Outcomes of Ossiculoplasty using Homologous Septal Cartilage Versus Autologous Conchal Cartilage: A Comparative Study

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ABSTRACT

Background
Ossicular necrosis is a frequent complication of chronic otitis media (COM) resulting in mild to moderate hearing loss, with the long process of the incus being the most commonly affected ossicle. Various materials are used for reconstruction for decades to give desirable hearing outcomes by trail and error method. This randomised control trail study evaluates and compares the surgical and audiological outcomes of ossiculoplasty using two different graft materials: homologous septal cartilage and autologous conchal cartilage.

Methods
A total of 60 patients with COM were randomly assigned to two equal groups of 30. Group I underwent reconstruction using homologous septal cartilage, while Group II received autologous conchal cartilage.

Results
Over a 6-month follow-up period, objective and subjective hearing outcomes and postoperative complications were analyzed. Intraoperatively, the incus was found to be the most frequently eroded ossicle (93.33% in Group I; 86.67% in Group II), followed by the stapes suprastructure and malleus. Postoperatively, overall hearing improvement was observed in 86.67% of the homologous septal cartilage group compared to 80% of the autologous conchal cartilage group. Furthermore, postoperative complication rates-including graft rejection, extrusion, and dislocation-were lower in Group I (13.33%) than in Group II (20%).

Conclusion
These findings suggest that while both materials are highly effective for ossicular reconstruction following disease clearance, homologous septal cartilage yields slightly better audiological improvement and a lower complication rate compared to autologous conchal cartilage.

Keywords: Ossiculoplasty, Homologous, Cartilage.

INTRODUCTION

Reconstruction of the ossicular chain is the most challenging part of middle ear surgery in chronic otitis media (COM) with ossicular discontinuity.[1] Erosion of the ossicles is observed

in approximately 80% of squamosal COM cases, whereas it is seen in approximately 20% of the mucosal variety. The incus is the most frequently involved ossicle, followed by the stapes and the malleus.[2]

Multiple factors influence the success rate of ossiculoplasty. Intrinsic factors include the condition of the middle ear mucosa, the status of the residual ossicular chain, and Eustachian tube function. Extrinsic factors include the surgical technique, as well as the design and composition of the graft material.[3,4] Over the years, various grafts have been utilized-such as reshaped autologous bone, cartilage, and alloplastic total or partial ossicular replacement prostheses (TORP/PORP)—demonstrating equally good results.[5]

However, otolaryngologists still encounter challenges in determining the optimal surgical technique and graft selection, particularly for populations in low-resource settings. This study aimed to compare the efficacy of ossiculoplasty using autologous conchal cartilage versus homologous septal cartilage.

MATERIALS & METHODS

This prospective study was conducted on patients aged between 16 and 50 years attending a medical college from January 2024 to December 2025.

Inclusion Criteria

- Patients aged 16 to 50 years.
- Patients with inactive COM with ossicular discontinuity.
- Patients with an air-bone (A-B) gap > 35 dB.

Exclusion Criteria

- Patients with active COM, COM with complications, or otosclerosis.
- Patients with sensorineural hearing loss (SNHL) or mixed hearing loss.
- Patients requiring revision surgeries.

Patients were assessed via detailed otoscopic examination, followed by pure tone audiometry (PTA) and high-resolution computed tomography (HRCT) of the temporal bone. Those with COM and an ossicular defect were randomly assigned to undergo reconstructive surgery using either homologous septal cartilage (Group I) or autologous conchal cartilage (Group II). A postoperative A-B gap of < 20 dB was considered a surgical success.

Ethical Clearance and Consent

Ethical clearance was obtained from the appropriate institutional committee for research on human subjects. Written informed consent was obtained from all patients using a standard consent form. All authors declare that they have no conflicts of interest.

Surgical Technique

A total of 60 patients underwent ossiculoplasty. Of these, 30 patients were randomly assigned to Group I (homologous septal cartilage) and 30 patients to Group II (autologous conchal cartilage). All procedures were performed under general anesthesia via a post-aural approach.

Graft Preparation

Homologous septal cartilage was harvested during a submucous resection (SMR) or septoplasty and preserved in 70% alcohol. Prior to use, it was washed in normal saline one hour before and contoured to the desired length using a No. 15 blade. The superior contact surface

was sloped, and the margins were smoothed.

If the stapes superstructure was present, the inferior portion of the cartilage was drilled using a 0.6 mm diamond burr to form a socket, and a groove for the stapedius tendon was created using a No. 15 blade.

If only the stapes footplate was present, the inferior base of the cartilage was smoothed using a No. 15 blade to fit directly over the footplate without contacting the adjacent facial canal or promontory.

