

A COMPARATIVE STUDY OF OUTCOME OF MYRINGOPLASTY WITH TEMPORALIS FASCIA VERSUS MYRINGOPLASTY WITH SLICED TRAGAL CARTILAGE GRAFT

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Abstract

Background: Myringoplasty is a common surgery for repairing the tympanic membrane in chronic otitis media. While the traditional choice of graft is Temporalis fascia, sliced tragal cartilage has gained interest. This study aims to compare the physical and functional outcomes of these grafting materials. **Methods:** A randomized controlled trial took place at Sahiwal Teaching Hospital over six months from August 2024 till January 2025. It included 60 patients, aged 10 to 70, with chronic tympanic membrane perforation. Patients were randomly assigned to two groups: Group A received myringoplasty with sliced tragal cartilage grafts, and Group B received a Temporalis fascia graft. The results were assessed based on hearing improvement measured by the air-bone gap (ABG) on pure-tone audiometry after surgery, graft acceptance, and three months later using SPSS 27. **Results:** Both groups had similar basic demographics and comorbidities. The average operative time in the Cartilage Group was 29.81 ± 3.15 minutes, which was significantly shorter than the fascia group at 60.60 ± 4.86 minutes ($p < 0.001$). The postoperative ABG in the Fascia Group was 14.89 ± 5.47 dB ($p = 0.001$), while it was lower in the cartilage group at 10.35 ± 4.58 dB. This indicates better functional hearing results for the cartilage group. The graft uptake rate in both groups was satisfactory, and there were no significant differences in complication rates. **Conclusions:** The sliced tragal cartilage graft results in less operative time and better postoperative hearing improvement compared to the temporalis fascia in myringoplasty. This makes it a reliable option for tympanic membrane reconstruction.

INTRODUCTION

Tympanic membrane holes can be fixed surgically with myringoplasty. In the treatment of chronic otitis media, it is essential for restoring hearing and avoiding recurrent infections. Because of its

availability and tissue structure similarity, temporalis fascia has long been considered the gold standard material for grafting for the fibrous part of the tympanic membrane(1). However, research into the

stability and uptake rates of alternative graft materials has been spurred, particularly for more extensive or anterior perforations (2). Grafts of cartilage may provide resistance to reperforation or retraction.

According to recent research, cartilage grafts may offer comparable anatomical success rates with fewer side effects and enhanced structural stability, guaranteeing the integrity of the graft over time (3,4). There is ongoing discussion regarding the differences in hearing outcomes between cartilage grafts and temporalis fascia. According to certain research, the thinness of the temporalis fascia, which improves sound conduction, may result in marginally better hearing gains. However, it seems that the two materials' variations in air-bone gap closure are negligible. Furthermore, because of their rigidity, cartilage grafts may be beneficial in complicated cases involving larger perforations because they help hold the graft in place against middle ear pressure (5).

Few high-quality randomized controlled trials (RCTs) comparing each of these grafting techniques among well-defined patient populations exist, despite the abundance of observational and retrospective studies. The need for solid evidence to support surgical decisions is highlighted by inconsistent information on graft uptake rates along with audiological outcomes. Direct comparisons are made more difficult by the frequent differences in graft preparation techniques, patient recruitment, and follow-up across studies(6,7).

High-quality data must be produced in order to assess the safety and efficacy of Temporalis fascia in comparison to sliced tragal cartilage, since tympanic membrane perforation is a major worldwide health concern and the type of graft may impact patients' quality of life(8). In order to compare the functional and physical results of myringoplasty for chronic inactive mucous otitis media, this study will use either sliced tragal cartilage grafts or Temporalis fascia grafts in a randomized controlled trial.

The rationale for this trial is to determine which graft material has a better uptake rate, fewer complications, and more significant hearing improvements in a controlled clinical environment. This information is vital for refining surgical practices and improving patient outcomes.

Materials and methods:

The study was designed as a potential, randomized controlled trial held in the department of otorhinolaryngology, Sahiwal Teaching Hospital, Sahiwal over a period of six months from August 2024 till January 2025 with ethical approval from the Institutional Review Board. In the case of minors, written informed consent was obtained from all participants or their legal parents.

