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RESEARCH ARTICLE
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A COMPARATIVE STUDY OF TYMPANOPLASTY WITH OR WITHOUT MASTOIDECTOMY IN TUBOTYMPANIC TYPE OF CHRONIC SUPPURATIVE OTITIS MEDIA

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ABSTRACT:

Background- Chronic suppurative otitis media (CSOM) ranks among the prevalent ear disorder in developing nations. The absence of aerating mastoidectomy during the initial tympanoplasty is identified as a potential cause of failure in individuals with chronic non-cholesteatomatous otitis media. Consequently, the combination of cortical mastoidectomy with tympanoplasty has been consistently regarded as the preferred surgical intervention. Our research aims to investigate the efficacy of tympanoplasty, both with and without cortical mastoidectomy.

Method- The current research was performed in the department of ENT outpatient at a tertiary care hospital in Maharashtra, India. The study included 50 patients of both genders who attended the outpatient clinic in the department of ENT. Their chief complaint was a discharging ear with decreased hearing during the two-year study period. Out of the 50 individuals who had surgical treatment, tympanoplasty with mastoidectomy was performed in 25 cases, while tympanoplasty without mastoidectomy was done in the remaining 25 cases.

Result: In the current study, we found a higher prevalence of chronic suppurative otitis media in females compared to males. In x-ray bilateral mastoids Schuller's view, 26 individuals (54%) had sclerotic mastoids and 24 individuals (46%) had pneumatic mastoids. Clinical improvement, graft uptake, and postoperative hearing improvement were alike in both groups

Conclusions: CSOM seems to be more prevalent among females. The enhancement in hearing after undergoing either tympanoplasty alone or combined tympanoplasty with mastoidectomy demonstrated similar outcomes in both cohorts. It was observed that incorporating mastoidectomy into tympanoplasty did not yield additional advantages in terms of improvement in hearing.

INTRODUCTION:

Chronic suppurative otitis media (CSOM) is characterized as a persistent and gradually developing condition, often leading to significant damage to middle ear structures. Clinically, it presents with some symptoms such as deafness and discharge persisting for over three months. This condition, prevalent since ancient times, remains a significant contributor to the middle ear ailments and stands as one of the most prevalent ear disorders in developing nations. [1] The ratio of disease prevalence between urban and rural areas is 1:2, with the highest occurrence observed in economically disadvantaged rural communities.[2,3]

The incidence of chronic suppurative otitis media (CSOM) is heightened among individuals with lower socioeconomic status, suboptimal nutritional conditions, and insufficient health education, with a particular prevalence observed in rural populations.[4]

The condition is identified by the presence of recurring or prolonged ear discharge (otorrhoea) lasting between 2 to 6 weeks, facilitated by a perforation of the tympanic membrane. CSOM is categorized into two types: tubotympanic (mucosal) and atticoantral (squamosal).[1]

The standard approach for treating CSOM involves conservative measures, including aural toilet, topical and systemic antibiotics, and adherence to dry ear precautions [5]. Surgical intervention, specifically tympanoplasty, becomes necessary for cases that don't resolve or show spontaneous healing of the tympanic membrane with conservative methods [5]. Tympanoplasty for safe/tubotympanic/non-cholesteatomatous CSOM poses a dual challenge of eliminating the disease process while preserving as much normal tissue as possible to aid in the reconstruction of the hearing mechanism. The concept of mastoidectomy improving the success of tympanoplasty in individuals with non-cholesteatomatous chronic otitis media was initially suggested by Holmquist and Bergstrom. They emphasized that creating an aerated mastoid enhances success, especially in individuals with poor tubal function or a small mastoid air cell system [6]

The surgical management of CSOM remains a topic of debate. The primary goal of the procedure is widely accepted as achieving a permanently dry ear and closing the tympanic perforation. While tympanoplasty with mastoidectomy is acknowledged as an effective treatment for chronic ear infections resistant to antibiotics, its impact on patients lacking evidence of active infectious disease is a subject of ongoing debate and lacks definitive evidence. [7] As a preventive measure, numerous surgeons routinely conduct both tympanoplasty and mastoidectomy, regardless of the disease stage, to mitigate concerns related to recurrence and graft failure. [8] But its role in quiescent disease is questionable. Hence the aim of the present research was to relate the effectiveness of tympanoplasty with or without mastoidectomy.

