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Comparative Study of Tympanoplasty with and without Mastoidectomy for CSOM Tubotympanic Type

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ABSTRACT

Background: Chronic suppurative otitis media (CSOM) of the tubotympanic type is a common cause of conductive hearing loss, and tympanoplasty remains the standard surgical treatment. The role of adding cortical mastoidectomy in inactive disease, however, remains controversial. This retrospective comparative study was conducted over a five-year period from January 2018 to December 2022 to compare the anatomical and functional outcomes of tympanoplasty performed with and without mastoidectomy in patients with inactive CSOM tubotympanic type. A total of 64 patients were included and divided equally into two groups: Group A underwent tympanoplasty with cortical mastoidectomy (n = 32), and Group B underwent tympanoplasty alone (n = 32). Anatomical outcome was assessed by graft uptake, and functional outcome was evaluated by hearing improvement using pure tone audiometry. Successful graft uptake was achieved in 93.8% of patients in Group A and 90.6% in Group B, with no statistically significant difference between the groups. Both groups demonstrated significant postoperative improvement in hearing, with mean air–bone gap improving from 28.4 ± 6.1 dB to 14.2 ± 4.8 dB in Group A and from 27.9 ± 6.4 dB to 14.8 ± 5.1 dB in Group B. Intergroup comparison revealed no statistically significant difference in hearing gain. The findings suggest that tympanoplasty alone provides satisfactory anatomical and functional outcomes in inactive CSOM tubotympanic type, and routine addition of cortical mastoidectomy does not offer a significant advantage and should be reserved for selected cases.

Keywords: CSOM, Tympanoplasty, Mastoidectomy, Tubotympanic, Hearing outcome.

INTRODUCTION:

Chronic suppurative otitis media (CSOM) is a chronic inflammatory condition of the middle ear cleft characterized by persistent tympanic membrane perforation with or without otorrhea for a duration exceeding three months [1]. It remains a significant public health problem in developing countries due to overcrowding, poor socioeconomic conditions, limited access to healthcare, and recurrent upper respiratory tract infections [2]. CSOM is a major cause of preventable hearing loss, particularly in young and middle-aged adults, adversely affecting communication, educational achievement, and quality of life [3] including mental health.

CSOM is traditionally classified into tubotympanic (safe) and atticoantral (unsafe) types. The tubotympanic type involves the pars tensa and is usually associated with central perforation, relatively mild symptoms, and a lower risk of complications when compared to the atticoantral variety [4]. Despite being considered "safe," long-standing tubotympanic disease can still lead to significant conductive hearing loss and recurrent infections if left untreated [5].

Tympanoplasty is the definitive surgical treatment for CSOM tubotympanic type, aiming to eradicate disease, reconstruct the tympanic membrane, and restore hearing [6]. Various techniques and graft materials have been described, with temporalis fascia being the most commonly used graft owing to its ease of harvest and high uptake rates [7]. While tympanoplasty alone is widely accepted for inactive disease, the role of concurrent cortical mastoidectomy remains a subject of ongoing debate.

Advocates of adding mastoidectomy argue that removal of diseased mastoid air cells improves middle ear aeration, eliminates residual infection, and reduces the risk of graft failure, particularly in cases with poor Eustachian tube function

[8]. Mastoidectomy is also believed to convert a poorly ventilated mastoid into a healthy air reservoir, thereby improving long-term surgical outcomes [9]. However, several studies have failed to demonstrate a significant advantage of routine mastoidectomy in inactive tubotympanic CSOM, reporting comparable graft uptake rates and hearing outcomes with tympanoplasty alone [10,11].

Routine addition of mastoidectomy increases operative time, cost, and surgical morbidity, and may not be justified in all patients with tubotympanic disease [12]. Given the lack of consensus in existing literature, it is important to evaluate the necessity of mastoidectomy on a case-to-case basis, particularly in resource-limited settings.

The present study was undertaken to compare the anatomical and functional outcomes of tympanoplasty performed with and without mastoidectomy in patients with CSOM tubotympanic type, with the aim of determining whether routine mastoidectomy offers any additional benefit.