A total of 60 patients who met the eligibility criteria were nominated through the Outpatient Department. The sample size was calculated using WHO sample size calculator, with 95% confidence interval, 90% study power and operative time derived from previously published data. Patients were randomly allocated in two equal groups (n = 15 each) using the lottery method. Group A reduced myringoplasty using a sliced tragal cartilage graft, while Group B had to undergo Myringoplasty with Temporalis fascia graft.

Eligible patients consisted of individuals aged 10-70, either of sex, with tympanic membrane perforation indicated for myringoplasty. The American Society of Anesthesiologists (ASA) class III or IV status, perforations due to cholesteatoma, history of mastoid surgery or pre -tympanoplasty, anemia (hemoglobin <10 g/dL), granulomatous disease, or malignancies were excluded. Demographic and clinical characteristics, including age, gender, residence, socio-economic status, comorbidities (diabetes mellitus and hypertension), and duration of perforation have been recorded.

All procedures were performed under general anesthesia using a standardized surgical techniques standard by experienced otologic surgeons. In Group A, the tragal cartilage was cut and sliced before placement, while in Group B, the Temporalis fascia was cut and prepared for grafting. The operative time was recorded to remove the equipment from the insertion. Later, patients were managed with standard antibiotic and analgesic protocols and discharged with scheduled follow -up.

After 3 months, a follow -up assessment was done at the outpatient clinic in surgery. The results were evaluated in terms of operative period and hearing improvement, measured by average changes in the air-bone gap (ABG) using pure-tone audiometry. The entire graft uptake was also noted. According to institutional guidelines, patients with incomplete

healing or unsatisfactory hearing improvements were managed.

The data was analyzed using the SPSS version 27. The quantitative variable, which included age, duration of injury, operative time and ABG changes, was introduced as mean and standard deviation and compared between groups using independent-sample T-tests. The range of variables, such as gender, comorbidities and ASA status, were expressed as frequencies and percentage. The subgroup analysis was performed by stratifying results according to age, gender, duration and injury, components and socio-economic conditions. A P-Value.0.05 was considered statistically significant.

Results:

With an overall mean age of 40.88 ± 20.56 years, the patients in the temporalis fascia group were $43.90 \pm$

22.17 years old, whereas those in the sliced tragal cartilage graft group were 37.87 ± 18.71 years old. The cartilage group experienced an average injury length of 18.43 ± 11.39 months, whereas the fascia group experienced an average of 18.07 ± 10.12 months, for a total mean of 18.25 ± 10.68 months.

With a combined mean of 45.21 ± 16.05 minutes, the cartilage group's operating time was much lower (29.81 ± 3.15 minutes) than the fascia group's (60.60 ± 4.86 minutes). With an overall mean of 19.87 ± 4.97 dB, the preoperative air-bone gap values were 18.91 ± 4.39 dB for the cartilage group and 20.83 ± 5.39 dB for the fascia group. After surgery, there was a noticeable improvement; the cartilage group's mean air-bone gap was narrower (10.35 ± 4.58 dB) than the fascia group's (14.89 ± 5.47 dB), for an overall mean of 12.62 ± 5.50 dB.

Variable	Sliced tragal cartilage graft (n=30)	Temporalis fascia (n=30)	Total (n=60)
Age (years)	37.87 ± 18.71	43.90 ± 22.17	40.88 ± 20.56
Duration of injury (months)	18.43 ± 11.39	18.07 ± 10.12	18.25 ± 10.68
Operative time (min)	29.81 ± 3.15	60.60 ± 4.86	45.21 ± 16.05
Air-Bone gap Pre (dB)	18.91 ± 4.39	20.83 ± 5.39	19.87 ± 4.97
Air-Bone gap Post (dB)	10.35 ± 4.58	14.89 ± 5.47	12.62 ± 5.50

Both groups' baseline characteristics were similar. The sliced tragal cartilage transplant group had a sex distribution of 46.7% females and 53.3% males, whereas the temporalis fascia group had 60.0% females and 40.0% men, for a total distribution of 53.3% females and 46.7% males. In terms of socioeconomic status, the fascia group had 36.7% high, 36.7% low, and 26.7% middle socioeconomic status, meaning that overall proportions were 36.7%, 38.3%, and 25.0%, respectively, whereas the cartilage group had 36.7% high, 40.0% low, and 23.3% middle socioeconomic status.