Autologous conchal cartilage was harvested intraoperatively and contoured to the appropriate length and shape using a No. 15 blade.

Placement

The tympanomeatal flap and underlay placed temporalis fascia graft was elevated from the posterior aspect to visualize the oval window area. The cartilage prosthesis was placed between the stapes and the neo-tympanum such a way that the cartilage just protrude in neo-tympanum. Stability was verified and temporarily supported with antibiotic-soaked Gelfoam. The underlay temporalis fascia graft was then secured, and the tympanomeatal flap was repositioned. The external auditory canal was packed with Gelfoam and an antibiotic ointment-coated cotton ball.

Outcome & Follow-up

Audiometric evaluation was conducted at 3 and 6 months to calculate the postoperative A-B gap. The closure of the perforation, graft uptake, and the presence of any retraction pockets were also analyzed.

RESULTS

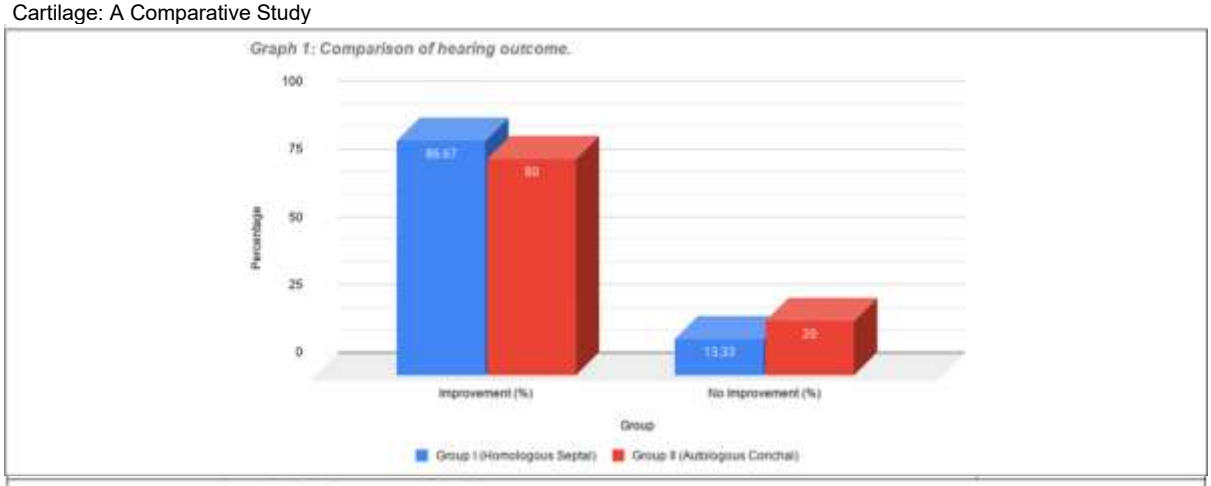
Among the total of 60 patients, 30 underwent ossiculoplasty using homologous septal cartilage (Group I), and 30 received autologous conchal cartilage (Group II). Postoperative audiological (PTA) and anatomical (otoscopy) evaluations were conducted at 3 and 6 months.

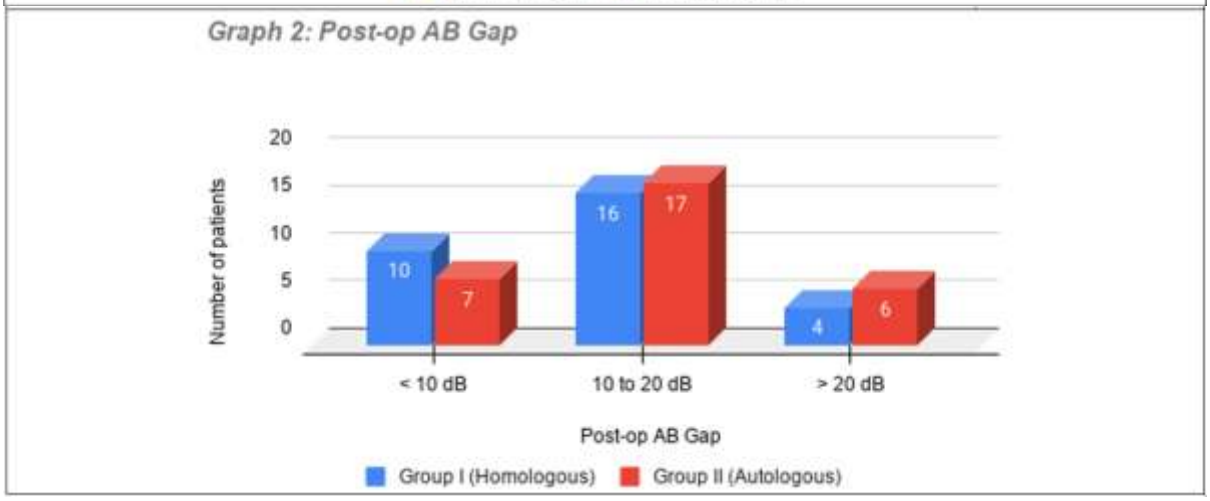
In Group I, 26 out of 30 patients (86.7%) showed significant hearing improvement (A-B gap < 20 dB), compared to 24 out of 30 patients (80.0%) in Group II. Hearing results are illustrated in Graph I. An average postoperative A-B gap of > 20 dB was considered as having no significant improvement.

