COMPARISON OF AIR-BONE GAP POST MYRINGOPLASTY IN CARTILAGE VERSUS TEMPORALIS FASCIA GRAFT: A SINGLE CENTER COMPARATIVE STUDY

BAKHT AZIZ[1], UMAIR WAHAB[2], ATEEQ-U-REHMAN[3], SAJJAD AKRAM[4], IRSHAD MALIK[5], MUHAMMAD HAMAD[6]

[1,4]Associate Professor, Department of ENT, Allama Iqbal Medical College, Lahore, [2,3]Assistant Professor, Department of ENT, Allama Iqbal Medical College, Lahore, [5]Lahore General Hospital, Lahore, [6]Professor, Department of ENT, Allama Iqbal Medical College, Lahore, Senior Registrar, Department of ENT, Allama Iqbal Medical College, Lahore

ABSTRACT

Background: The myringoplasty using a cartilage graft is always considered to be rigid and stable. The temporalis fasia graft is considered to be thinner and elastic. Multiple ear conditions like a dysfunctional eustachian tube or a retraction pocket, may alter the results. The surgical procedure of Myringoplasty aims to reinstate the ear drum integrity and improving the functionality of the ear drum in terms of hearing improvement (air-bone gap).

Objectives: To compare the audiological and surgical results of cartilage versus temporalis fascia graft in myringoplasty.

Methods: A clinical trial at Jinnah Hospital involved 100 patients who had myringoplasty surgery to repair the tympanic membrane. Patients were chosen from the ENT Outpatient Department from June 2023 to May 2024. The patients were randomly split into two groups. One group (50 patients) used temporalis fascia grafts, while the other group (50 patients) used cartilage grafts.

Results: After surgery, the mean Air-Bone Gap (ABG) for group 1 and 2 is 10.82±2.86 dB and 9.48±2.54 dB, respectively. While after surgery, the mean Air Conduction (AC) for group 1 and 2 is 21.34±3.65 dB and 19.44±3.50 dB, respectively. Overall, there was 89% surgical success rate.

Conclusion: An analysis of the data revealed that there was a remarkably negligible and statistically insignificant difference observed, neither in the surgical success rate that was achieved nor in the extent of hearing gain that was realized between the two distinct groups that were being compared in this particular study.

Keywords: *Temporalis Fascia, Cartilage, Myringoplasty*.

How to cite this article: Aziz B, Wahab U, Rehman A, Akram S, Malik I, Hamad M. Comparison of Air-Bone Gap Post Myringoplasty in Cartilage Versus Temporalis Fascia Graft: A Single Center Comparative Study. Pak Postgrad Med J 2025;36(2):80-84

Correspondence to: *Bakhat Aziz*
Associate Professor, Department of ENT, Allama Iqbal Medical College, Lahore, Lahore, Pakistan.

Email: *bakhataziz@gmail.com*

Received: February 18,2025; Revised: March 26,2025
Accepted: March 27,2025

DOI: https://doi.org/10.51642/ppmj.v36i02.761

INTRODUCTION

Myringoplasty repairs tympanic membrane perforations to enhance auditory function, establish a dry auditory environment, and reduce susceptibility to infections caused by various factors like infections, barotrauma, atmospheric pressure changes, head injuries, loud noises, foreign object insertion in the ear canal, and medical interventions.[1-2]

Key reasons for considering myringoplasty include recurrent otitis media episodes, leading to compromised tympanic membrane integrity; resulting hearing loss

affecting communication and quality of life; and broader social implications like discomfort during activities such as swimming, causing physical pain and emotional distress, thereby highlighting the complex impact on the patient's daily life and social interactions.[3]

Myringoplasty, a surgical procedure to repair the eardrum, shows success rates ranging from 60% to 99% in adults and 35% to 94% in children. A common cause for myringoplasty is Inactive Chronic Otitis Media, a persistent condition that can severely impact hearing and often requires surgical correction.[4-6]

Despite the variety of graft materials and methodologies available in clinical practice, no definitive superior approach has emerged. Common graft materials include TF, cartilage, perichondrium, periosteum, vein, adipose tissue, and skin, each with its pros and cons. Temporalis fascia and tragal cartilage are widely utilized for their surgical reconstruction benefits. Comparative studies between these grafting techniques are crucial to understanding their effectiveness and improving patient outcomes in reconstructive surgery. Prioritizing such research is essential for enhancing healthcare practices.