METHODOLOGY:

The research took place at the outpatient department of the Otolaryngology in a tertiary care hospital in Maharashtra, India. The research involved 50 patients of both genders who visited the ENT clinic with complaints of a discharging ear and decreased hearing over a two-year period. Among the patients who underwent surgery, 25 patients involved tympanoplasty with mastoidectomy, while the remaining 25 cases underwent tympanoplasty without mastoidectomy.

Inclusion criteria:

Individuals aged six years and above, of any gender, diagnosed with chronic suppurative otitis media of tubotympanic type, having an intact ossicular chain, and expressing a willingness individuals who gave written informed consent were involved in the research.

Exclusion criteria:

Individuals below six years of age, those with multiple tympanic membrane perforations or other ear diseases with medical contraindications for surgery, cases of chronic suppurative otitis media (CSOM) with complications, and individuals with hearing in only one ear were excluded.

A thorough evaluation and examinations were carried out, including Otoendoscopy, tuning fork tests (Rinne's, Weber, and ABC tests), assessment of Eustachian tube function via Valsalva's

maneuver, X-ray bilateral mastoid Schuller's view, and preoperative pure-tone audiometry. Subsequent to this, postoperative follow-up and Pure Tone Audiometry were conducted at 1 to 3-month intervals. The random sampling method was applied to classify individuals into two groups: the first group underwent tympanoplasty alone, while the second group underwent tympanoplasty with mastoidectomy.

Surgical Procedures –
Tympanoplasty:
Pre-operative Preparation:
Patients underwent routine otology surgery preparations, including a Xylocaine test, shaving of the postaural area, obtaining informed consent, and administering preoperative intravenous antibiotics.

Anesthesia:
All the procedures were conducted using local anesthesia to mitigate potential graft failure associated with general anesthesia. Local anesthesia involved using 2% lignocaine with adrenaline in the subcutaneous tissue of the postauricular region and external auditory canal.

Procedure:
Patients underwent a postaural approach with Wilde's incision, 5 mm behind the postaural groove. Temporalis fascia graft, identified by its ivory color, was harvested, teased, and later on was used the periosteum over the mastoid was incised and elevated to the posterior meatal wall. Posterior meatotomy, incisions, and elevations facilitated clear visualization of the tympanic membrane and perforation. Perforation edges were freshened, and ossicles were inspected for erosion. Adhesions were cleared, ossicle mobility was determined, and the graft was slit and placed in the middle ear as an underlay, with gel foam wrapping around the malleus handle. The tympanometry flap was reposited, and the external auditory canal was packed with medicated gel foam. The postural incision was sutured in 3 layers, followed by dressing. Mastoidectomy type selection depended on ossicular chain condition.

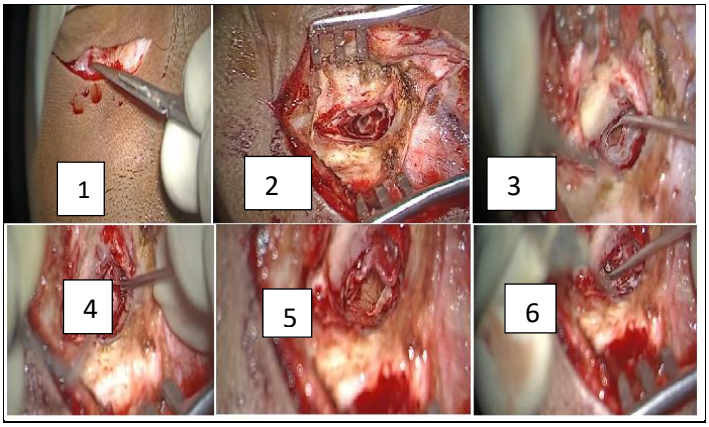


Fig A - 1) Post–auricular Wilde's incision 2) Visualisation of perforation after meatotomy 3) Freshening of the edges of perforation 4) Elevation of posterior canal wall flap 5) Denuded handle of malleus 6) - Graft kept by underlay technique

Simple Mastoidectomy:
The perioperative preparation and anesthesia procedures employed were similar to the surgical techniques followed in tympanoplasty surgery.

