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COMPARISON OF MYRINGOPLASTY WITH AND WITHOUT CORTICAL MASTOIDECTOMY ON PATIENT OUTCOME

Original Research

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ABSTRACT

Background: Chronic suppurative otitis media (CSOM) is a prevalent condition causing tympanic membrane perforation, recurrent otorrhea, and hearing loss. Myringoplasty is a widely used surgical technique for tympanic membrane repair, but the role of adjunctive cortical mastoidectomy remains debated. While some studies suggest that mastoidectomy improves middle ear ventilation and disease resolution, others report no significant benefit over myringoplasty alone. This study aimed to compare the effectiveness of myringoplasty with and without cortical mastoidectomy in patients with non-cholesteatomatous CSOM.

Objective: To evaluate the impact of myringoplasty alone versus myringoplasty combined with cortical mastoidectomy on graft uptake, postoperative ear dryness, and hearing outcomes in non-cholesteatomatous CSOM.

Methods: This prospective study was conducted over six months at the Department of Otorhinolaryngology, Islamabad Hospital. A total of 36 patients with dry, non-cholesteatomatous CSOM were enrolled. Patients were randomized into two groups: 18 underwent myringoplasty alone, while 18 underwent myringoplasty with cortical mastoidectomy. Surgeries were performed using a postauricular approach with temporalis fascia grafts. Preoperative and postoperative pure-tone audiometry was conducted at three months to assess hearing outcomes. Graft uptake and ear dryness were evaluated during follow-up visits. Statistical analysis was performed using independent sample t-tests and chi-square tests, with significance set at $p<0.05$.

Results: The mean preoperative air-bone (A-B) gap was 23.3±7.5 dB in the myringoplasty group and 23.4±7.2 dB in the myringoplasty with mastoidectomy group. Postoperatively, the mean A-B gap was 21.0±8.3 dB and 17.3±10.0 dB, respectively, with no statistically significant difference ($p=0.5$). Graft uptake success rates were 70% in both groups ($p=0.4$). Ear dryness was observed in 90% of patients who underwent myringoplasty alone and 75% of those who received myringoplasty with mastoidectomy ($p=0.7$).

Conclusion: Myringoplasty alone and myringoplasty with cortical mastoidectomy yielded comparable hearing outcomes and graft success rates in non-cholesteatomatous CSOM. While mastoidectomy did not significantly improve postoperative results, it may be considered on a case-by-case basis, particularly in patients with recurrent infections or persistent middle ear disease.

Keywords: Air-bone gap, Chronic otitis media, Hearing loss, Mastoidectomy, Myringoplasty, Tympanic membrane, Tympanoplasty.

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INTRODUCTION

Chronic suppurative otitis media (CSOM) is a longstanding condition characterized by persistent inflammation of the mucoperiosteal lining of the mastoid and middle ear. This condition has plagued humanity for centuries, with middle ear infections remaining a significant global health concern. The primary aim of surgical intervention in CSOM is to establish a permanently dry ear and close tympanic membrane perforations. Myringoplasty, a well-established surgical technique, is widely performed to repair eardrum perforations, which commonly result from recurrent middle ear infections or traumatic injuries (1). Despite its widespread use, myringoplasty alone may not always provide optimal outcomes, raising questions about the potential role of additional surgical procedures such as cortical mastoidectomy. CSOM remains a pervasive issue worldwide, with an even higher prevalence in developing countries where inadequate healthcare access exacerbates disease progression. Patients suffering from this condition often experience recurrent ear discharge (otorrhoea) and hearing impairment, significantly impacting their quality of life. Myringoplasty is generally recommended to prevent these long-term complications; however, its success is influenced by multiple factors, including surgical technique, type of graft used, and the condition of the middle ear and mastoid at the time of surgery. While several studies have assessed the impact of different graft materials and surgical methodologies on myringoplasty outcomes, the role of cortical mastoidectomy in patients without active infection remains a subject of debate (2).