In terms of comorbidities, the total rates for diabetes and hypertension were 45.0% and 35.0%, respectively. Diabetes was found in 40.0% of cartilage patients and 50.0% of fascia patients, while hypertension was found in 33.3% and 36.7% of

patients, respectively. Patients in the cartilage group were 40.0% rural, 33.3% semi-urban, and 26.7% urban, according to the distribution by dwelling area; patients in the fascia group were 23.3% rural, 50.0% semi-urban, and 26.7% urban, for a total of 31.7%, 41.7%, and 26.6%, respectively.

According to ASA classification, patients in the cartilage group were 46.7% ASA I and 53.3% ASA II, while patients in the fascia group were 60.0% ASA I and 40.0% ASA II. The total distribution was 53.3% ASA I and 46.7% ASA II. The overall distributions of the causes of injury were 31.7% infection, 31.6% trauma, and 36.7% other reasons. Infection was responsible for 30.0% of injuries in the cartilage group and 33.3% in the fascia group, trauma for 33.3% and 30.0%, and other causes for 36.7% in both groups.

Variable	Category	Sliced tragal cartilage graft (n=30)	Temporalis fascia (n=30)	Total (n=60)
Sex	Female	14 (46.7%)	18 (60.0%)	32 (53.3%)

	Male	16 (53.3%)	12 (40.0%)	28 (46.7%)
Socioeconomic status	High	11 (36.7%)	11 (36.7%)	22 (36.7%)
	Low	12 (40.0%)	11 (36.7%)	23 (38.3%)
	Middle	7 (23.3%)	8 (26.7%)	15 (25.0%)
Diabetes	No	18 (60.0%)	15 (50.0%)	33 (55.0%)
	Yes	12 (40.0%)	15 (50.0%)	27 (45.0%)
Hypertension	No	20 (66.7%)	19 (63.3%)	39 (65.0%)
	Yes	10 (33.3%)	11 (36.7%)	21 (35.0%)
Living area	Rural	12 (40.0%)	7 (23.3%)	19 (31.7%)
	Semi-urban	10 (33.3%)	15 (50.0%)	25 (41.7%)
	Urban	8 (26.7%)	8 (26.7%)	16 (26.6%)
ASA status	I	14 (46.7%)	18 (60.0%)	32 (53.3%)
	II	16 (53.3%)	12 (40.0%)	28 (46.7%)
Cause of injury	Infection	9 (30.0%)	10 (33.3%)	19 (31.7%)
	Other	11 (36.7%)	11 (36.7%)	22 (36.7%)
	Trauma	10 (33.3%)	9 (30.0%)	19 (31.6%)

In terms of diabetes ($p = 0.436$), hypertension ($p = 0.787$), ASA status ($p = 0.301$), injury cause ($p = 0.949$), injury duration ($p = 0.896$), and preoperative air-bone gap ($p = 0.135$), statistical analysis revealed no significant differences between the two groups, confirming baseline comparability. On the other hand, the sliced tragal cartilage graft group was favored by substantial differences in both surgical time ($p < 0.001$) and postoperative air-bone gap ($p = 0.001$).

Variable	Type of test	p-value
Diabetes	Chi-square	0.436
Hypertension	Chi-square	0.787
ASA status	Chi-square	0.301
Cause of injury	Chi-square	0.949
Duration of injury (months)	Independent t-test	0.896
Operative time (min)	Independent t-test	<0.001
Air-Bone gap Pre (dB)	Independent t-test	0.135
Air-Bone gap Post (dB)	Independent t-test	0.001

Discussion:

A comparative study of the outcomes of myringoplasty using sliced tragal cartilage graft versus temporalis fascia is a key area of research. It focuses on improving surgical results like graft uptake, hearing improvement, and minimizing complications. This randomized control trial (RCT) presents valuable findings on the differences in demographic features, surgical time, and auditory results between these two graft materials.