MATERIALS & METHODS:

Study Design and Setting

This was a retrospective comparative study conducted in the Department of Otolaryngology, W-Pratiksha Multi-Speciality Hospital, Gurgaon, Haryana, India, where the study procedures were performed during the study period.

Study Period

The study was carried out over a five-year period from January 2018 to December 2022.

Study Population

Patients diagnosed with chronic suppurative otitis media (CSOM) of the tubotympanic type who underwent tympanoplasty surgery during the study period were included. Owing to suspension of routine elective otologic surgeries during the COVID-19 pandemic, the final sample size was limited.

Sample Size

A total of 64 patients fulfilling the inclusion and exclusion criteria were included in the final analysis.

Inclusion Criteria

- Patients aged 15 to 60 years
- Diagnosed cases of CSOM tubotympanic type
- Inactive (dry) ear for a minimum period of 6 weeks prior to surgery
- Presence of conductive hearing loss
- Intact ossicular chain on preoperative clinical and audiological assessment

Exclusion Criteria

- Atticoantral disease or evidence of cholesteatoma
- Active ear discharge at the time of surgery
- History of revision ear surgery
- Sensorineural or mixed hearing loss
- Associated nasal or nasopharyngeal pathology likely to affect Eustachian tube function

Grouping of Patients

Patients were divided into two equal groups based on the surgical procedure performed:

- **Group A:** Tympanoplasty with cortical mastoidectomy (**n = 32**)
- **Group B:** Tympanoplasty without mastoidectomy (**n = 32**)

Preoperative Assessment

All patients underwent a detailed clinical evaluation, including otoscopic examination and tuning fork tests. Pure tone audiometry was performed preoperatively to assess hearing status, with particular emphasis on the air–bone gap (ABG).

Surgical Technique

All surgeries were performed under general anesthesia using a postauricular approach. Temporalis fascia graft was used in all cases for tympanic membrane reconstruction. In Group A, cortical mastoidectomy was performed prior to tympanoplasty. In Group B, tympanoplasty alone was carried out without mastoid exploration. The ossicular chain was found to be intact intraoperatively in all patients.

Postoperative Follow-up

Patients were followed up postoperatively at regular intervals. Graft status was assessed at 3 and 6 months after surgery using otoscopic examination. Pure tone audiometry was repeated at 6 months postoperatively to evaluate hearing improvement.

Outcome Measures

- **Anatomical outcome:** Successful graft uptake at 3 and 6 months
- **Functional outcome:** Improvement in hearing assessed by change in air–bone gap on pure tone audiometry

Statistical Analysis
Data were compiled and analyzed using standard statistical methods. Quantitative data were expressed as mean ± standard deviation, and qualitative data as frequency and percentage. Comparison between groups was performed using appropriate statistical tests. A p-value < 0.05 was considered statistically significant.

RESULTS:
A total of 64 patients diagnosed with chronic suppurative otitis media (CSOM) tubotympanic type were included in the study. Patients were divided equally into two groups: Group A (tympanoplasty with cortical mastoidectomy) and Group B (tympanoplasty without mastoidectomy), with 32 patients in each group.

Demographic Profile
The age of patients ranged from 15 to 60 years. The mean age in Group A was 34.6 ± 9.8 years, while in Group B it was 33.9 ± 10.2 years. Both groups showed a male predominance. There was no statistically significant difference between the two groups with respect to age and sex distribution ($p > 0.05$).

Table 1: Demographic distribution of study population

Parameter	Group A (n=32)	Group B (n=32)
Mean age (years)	34.6 ± 9.8	33.9 ± 10.2
Males	19 (59.4%)	18 (56.3%)
Females	13 (40.6%)	14 (43.7%)

Laterality of Disease
Unilateral disease was more common in both groups. Right ear involvement was slightly higher than left ear involvement; however, the difference between the two groups was not statistically significant.