Mastoidectomy, particularly cortical mastoidectomy, is often performed alongside myringoplasty in cases where chronic ear infections are resistant to medical treatment. This additional procedure involves the removal of mastoid air cells to improve ventilation and drainage, theoretically reducing the likelihood of recurrent infection. Some studies suggest that combining cortical mastoidectomy with myringoplasty enhances surgical success, particularly in cases of chronic ear infections that do not respond to antibiotics (3). However, controversy persists regarding its necessity in patients with inactive disease. There are three prevailing perspectives on this issue: the first supports mastoidectomy for both infected and dry ears, the second advocates for mastoidectomy only in actively infected ears, and the third argues that mastoidectomy provides no significant benefit regardless of the infection status (4). Given the ongoing debate, this study aims to compare the outcomes of myringoplasty with and without cortical mastoidectomy in patients with non-cholesteatomatous CSOM. The objective is to evaluate the impact of these surgical techniques on postoperative parameters such as air-bone gap closure, graft uptake, and the achievement of a dry ear, providing evidence to inform surgical decision-making and optimize patient outcomes (5).

METHODS

This prospective, randomized clinical trial was conducted at the Department of Otorhinolaryngology, Faculty of Medicine, Islamabad Hospital, to compare the outcomes of myringoplasty alone versus myringoplasty with cortical mastoidectomy in patients with non-cholesteatomatous chronic suppurative otitis media (CSOM). The sample size was determined using Cochran's formula, with statistical parameters set as Z=1.6, p=0.45, q=0.21, and e=0.05 (5). A total of 36 participants were recruited and randomly assigned into two groups: Group 1 (n=18) underwent myringoplasty alone, while Group 2 (n=18) received myringoplasty with cortical mastoidectomy. Randomization was achieved through a lottery method, wherein participants blindly selected a piece of paper from a box containing group allocations. All participants provided written informed consent after being fully briefed about the study objectives, risks, and benefits. Ethical approval was obtained from the institutional review board (IRB) before the commencement of the study (6). Participants aged 12 years or older with dry central tympanic membrane perforations persisting for at least one month and diagnosed with tubo-tympanic disease were included in the study. Exclusion criteria comprised patients with marginal or attic perforations, active ear discharge (wet ear), cholesteatomatous disease, concomitant otitis externa, prior mastoid surgery, and underlying systemic conditions such as diabetes mellitus. A detailed clinical history was obtained for each participant, including symptom onset, duration, previous treatments, medication use, and history of trauma or prior surgical interventions. A comprehensive otological examination was performed to assess tympanic membrane status, middle ear mucosa, and any indications of prior surgical procedures. Tuning fork testing was conducted for an initial hearing assessment, and a complete nasal and oral examination was performed to identify any predisposing factors such as allergies or anatomical abnormalities contributing to recurrent infections (7).

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Baseline pure-tone audiometry (PTA) was conducted for all participants before surgery and repeated three months postoperatively to evaluate auditory outcomes. Routine preoperative laboratory investigations were completed for each patient. To ensure infection-free conditions before surgery, all participants received a 10-day course of topical ciprofloxacin ear drops along with systemic antibiotic therapy comprising amoxicillin-clavulanic acid (1 g daily). Cases exhibiting resistance to initial antibiotic treatment were subjected to microbiological analysis, and three participants with persistent infection were treated with oral ciprofloxacin (500 mg daily) and topical ciprofloxacin ear drops for an additional 10 days. Surgery was scheduled only after a minimum period of one month had elapsed since the last episode of ear discharge, ensuring that all perforations were dry at the time of intervention (8). All participants underwent postauricular myringoplasty using the underlay technique, with temporalis fascia grafts harvested intraoperatively. Cortical mastoidectomy was performed in Group 2 patients to ensure mastoid aeration and clearance of any residual inflammatory tissue. Surgical procedures were conducted under standard aseptic conditions, and all surgeries were performed by the same experienced otologic surgeon to minimize procedural variability. Postoperative care included a 10-day course of amoxicillin-clavulanic acid (1 g daily) for all participants, except for the three cases with prior antibiotic resistance, who continued ciprofloxacin (500 mg daily) instead. Standard wound care was provided, with bacitracin ointment applied to the postauricular incision site twice daily for one week. The initial postoperative visit occurred on day 10, during which ear dressings, packing, and skin sutures were removed. Patients were instructed to keep their ears dry and avoid water exposure during the healing period (9).