METHODS

In this clinical study at Jinnah Hospital, 100 myringoplasty patients underwent surgery. They were randomly split into two groups: one receiving temporalis fascia grafts and the other tragal cartilage grafts. A thorough examination by experienced surgeons was done preoperatively to assess factors like membrane perforation size, infection presence, and auditory capacity. This assessment ensured tailored surgical approaches. The study findings will offer insights into graft material effectiveness in myringoplasty and its impact on patient recovery and hearing improvement.

The audiometric evaluation used a precise Amplivox 260 audiometer in a specialized booth to assess hearing. Pure tone audiometry covered frequencies at 250-8000 Hz for air conduction and 250-4000 Hz for bone conduction, capturing a comprehensive view of auditory function. Hearing level was determined at 500, 1000, 2000, and 3000 Hz, indicating the subject's auditory abilities. Calculating the air-bone gap from the averages highlighted differences in hearing thresholds. These results inform clinical practice and audiology research by providing accurate diagnostic information.

The audiometric evaluations were conducted meticulously by one audiometrist, without knowledge of the surgical techniques used in myringoplasty for unbiased results. To ensure comparability between the groups, only patients with medium-sized tympanic membrane perforations were included. Standardized surgical protocols were followed, and patients' ages were closely matched. Exclusion criteria were set to maintain study rigor, excluding cases with cholesteatoma, otosclerosis, ossicular fixation, or requiring surgical revision.

The decision for the type of graft was decided just prior to surgery. All surgeries were done under general anesthesia. A solution of 1% Xylocaine and adrenalin was injected around the ear. Perforation edges were refreshed to promote membrane regeneration over the graft. An incision was made behind the ear to access middle ear structures. Retractors were used to hold the ear forward for better visibility. When needed, canalplasty widened the passage. Before inserting graft, ossicular chain was checked for the presence of mobility.

The temporalis fascia was carefully harvested, cleaned, and prepared for surgery. Cartilage, if chosen, was extracted from the tragus and placed strategically. Both materials were positioned under the tympanic membrane to optimize results. Detailed steps were taken, including creating a small slit for proper fit. The ear was restored post-surgery with gel foam support and a protective BIPP pack. This meticulous procedure demonstrates a thorough understanding of key anatomical factors for successful outcomes in otologic surgeries.

The patient received one gram of ceftriaxone daily for five days post-surgery for optimal antibiotic coverage. Sutures were removed after seven days, packing material after ten days, followed by a ten-day regimen of ciprofloxacin eye drops. Gel foam, a hemostatic agent promoting tissue regeneration, was either absorbed naturally or removed after three weeks. This holistic postoperative care involves pharmacological and mechanical interventions to ensure successful recovery.

The audiogram was regularly repeated to compare results over time. Surgical success meant no residual perforation post-surgery and no re-perforation later. Auditory success was measured by comparing pre- and post-operative AC and ABG metrics. Hearing threshold was based on mean pure tone averages at key frequencies. The final audiogram at nine months post-surgery was crucial for evaluation. Monitoring audiological parameters systematically improves data reliability and long-term surgical efficacy understanding. Regular assessments and strict success criteria emphasize ongoing evaluation in otology and audiology.

All data were systematically collected and analyzed utilizing SPSS version 25.0. Quantitative variables were represented as means accompanied by standard deviations, whereas qualitative variables were denoted through counts and percentages. An independent sample t-test was employed to assess the differences in means across the groups. The Chi-square test was utilized to evaluate the discrepancies in categorical variables between the two groups. A p-value threshold of less than 0.05 was deemed statistically significant.

