predominated. These findings underline the necessity of early diagnosis and careful therapy of cholesteatoma to prevent structural and functional consequences in CSOM.

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