Follow-up assessments were conducted at three to four weeks postoperatively and continued until three months after surgery. During each visit, graft uptake and postoperative ear dryness were evaluated by an independent examiner who was not involved in the surgical procedures. Microscopic examination and suction clearance were performed when necessary. Successful graft uptake was defined as the complete absence of residual tympanic membrane perforation at the final follow-up visit. Postoperative audiometry was conducted at three months to compare air-bone gap closure between the two groups (10). All clinical data were recorded on standardized patient medical sheets and cross-verified for accuracy before analysis. Data entry was performed using Microsoft Excel (2010), and statistical analysis was carried out using SPSS software version 25. Descriptive statistics, including mean and standard deviation, were used for continuous variables, while categorical data were analyzed using frequency distributions. Between-group comparisons for quantitative variables were conducted using independent sample t-tests, while qualitative variables were analyzed using the Chi-square or Fisher's exact test, as appropriate. A paired t-test was used to assess pre- and postoperative air-bone gap differences within each group. Statistical significance was set at $p<0.05$, with $p<0.01$ considered highly significant. Results were presented in tabular format for clarity (11).

RESULTS

The study included 36 patients who were randomized into two groups: Group 1, comprising individuals who underwent myringoplasty alone, and Group 2, consisting of those who underwent myringoplasty with cortical mastoidectomy. Each group included 18 patients, with an equal distribution of males (55%) and females (45%). The mean age of participants was 24.3±7.1 years in Group 1 and 28.2±8.3 years in Group 2. The youngest participant was 13 years old. The primary presenting symptoms in both groups were otorrhea and hearing loss. Preoperative pure-tone audiometry showed that the mean air-bone (A-B) gap was 23.3±7.5 dB in Group 1 and 23.4±7.2 dB in Group 2. At three months postoperatively, the mean A-B gap improved to 21.0±8.3 dB in Group 1 and 17.3±10.0 dB in Group 2. However, the difference in A-B gap closure between the two groups was not statistically significant (p=0.5). The mean reduction in the A-B gap was -2.5±6.7 dB in Group 1 and -0.4±9.7 dB in Group 2, with no significant difference observed between the groups (p=0.4). The graft uptake success rate was 70% in both groups, with no statistically significant difference (p=0.4). Regarding postoperative ear dryness, 90% of patients in Group 1 achieved a dry ear status at three months, compared to 75% in Group 2 (p=0.7). Notably, 92% of individuals in Group 1 had a dry ear postoperatively compared to 76% in Group 2 (p=0.4). Among patients with failed graft uptake, 50% experienced postoperative ear discharge, while all patients with successful graft uptake had dry ears ($p<0.03$). A significant association was observed between graft uptake and postoperative dryness in Group 2, where 83.7% of patients with failed graft uptake had persistent ear discharge, while all patients with successful graft uptake had a dry middle ear mucosa ($p<0.001$).

Table 1: Demographic statistics of Group 1 and Group 2 (N=36)

Variables	Group 1 (n=18)	Group 2 (n=18)	p-value
Sex (Male)	10 (55%)	10 (55%)	1
Sex (Female)	8 (45%)	8 (45%)	
Age (MeanÂ±SD)	24.3Â±7.1	28.2Â±8.3	0.6

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Table 2: Independent sample t-tests between Group 1 and Group 2 (N=36)

	Group 1 (n=18)	Group 2 (n=18)	P value
Preoperative A-B gap	23.4±7.5	23.3±7.2	0.9
Postoperative A-B gap	21.0±8.3	17.3±10.0	0.5
A-B gap difference	-2.5±6.7	-0.4±9.7	0.4

Table 3: Independent t-test for Graft's chances of success in Group 1 and Group 2 (N=36)