RESULTS

The age range of the patients varied from 15 to 60 years, with a mean of 37.8±6.9 years. The distribution of gender and age categories was similar across the groups. There was no statistically significant difference between the first group (fascia) and the second group (cartilage) concerning preoperative air-bone gap (ABG) and air conduction (AC). The average postoperative ABG for the first and second groups was recorded at 10.82±2.86 dB and 9.48±2.54 dB, respectively.

Conversely, after surgery the mean Air conduction (AC) was noted in group 1 and 2 at 21.34±3.65 dB and 19.44±3.50 dB, respectively. In total, the surgical success rate for the entire cohort was 89%. The success rates for the group 1 and 2 were found to be 84.0% and 94.0%, respectively. There was no significant difference in rates of graft uptake between the two groups, p= 0.110.

Table-1: Comparison of gender distribution between groups

Gender	Groups		Total
	Temporalis fascia graft	Cartilage graft	
Male	29 58.0%	28 56.0%	57 57.0%
Female	21 42.0%	22 44.0%	43 43.0%
Total	50 100.0%	50 100.0%	100 100.0%

Table-2: Comparison of age distribution between groups

Age groups	Groups		Total
	Temporalis fascia graft	Cartilage graft	
15-30 years	19 38.0%	18 36.0%	37 37.0%
31-50 years	29 58.0%	28 56.0%	57 57.0%
>50 years	2 4.0%	4 8.0%	6 6.0%
Total	50 100.0%	50 100.0%	100 100.0%

Table-3: Comparison of Air bone gap (ABG) between the Study Groups

Air bone gap (ABG) (dB)	Temporalis fascia n=50	Cartilage graft n=50	p-value
Pre-operative	28.32±2.43	28.26±2.09	0.951
Post-operative	10.82±2.86	9.48±2.54	0.003
Mean Change	17.50±3.43	18.78±3.012	0.001

Table-4: Comparison of air conduction (AC) between the Study Groups

Air conduction (AC) (dB)	Temporalis fascia graft n=50	Cartilage graft n=50	p-value
Pre-operative	38.14±2.23	39.12±3.048	0.711
Post-operative	21.4±3.65	19.44±3.50	0.005
Mean Change	16.8±4.61	19.68±4.05	0.001

Table-5: Comparison of surgical success between groups

Surgical success	Groups		Total	p-value
	Temporalis fascia graft	Cartilage graft		
Yes	42 84.0%	47 94.0%	89 89.0%	0.110
No	8 16.0%	3 6.0%	11 11.0%	
Total	50 100.0%	50 100.0%	100 100.0%	

DISCUSSION

Myringoplasty, a versatile and reliable surgical procedure to repair the tympanic membrane, shows high efficacy using cartilage or fascia as graft materials. Our analysis revealed an 89% success rate, consistent with existing studies, bolstering the intervention's credibility. Further investigation is warranted to identify key factors behind these positive outcomes and refine surgical techniques for improved patient care in otological research.[7-8]

Our investigation carefully matched two patient cohorts in terms of various parameters, including age, sex, and auditory function, with no notable discrepancies. Comparing surgical success outcomes across both groups revealed no significant differences, confirming the consistency in surgical intervention effectiveness. These results have important implications for understanding surgical efficacy and patient outcomes, demonstrating the strength of our methodology and the reliability of our findings.

This particular finding aligns harmoniously with the conclusions drawn by the esteemed researchers Mauri and colleagues, as well as those articulated by Cabra and Monux, in addition to the contributions made by Yung and his research team, thus indicating a consistent pattern across the various studies conducted in this domain.[9-11]

Tek and his colleagues discovered that using cartilage grafts outperformed fascia, indicating cartilage's advantages in clinical settings. This suggests cartilage grafts could lead to better outcomes in procedures involving tissue repair. This research is significant for enhancing tissue grafting understanding and improving regenerative surgical strategies in the future.[8]

This research differs from our own as it included subjects with significant perforations. Both surgical procedures showed improved auditory function, with a 16.8 decibel enhancement in fascia graft recipients and a more significant 19.6 decibel improvement in cartilage graft recipients. On average, the study group experienced a 17.5 decibel enhancement in hearing threshold.