Table 2: Laterality of ear involvement

Side involved	Group A (n=32)	Group B (n=32)
Right ear	17 (53.1%)	16 (50%)
Left ear	15 (46.9%)	16 (50%)

Graft Uptake Rate
Graft uptake was assessed at 3 and 6 months postoperatively. Successful graft uptake was observed in 30 patients (93.8%) in Group A and 29 patients (90.6%) in Group B. The difference in graft uptake rates between the two groups was not statistically significant ($p > 0.05$).

Table 3: Graft uptake outcome

Outcome	Group A (n=32)	Group B (n=32)
Successful graft uptake	30 (93.8%)	29 (90.6%)
Graft failure	2 (6.2%)	3 (9.4%)

Hearing Outcome
Hearing improvement was assessed using pure tone audiometry, with air-bone gap (ABG) as the primary parameter. In Group A, the mean preoperative ABG was 28.4 ± 6.1 dB, which improved to 14.2 ± 4.8 dB postoperatively. In Group B, the mean preoperative ABG was 27.9 ± 6.4 dB, improving to 14.8 ± 5.1 dB after surgery. Both groups demonstrated statistically significant postoperative hearing improvement ($p < 0.05$). However, intergroup comparison of postoperative ABG closure showed no statistically significant difference ($p > 0.05$).

Table 4: Comparison of hearing outcomes (Air-Bone Gap)

Parameter	Group A	Group B
Preoperative ABG (dB)	28.4 ± 6.1	27.9 ± 6.4
Postoperative ABG (dB)	14.2 ± 4.8	14.8 ± 5.1
Mean hearing gain (dB)	14.2	13.1

Overall Outcome Assessment
Both surgical techniques resulted in high graft uptake rates and significant hearing improvement. The addition of cortical mastoidectomy did not demonstrate any statistically significant advantage over tympanoplasty alone in terms of anatomical or functional outcomes.

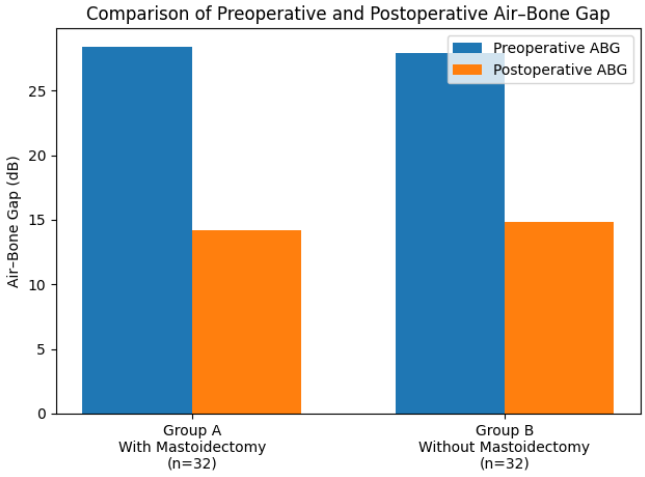

Figure 1: Comparison of preoperative and postoperative air–bone gap (ABG) in patients undergoing tympanoplasty with mastoidectomy (Group A, n = 32) and without mastoidectomy (Group B, n = 32). Both groups showed statistically significant postoperative improvement, with no significant intergroup difference.

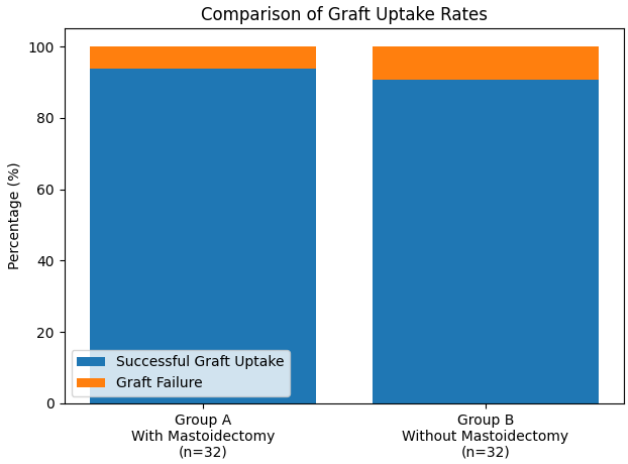

Figure 2: Comparison of graft uptake rates in patients undergoing tympanoplasty with mastoidectomy (Group A, n = 32) and without mastoidectomy (Group B, n = 32). No statistically significant difference was observed between the two groups.