Procedure:

The surgeon made an incision behind the ear, akin to the tympanoplasty procedure. They harvested and prepared tissue from the temporalis fascia, following the same steps as in tympanoplasty. After a small ear canal opening, the back part of the eardrum was raised. Using a knife, a flap was lifted, and the eardrum was checked and trimmed. The malleus handle was visualized and prepared.
Drilling began at a specific area, continuing until reaching the antrum. The mastoid bone was inspected for issues, and the antrum was opened and checked for disease, which was removed if present.

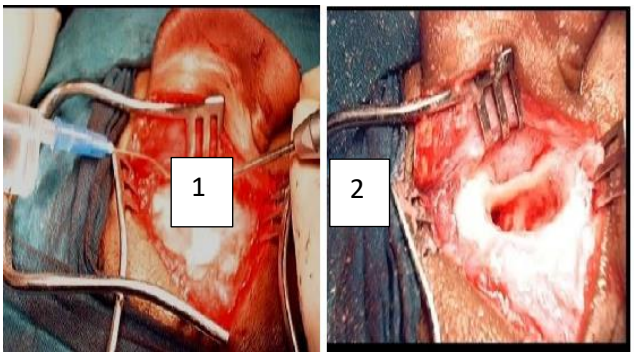
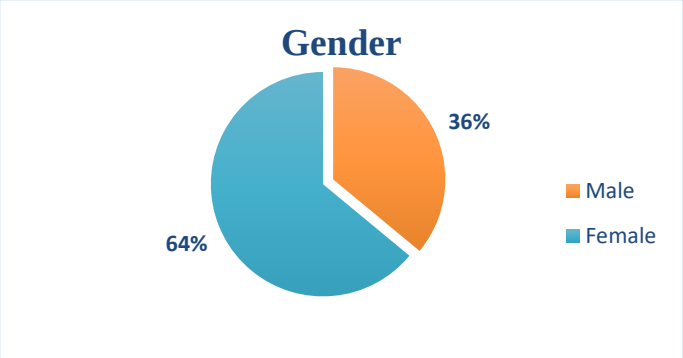


Fig B – 1) Drilling started at the Macewan's triangle 2) Exposure of Antrum

OBSERVATIONS AND RESULTS:

The present study included the 50 cases of CSOM. Many observation were made in the study according to two groups i.e, patients with or without tympanoplasty . In the current study, 28 participants fell within the age range of 15 to 30 years. This observation may be attributed to the increased social activity and health consciousness typically associated with individuals in this age group. The following observations were made.



Graph: 1 – Distribution of gender in the study

In this current study, there were 18 male individuals (36%) and 32 female individuals (64%) out of a total of 50 participants.

PNEUMATIZATION OF MASTOID	NO. OF Individuals	%
SCLEROTIC	27	54%
PNEUMATISED	23	46%

Table: 1 – Classification of pneumatization of mastoid.

In the bilateral mastoid Schuller's view X-ray, 26 patients (54%) exhibited sclerotic mastoids, while 24 patients (46%) displayed pneumatic mastoids.