The analysis of various graft materials used in hearing restoration surgeries shows no notable preference among them for auditory improvements. While research comparing these materials and techniques exists, most

are retrospective, potentially biased studies. Four trials compared cartilage and fascia grafts for myringoplasty, shedding light on optimal graft selection for tympanic membrane repair. These studies highlight pros and cons of each material, aiding otolaryngologists in improving patient outcomes for perforated eardrums.

In their study, Mauri and team compared inlay butterfly cartilage grafts to fascia grafts for tympanic membrane perforations under 50%. They found no significant difference in surgical success rates or hearing outcomes, indicating both methods are equally effective for smaller perforations. This insight could impact graft material choices in ear surgeries.[9]

In a comparable manner, the researchers Cabra and Monux observed that there was a lack of significant differentiation in terms of surgical success rates or the degree of hearing improvement when comparing the use of cartilage palisade grafts versus fascia grafts in the context of medium-sized and large tympanic membrane perforations, highlighting the potential equivalence of these two grafting techniques in achieving similar clinical outcomes.[10]

Yung et al. found no significant difference in outcomes between cartilage and fascia grafts for tympanic membrane perforations over 50%, suggesting both graft types are similarly effective in tissue integration and auditory function restoration. This challenges assumptions about one graft's superiority over the other in such cases, emphasizing the need for more research on graft selection's impact in tympanoplasties, especially for larger perforations.[11]

A meta-analysis by the same researchers confirmed and strengthened previous findings, combining data from recent studies by Cabra and Monux, as well as Yung et al. This thorough analysis increases the reliability and applicability of the results, supporting a more solid understanding of the subject. The overall significance of this meta-analysis lies in its consistent results across various studies, which greatly enhances the field's knowledge.[10-11]

In their study, Tek et al. compared cartilage reinforcement grafts under fascial tissue with fascia alone for tympanic membrane perforations. They found cartilage grafts significantly improved take rates, indicating better surgical success. However, no significant difference was observed in hearing outcomes. While cartilage enhanced graft integrity, it did not substantially impact hearing restoration. Further research is needed on factors influencing graft success and hearing outcomes. This study contributes to optimizing surgical techniques for tympanic membrane repair and selecting appropriate graft materials in otology.[8]

The significant variation among studies, including ours, regarding perforation dimensions, follow-up duration, and grafting materials and techniques, makes it impractical to combine data for a meta-analysis. Mauri et al.'s study used an inlay butterfly cartilage graft for perforations <50% in size and had a short two-month follow-up.[9]

Cabra, Monux, and Yung and their research teams extensively studied various perforation sizes, focusing on medium and large sizes to explore implications thoroughly. The follow-up period lasted 24 months, enabling a detailed analysis of long-term outcomes. This rigorous approach underscores the significance of longitudinal studies in understanding the subject complexities.[10-11]

Tek et al. used a unique methodology different from other studies, examining various perforation sizes for a comprehensive analysis. They closely monitored cases for six months to thoroughly assess outcomes and long-term effects of interventions.[8]

CONCLUSION

Myringoplasty, using either cartilage or temporalis fascia as grafts, yields similar results in integrating the graft and enhancing hearing. Cartilage generally provides superior audiological outcomes, albeit with longer duration, while temporalis fascia shortens the procedure. The choice of graft material significantly impacts surgical effectiveness and efficiency, necessitating careful consideration.

ETHICAL APPROVAL

Ethical approval was granted by the Institutional Review Board of Allama Iqbal Medical College / Jinnah Hospital, Lahore vide reference No ERB170 1/05-05-2023/SI ERB dated: 05/05/2023.

CONFLICT OF INTEREST

Authors declare no conflict of interest.