DISCUSSION:

The surgical management of chronic suppurative otitis media (CSOM) of the tubotympanic type continues to generate debate, particularly regarding the necessity of adding cortical mastoidectomy to tympanoplasty in cases of inactive disease. While tympanoplasty alone is widely accepted as the standard surgical treatment, differing opinions persist on whether mastoidectomy offers additional anatomical or functional benefits. The present retrospective comparative study evaluated outcomes of tympanoplasty performed with and without mastoidectomy and demonstrated comparable graft uptake and hearing improvement between the two techniques.

In the current study, successful graft uptake was achieved in 93.8% of patients undergoing tympanoplasty with mastoidectomy and 90.6% of those undergoing tympanoplasty alone. Although the uptake rate was marginally higher in the mastoidectomy group, this difference was not statistically significant, suggesting that routine mastoidectomy does not significantly influence graft success in inactive tubotympanic CSOM. These findings are consistent with the observations of Balyan et al. and Albu et al., who reported no clear advantage of adding mastoidectomy in non-cholesteatomatous, dry ears [13,14,15].

Functional outcomes assessed by air–bone gap (ABG) closure revealed statistically significant postoperative hearing improvement in both groups, with no significant intergroup difference. This finding supports earlier reports by Mishiro et al. and Nayak et al., who demonstrated that hearing outcomes following tympanoplasty are largely independent of mastoid intervention in inactive CSOM [16,17]. Restoration of sound conduction appears to depend primarily on successful tympanic membrane reconstruction and an intact ossicular chain rather than on mastoid air cell clearance in dry ears [6,7].

The theoretical rationale for adding cortical mastoidectomy includes eradication of residual infection, improvement of middle ear ventilation, and conversion of the mastoid into a functional air reservoir [8,9]. However, in long-standing inactive CSOM, the mastoid mucosa is often sclerotic and poorly pneumatized, thereby limiting its contribution to middle ear aeration. Several authors have questioned the functional significance of mastoidectomy in such ears, noting that removal of non-functional mastoid air cells may not translate into improved surgical outcomes [18,19].

Routine mastoidectomy also increases operative time, healthcare cost, and surgical morbidity, and carries potential risks such as facial nerve injury, postoperative pain, and delayed wound healing [12,20]. In resource-limited settings, avoiding unnecessary surgical steps without compromising outcomes is of particular importance. The findings of the present study therefore support a selective rather than routine approach to mastoidectomy in tubotympanic CSOM, reserving it for cases with specific clinical, radiological, or intraoperative indications [10,11,21].

It is noteworthy that the final sample size in this study was limited to 64 patients, largely due to the suspension of elective otologic surgeries during the COVID-19 pandemic. Despite this limitation, the study demonstrates trends consistent with existing literature and reinforces the growing consensus that tympanoplasty alone is adequate for managing inactive tubotympanic CSOM in appropriately selected patients [13,16,17].

Limitations of the present study include its retrospective design, relatively small sample size, and limited follow-up duration. Long-term outcomes such as late graft failure, recurrent otorrhea, and sustained hearing improvement were not evaluated. Future prospective, randomized studies with larger sample sizes and longer follow-up periods are required to further validate these findings and establish definitive surgical guidelines [21,22].

Overall, the results of this study add to the existing body of evidence suggesting that routine cortical mastoidectomy is not necessary in the surgical management of inactive CSOM tubotympanic type and should be reserved for selected cases based on individual patient factors rather than employed as a routine adjunct.

CONCLUSION:

Tympanoplasty alone provides satisfactory anatomical and functional outcomes in patients with CSOM tubotympanic type. The routine addition of cortical mastoidectomy does not confer a significant advantage in terms of graft uptake or hearing improvement in inactive disease. Mastoidectomy should therefore be reserved for selected cases based on clinical and intraoperative findings rather than performed as a routine adjunct.

Declaration:

Conflicts of interests: The authors declare no conflicts of interest.

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