Variables	Group 1 (n=18)	Group 2 (n=18)	p-value
Graft Uptake (Successful)	12 (70%)	12 (70%)	0.4
Graft Uptake (Failed)	6 (30%)	6 (30%)	-
Dryness (Successful)	16 (90%)	13 (75%)	0.7
Dryness (Failed)	2 (10%)	5 (25%)	-

Table 4: Chi-square Test for Graft Uptake Failure

Dryness Status	Graft Uptake - Good (Group 1)	Graft Uptake - Bad (Group 1)	P-value (Group 1)	Graft Uptake - Good (Group 2)	Graft Uptake - Bad (Group 2)	P-value (Group 2)
Dry	14 (100%)	2 (50.0%)	<0.03	13 (100%)	1 (16.3%)	<0.001
Discharge	0 (0.0%)	2 (50.0%)	-	0 (0.0%)	4 (83.7%)	-

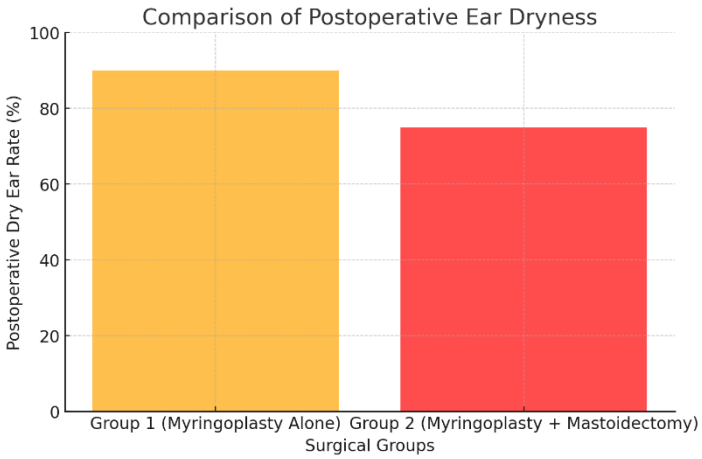

Figure 2 Comparison of Postoperative Ear Dryness

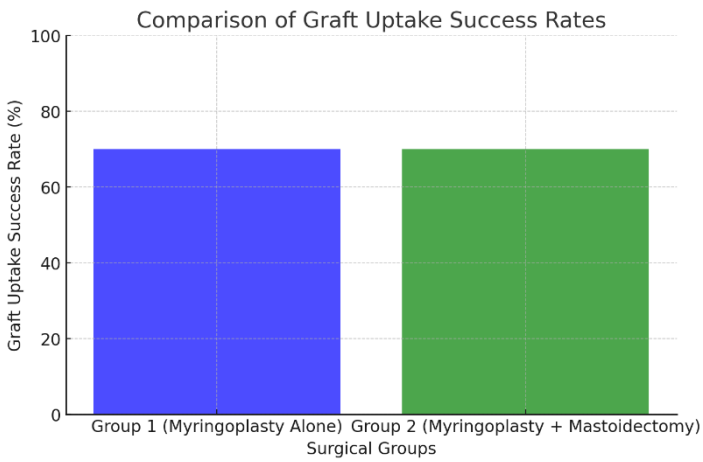

Figure 1 Comparison of Graft Uptake Success Rates

DISCUSSION

Mastoidectomy remains one of the most commonly performed otological procedures, with its indications ranging from the management of chronic infections to facilitating neurotological surgeries. The technique has evolved over time, with cortical mastoidectomy being widely adopted to mitigate complications associated with radical mastoidectomy. Myringoplasty, on the other hand, is a well-established

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reconstructive procedure aimed at repairing tympanic membrane perforations while ensuring an infection-free middle ear and an intact, functional ossicular chain. Despite extensive research on the surgical management of chronic otitis media, the necessity of combining mastoidectomy with myringoplasty remains a subject of debate, particularly in cases of non-cholesteatomatous chronic suppurative otitis media (CSOM) (4,12). The findings of this study suggest that cortical mastoidectomy does not confer a significant additional benefit in improving postoperative hearing outcomes, graft uptake, or the achievement of a dry ear. The mean air-bone gap reduction was comparable between the two groups, with no statistically significant difference in postoperative auditory outcomes. These results align with previous studies that reported similar hearing improvements regardless of whether mastoidectomy was performed alongside myringoplasty (5,6). However, some research has indicated a significant improvement in hearing outcomes when mastoidectomy is performed, particularly in cases where chronic inflammation persists despite medical therapy (3,13).