The RCT showed that the sliced tragal cartilage graft group had significantly less surgical time and better postoperative air-bone gap (ABG) compared to the temporalis fascia group. These results align with recent studies that emphasize the advantages of

cartilage grafts in myringoplasty. A study by Venkatesan et al. (2021) found similar graft uptake rates between temporalis fascia and tragal cartilage grafts but noted shorter surgery times and better cosmetic outcomes with cartilage grafts(9). Additionally, a 2020 study in JCPSP reported a high graft success rate for cartilage grafts (93.8%) compared to temporalis fascia grafts (80.2%), revealing no significant difference in hearing outcomes and indicating greater durability for cartilage as a graft material(10).

The postoperative ABG improvement in the cartilage group (10.35 ± 4.58 dB) compared to the fascia group (14.89 ± 5.47 dB) shows the functional advantage of cartilage grafts for hearing results. This is consistent

with the findings from 2022 comparative studies where cartilage grafts achieved better success rates while providing similar hearing benefits to fascia grafts in type 1 tympanoplasty(11). Furthermore, a 2024 study on cartilage myringoplasty using concha cartilage demonstrated excellent hearing results and a high graft uptake rate, reinforcing the effectiveness of cartilage grafts(12).

Regarding graft uptake and complications, the current study found no significant differences in baseline characteristics. However, it clearly showed better hearing results and reduced surgical time with cartilage grafts. This corresponds with the 2025 PMC study, which analyzed revision myringoplasty(13). Despite similar anatomical closing rates, the study reported fewer complications and better engraftment rates with cartilage grafts compared to temporalis fascia. Cartilage grafts are noted for their stability and resistance to reperforation due to their hardness, which may explain these clinical benefits.

This RCT provides strength for the purpose of the conclusions by eliminating confounding factors in baseline demographic and clinical factors (age, sex ratio, duration of injury, corresponding, comorbidities, ASA classification). This methodology increases the validity of the differences reported in surgical time and hearing results, reflecting the true effects of graft selection. Several observation studies and meta-analysis published since 2020 confirms these findings, consistently suggest that the tragal cartilage grafts provide better or at least equivalent physical and functional success with additional benefits of low operative time and postoperative stability(14-16).

In addition, the minimum statistically significant differences in pre and post air-bone gaps between diabetes, high blood pressure, injury, and groups between groups carry forward comparable basic clinical profiles here, which is attributed to the difference of results for graft material rather than patient heterogeneity.

Comparison with previous literature suggests that while Temporalis fascia remains a widely accepted grafting option due to ease of fascia harvesting and good biocompatibility, cartilage grafting is especially being favored in cases that require more durable grafts especially in cases prone to reperforation, large or anterior perforations(17). The biomechanical

flexibility of the cartilage combined with its favorable hearing results makes it an attractive graft option. A study of myringoplasty results since 2024 underlined the growing consensus towards cartilage as a graft with less operative time and low complexity rates, better or similar anatomical and audiological results for fascia(18).

The cartilage group had an average operative time of 29.81 ± 3.15 minutes, while the fascia group took 60.60 ± 4.86 minutes. This study found that shorter operative times were in line with the 2021 studies by Venkatesan et al(9). These studies showed that the time needed for the cartilage graft procedures was much shorter. Less surgical time not only improves efficiency but can also reduce risks related to patient recovery and anesthesia, which is an important factor in clinical decision-making.

The results of this randomized controlled trial support a growing body of evidence favoring sliced tragal cartilage grafts over temporalis fascia in myringoplasty. This highlights improvements in hearing after surgery, shorter surgical times, and lower complexity rates. These findings add significant clinical evidence that addresses patient needs and surgical goals, reinforcing cartilage grafts as an effective standard for tympanic membrane reconstruction.

Conclusion:

The sliced tragal cartilage graft showed important benefits over the temporalis fascia. It led to shorter operative times and better hearing outcomes without affecting graft uptake or safety. These results support its use as a superior graft material, especially for patients needing rebuilding of a sustainable tympanic membrane.

Conflict of Interest:

The authors reported no conflicts of interest.

Funding:

This project received no funding from any institution or hospital.

Ethical Considerations:

The study was approved by the institutional board. Informed consent was obtained from all participants, and measures were put in place to ensure patient confidentiality.

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