Size of Perforation	Without	With	Total	chi-square (P-value)

	Mastoidectomy		Mastoidectomy			
	N	%	N	%	N	
Small	**2**	**28.57**	**5**	**71.43**	**07**	
Moderate	**14**	**53.85**	**12**	**46.15**	**26**	**1.49**
Large	**09**	**52.94**	**08**	**47.06**	**17**	**(0.47)**
Total	**25**	**50**	**25**	**50**	**50**	

Table: 2 –Comparison of Size of perforation between research groups

The study analyzed the perforation size of mastoidectomy presence or absence in 50 cases. For small perforations, 2 cases (28.57%) were without mastoidectomy, and 5 cases (71.43%) were with mastoidectomy (total 7 cases).
Moderate-sized perforations totaled 26 cases, with 14 (53.85) without mastoidectomy and 12 (46.15%) with mastoidectomy.
Large perforations amounted to 17 cases, with 9 (52.94%) without mastoidectomy and 8 (47.06%) with mastoidectomy. The chi-square test showed non-significance ($\chi^2 = 1.49$, $p = 0.47$), indicating no significant difference in small perforation distribution with or without mastoidectomy.

Discharge	**Without Mastoidectomy**		**With Mastoidectomy**		**Total**	**P**
	N	**%**	**N**	**%**	**N**	
Present	3	37.5	5	62.5	8	
Absent	22	52.38	20	47.61	42	0.44
Total	25	50	25	50	50	
Graft Uptake						
Taken up	22	48.88	23	51.12	45	
Rejected	03	60	02	40	5	0.63
Total	**25**	**50**	**25**	**50**	**50**	

Table: 3– Distribution of clinical improvement and graft uptake in with and without mastoidectomy.

Both groups exhibited similar clinical improvement. In the without mastoidectomy group, 3 patients (37.5%) presented with discharge, while in the tympanoplasty with mastoidectomy group, 5 patients (62.5%) showed discharge. There was no statistical significant found among the group ($p > 0.05$)
Graft uptake occurred in 51.12% (23 cases) of the tympanoplasty with the mastoidectomy group and 48.88% (22 cases) in the tympanoplasty without the mastoidectomy group. There was no significant statistical difference between the both groups in terms of graft uptake ($p > 0.05$).

AB GAP IN dB	WITH MASTOIDECTOMY		WITHOUT MASTOIDECTOMY	
	Pre-operative, N(%)	**Post-OP 3rd month N(%)**	**Pre-operative, N(%)**	**Post-OP 3rd month N(%)**
0-10	00 (00)	00 (00)	00 (00)	01 (04)
11-20	01 (04)	11 (44)	00 (00)	06 (24)
21-30	07 (28)	09(36)	14 (56)	08 (32)
31-40	09 (36)	03 (12)	09 (36)	06 (24)
41-50	08 (32)	02 (08)	02 (08)	04 (16)
Total	25(100)	25(100)	25(100)	25(100)
Chi-square	7.45		9.16	
P value	0.001		0.057	

Table 4 – PTA outcomes with and without mastoidectomy

The table 4 presents a comparison of hearing outcomes in patients with and without mastoidectomy before and after surgery, specifically focusing on the AB gap in decibels (dB) across different ranges. The data is categorized into five AB gap ranges (0-10 dB, 11-20 dB, 21-30 dB, 31-40 dB, 41-50 dB). For each range, the table indicates the number and percentage of patients with mastoidectomy and without mastoidectomy at both the pre-operative and post-operative 3rd-month stages. The total number of patients in each group is provided, along with the chi-square statistic and p-values for the comparison of the two groups at both time points. The chi-square values of 7.45 and 9.16 with corresponding p-values of 0.001 and 0.057 suggest significant differences in hearing outcomes between the mastoidectomy and non-mastoidectomy groups, particularly in the 0-10 dB range.

AB Gap in dB	Post-op in tympanoplasty without mastoidectomy	Post-op in tympanoplasty with mastoidectomy	Chi-square (P value)
0-10	01 (04%)	00 (00%)	4.19 (0.38)
11-20	06 (24%)	11 (44%)	
21-30	08 (32%)	09(36%)	
31-40	06 (24%)	03 (12%)	
41-50	04 (16%)	02 (08%)	
Total	25(100%)	25(100%)	

Table 5- Postoperative PTA findings in tympanoplasty with and without mastoidectomy

Postoperative assessment of AB gaps in tympanoplasty without mastoidectomy revealed that 4% incidence of gaps in the 0-10 dB range, 24% in the 11-20 dB range, 32% in the 21-30 dB range, 24% in the 31-40 dB range, and 16% in the 41-50 dB range. In contrast, the mastoidectomy group showed no gaps in the 0-10 dB range, 44% in the 11-20 dB range, 36% in the 21-30 dB range, 12% in the 31-40 dB range, and 8% in the 41-50 dB range. The chi-square test indicated no significant difference in AB gap distribution between the both groups (Chi-square = 4.19, p = 0.38).