Graft success rates were observed to be 70% in both groups, suggesting that cortical mastoidectomy does not enhance graft uptake in non-cholesteatomatous CSOM. This is consistent with previous research that has demonstrated no additional benefit of mastoidectomy in improving graft success rates (7). However, other studies have suggested that mastoidectomy may contribute to improved surgical outcomes by enhancing aeration of the middle ear and reducing the bacterial load within the mastoid air cells (8). The present study did not find a statistically significant advantage in performing mastoidectomy alongside myringoplasty in terms of postoperative ear dryness, with 90% of patients achieving a dry ear in the myringoplasty-only group compared to 75% in the mastoidectomy group. This is in line with findings that indicate mastoidectomy does not necessarily lead to improved middle ear conditions in the absence of an active infectious process (9,10,14,15). Contrasting reports in the literature suggest that mastoidectomy may be beneficial in specific subsets of patients. Some studies have highlighted that cortical mastoidectomy can aid in repneumatizing sclerotic mastoid air cells, thereby creating a healthier middle ear environment and reducing the risk of recurrent infections (11). Others have demonstrated that mastoidectomy helps eliminate residual mastoid reservoirs of infection, leading to lower recurrence rates and reduced need for revision surgeries (12). However, opposing evidence suggests that in cases of inactive CSOM with a dry middle ear, mastoidectomy may not yield additional benefits and could increase the risk of unnecessary surgical trauma (13,16,17).

The results of this study suggest that myringoplasty alone is a viable and effective option for managing non-cholesteatomatous CSOM, supporting the notion that routine mastoidectomy may not be required in all cases. While some studies have recommended the routine inclusion of cortical mastoidectomy to improve surgical outcomes (14), others have emphasized that myringoplasty alone is sufficient for achieving tympanic membrane closure and hearing restoration in the absence of persistent mastoid pathology (15). The decision to perform mastoidectomy should, therefore, be individualized based on the clinical presentation and intraoperative findings (18,19). Several factors may influence surgical success, including the condition of the opposite ear, the duration of a dry period before surgery, and patient-related factors such as smoking status. Some studies have highlighted that a prolonged dry period before surgery is significantly associated with better graft uptake and overall surgical success (16). Additionally, long-standing controversy exists regarding the necessity of mastoidectomy for tympanic membrane repair, as scientific evidence remains insufficient to conclusively support its routine use alongside myringoplasty (17). Mastoidectomy was historically considered essential for removing sequestered mastoid disease and creating an air reservoir within the mastoid cavity; however, its role in cases without cholesteatoma remains unclear (18,20-22).

This study has several limitations that should be acknowledged. The sample size was relatively small, which may limit the generalizability of the findings. Additionally, the follow-up period was brief, preventing an assessment of long-term outcomes and recurrence rates. Variability in surgical technique due to multiple operating surgeons may have also influenced the results. Future research should aim to include a larger sample size, a longer follow-up duration, and standardized surgical techniques to further clarify the role of cortical mastoidectomy in the management of non-cholesteatomatous CSOM.

CONCLUSION

This study highlights that while cortical mastoidectomy may offer potential advantages in achieving middle ear dryness and graft uptake, its superiority over myringoplasty alone in managing non-cholesteatomatous chronic suppurative otitis media remains inconclusive. Both surgical approaches demonstrated favorable outcomes, with no significant differences in hearing improvement. The decision to incorporate mastoidectomy should be carefully weighed against patient factors, surgical costs, and the presence of active disease. These findings reinforce the need for individualized surgical planning, ensuring that treatment choices align with patient needs while optimizing clinical outcomes.

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AUTHOR CONTRIBUTIONS

Author	Contribution
Muhibullah Younus*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Majid Dastgir	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Abdul Hakim	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Muhammad Tahir	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Inam Ul Haqa	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Amina Ali	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published

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