Complications such as extrusion, graft rejection, graft displacement, and ossicular necrosis were slightly more frequent in Group II (20%) compared to Group I (13.3%).

Ossicular Defect	Group I	Group II
Malleus erosion	5(16.67%)	8(26.67%)
Incus erosion	28(93.33%)	26(86.67%)
Stapes suprastructure erosion	10(33.33%)	13(43.33%)

Table 1: State of ossicles in the patients are depicted in the table





Complications	Group I	Group II
1. Extrusion	1	1
2. Cartilage displacement	0	2
3. Necrosis of ossicle	2	1
4. Implant rejection	1	2

Table 2: Comparison of Different Complications

DISCUSSION

Ossicular necrosis is frequently generally seen in chronic otitis media patients in the form of necrosis of long process of incus, malleus, stapes superstructure, etc. This causes hearing loss mostly mild to moderate degree. So, for these patients, ossicular reconstruction remains the mainstay of treatment. Several researches have been done regarding the material used in ossiculoplasty. It has been noted that hear improved in a significant number of patients after ossiculoplasty following proper disease clearance.

In our study, 60 patients with chronic otitis media participated. They were divided into two groups randomly. In the first group, 30 patients underwent ossicular reconstruction using homologous septal cartilage (group I) whereas the group of 30 patients had ossiculoplasty using autologous conchal cartilage (group ll).

Male & female ratio in 1*st gr -> 3:2, and 2nd gr -> 2:1 in our study. The* first group 25 (83.33%) patients had tubotympanic disease & 5 (16.67%) had attico-antral disease. In the second group 80% had tubotympanic variety & 20% had attico-antral disease. Adhikary P, Joshi S et al study shows 76% patients had tubotympanic & 24% had attico-antral disease.[6]

In 80% patients of 1st group underwent cortical mastoidectomy &20% underwent Modified radical mastoidectomy. In the second group, 83.33% of patients underwent cortical mastoidectomy & 16.67%underwent modified radical mastoidectomy.

In our study, incus is eroded in 93.33% in 1st group & 86.67% in 2nd group. Incus is the most comm ossicle eroded followed by stapes suprastructure (33% in group 1 and 43.33% in group 2) followed by Malleus (16.67% in Gr I & 26.67% in Gr II). *[Ref: Table 1]*

At follow up, subjective & objective hearing outcomes are analysed up to 6 months .26 patients out of 30 (86.67%) showed improvement with homologous septal cartilage. 24 pati out of 30 (80%) showed improvement with autologous conchal cartilage [Ref: Graph 1]. Minimum A-B gap was 8.5, maximum 29 & mean was 16.4 in group 1 whereas in group 2 minimum was 9, maximum 32.6 & mean was 18.4. In another study (K.C. Prasad et al) who used homologous cartilage saw 90% improvement.[7]

Our study shows different complications like graft rejection, extrusion or dislocation etc occured in 13.33%in 1st group & 20% in 2nd group after 6 months follow up. [Ref: Table 2]. In Sharma K, Guarrani P et al study also shows almost similar complications with homologous septal cartilage.[8]

CONCLUSION

Although various options are currently available for ossiculoplasty, many remain financially inaccessible for patients in low-resource settings. Therefore, autologous and homologous materials are preferred for cost-effective and efficient ossicular reconstruction.

Hearing outcomes with homologous septal cartilage were found to be comparable, and in some aspects superior to those achieved with autologous cartilage. Regarding complications, autograft present disadvantages such as prolonged operative time, a lack of rigidity, and occasional unavailability in cases of extensive disease. Conversely, homologous cartilage is easily accessible, can be preserved in 70% alcohol, provides greater rigidity than conchal cartilage, and reduces overall operative time. While there is a theoretical risk of prion transmission and extrusion with homologous grafts, no such evidence was observed in this study.

We conclude that readily available homologous septal cartilage is a safe and effective option for ossicular reconstruction without an increased risk of complications. However, further clinical trials with larger sample sizes and longer follow-up periods are needed for standardization.

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