FUNDING SOURCE: None

AUTHOR'S CONTRIBUTIONS

BA: Concept, design, manuscript writing, data collection
UW: Statistical analysis, Manuscript writing
AUR: Manuscript writing, data analysis
SA: Critical review, proof reading
IM: Manuscript writing, review literature
MH: Data collection, Data analysis
All Authors: Approval of the final version of the manuscript to be published

REFERENCES

1. Chen K, Zhao R. Comparison of cartilage and temporalis fascia grafts in type 1 tympanoplasty: A meta-analysis. Ear Nose Throat J. 2022 Oct 27:1455613221137122. doi: 10.1177/01455613221137122. Epub ahead of print. PMID: 36300279

2. Jung DJ, Lee HJ, Hong JS, Kim DG, Mun JY, Bae JW, Yoo MH, Lee KY. Prediction of hearing outcomes in chronic otitis media patients underwent tympanoplasty using ossiculoplasty outcome parameter staging or middle ear risk indices. PLoS One. 2021 Jul 29;16(7):e0252812. doi: 10.1371/journal.pone.0252812. PMID: 34324485; PMCID: PMC8321221.
3. Bhandarkar AM, Krishnan NV, Mathew NM. Interlay Cartilage Rim Augmented Fascia Tympanoplasty: An Effective Graft Model in Mucosal Chronic Otitis Media. Indian J Otolaryngol Head Neck Surg. 2022 Mar;74(1):32-38. doi: 10.1007/s12070-020-02150-y. Epub 2020 Sep 19. PMID: 35070923; PMCID: PMC8743324.
4. Çayir S, Kayabaşi S. Type 1 tympanoplasty in pediatric patients: Comparison of fascia and perichondrium grafts. Int J Pediatr Otorhinolaryngol. 2019 Jun;121:95-98. doi: 10.1016/ j.ijporl.2019.03.007. Epub 2019 Mar 9. PMID: 30878559.
5. Lin MY, Chang TS, Liao JB. The Pretragal Superficial Musculoaponeurotic System Fascia: A New Graft Material for Transcanal Tympanoplasty. Otol Neurotol. 2020 Jun;41(5):644-653. doi: 10.1097/MAO.0000000000002599. PMID: 32080032.
6. Lou ZC. Endoscopic myringoplasty: comparison of double layer cartilage-perichondrium graft and single fascia grafting. J Otolaryngol Head Neck Surg. 2020 Jun 22;49(1):40. doi: 10.1186/s40463-020-00440-7. PMID: 32571414; PMCID: PMC7310158.
7. Sharma S, Rawat DS, Aseri Y, Trivedi GP, Verma PC, Singh BK. A Prospective Randomized Study to Compare Surgical Outcome Using Wet and Dry Temporalis Fascia Graft in Type I Tympanoplasty. Indian J Otolaryngol Head Neck Surg. 2022 Aug;74(Suppl 1):229-233. doi: 10.1007/s12070-020-02027-0. Epub 2020 Aug 5. PMID: 36032894; PMCID: PMC9411447.
8. Tek A, Karaman M, Uslu C, Habeşoğlu T, Kılıçarslan Y, Durmuş R, Esen S, Egeli E. Audiological and graft take results of cartilage reinforcement tympanoplasty (a new technique) versus fascia. Eur Arch Otorhinolaryngol. 2012 Apr;269(4):1117-26. doi: 10.1007/s00405-011-1779-4. Epub 2011 Oct 4. PMID: 21968630.
9. Mauri M, Lubianca Neto JF, Fuchs SC. Evaluation of inlay butterfly cartilage tympanoplasty: a randomized clinical trial. Laryngoscope. 2001 Aug;111(8):1479-85. doi: 10.1097/00005537-200108000-00027. PMID: 11568587.
10. Cabra J, Moñux A. Efficacy of cartilage palisade tympanoplasty: randomized controlled trial. Otol Neurotol. 2010 Jun;31(4):589-95. doi: 10.1097/MAO.0b013e3181dbb35e. PMID: 20418792.
11. Yung M, Vivekanandan S, Smith P. Randomized study comparing fascia and cartilage grafts in myringoplasty. Ann Otol Rhinol Laryngol. 2011 Aug;120(8):535-41. doi: 10.1177/000348941112000808. PMID: 21922978.