DISCUSSION:

CSOM is the predominant ailment affecting the middle ear cleft. Tympanoplasty, with or without mastoidectomy, is undertaken to eliminate middle ear issues and restore the functionality of the conductive hearing mechanism.[4] Mastoid considerations involve factors such as the degree of mastoid pneumatization and the existence of inflammatory conditions in the mastoid. [9] However, there are varying perspectives on the necessity of performing mastoidectomy alongside tympanoplasty in these cases.

In this study, a higher prevalence of females were noted, accounting for 64%, while males constituted 36% of the population suffering with chronic supperative otitis media. This were comparable to the outcomes in the research performed by Methwani and Deshmukh [10] and Kaur et al [11] but the result of the present study differs from the findings with the research conducted by Nambiar RV et al in which Male preponderance was observed.[1]

In this study, plain X-ray assessments of mastoids revealed that 27 patients exhibited sclerosed mastoid air cells, while only 23 patients showed well-pneumatized mastoid cells. This above outcomes differs with the recent study by Nambiar RV et al

In this study, a maximum number of patients were found to have moderate size of perforation in the both groups. This observation was comparable to the outcomes in the research performed by Methwani and Deshmukh [10] in which they found small central perforation in 7 patients (15%) in Group 1 and 4 individuals (13.33%) in Group 2, large central perforation in 10 (33.33%) in Group 1 and 9 (30%) in Group 2, whereas subtotal perforation was noted in 2 (6.67%) and 6 (20%) in both

group, respectively. Moderately-sized perforation were found to be the most common. 11 patients (36.67%) patients in each group had moderate perforation.

In post-surgery examination the study found out that around 51.12% of the cases involved tympanoplasty with mastoidectomy, and the graft was successfully accepted. However, two patients experienced graft failure. Among those who underwent tympanoplasty without mastoidectomy about (48.88%), graft takeup was successful in the majority, with three cases reporting graft failure, similar results were found in Methwani and Deshmuk [10] who reported that maximum number of patients accepted graft takeup status in both groups. These above findings of current study were in congruence with Nambiar RV et al research. [11]

Post-operative enhancement in the range of hearing was discovered. of 11-40 dB gain in which maximum was found in the range of 21-30 by doing tympanoplasty alone and by tympanoplasty with mastoidectomy improvement in the hearing were observed in 11 patients in the range of 11-20. The chi-square test indicated no significant difference in AB gap distribution among both group (Chi-square = 4.19, p = 0.38). Similarly, the result was found in a study performed by Nambiar RV et al [1] in which there was no statistical difference observed in either of the groups in post-operative improvement in hearing.

The above investigation has determined that there is no discernible additional benefit associated with cortical mastoidectomy in the context of tympanoplasty for patients diagnosed with CSOM of the tubotympanic type. Further major research endeavors are imperative to comprehensively ascertain the efficacy of both techniques, shedding light on the nuanced intricacies of incorporating or omitting cortical mastoidectomy in tympanoplasty for patients with CSOM of the tubotympanic type.

CONCLUSION:

Tubotympanic type chronic suppurative otitis media (CSOM) exhibits a higher incidence in females. The study indicates that there is comparable hearing improvement between tympanoplasty alone and tympanoplasty with mastoidectomy, with no additional benefit observed. This finding suggests that cortical mastoidectomy may be beneficial in specific cases, and the decision to incorporate it should be based on a comprehensive evaluation by the surgeon. Generally, tympanoplasty alone is deemed sufficient for cases where the middle ear mucosa is healthy. The study emphasizes the importance of individualized treatment decisions in managing tubotympanic type CSOM, considering the specific characteristics of each patient's condition.

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