



A COMPREHENSIVE ANALYSIS OF ENDOSCOPIC TYMPANOPLASTY WITH TRAGAL CARTILAGE

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ABSTRACT **Objective:** The purpose of this study is to determine the effect of endoscopic tympanoplasty using tragal cartilage on the rate of graft uptake and improvement in hearing. **Methodology:** A prospective research was conducted on fifty patients receiving endoscopic tympanoplasty using tragal cartilage. We assessed the following factors: pre- and post-operative hearing levels, rate of graft success, hearing gain, and post-operative graft failure rate. We monitor the patients for an additional three months following surgery. **Results:** After three months, a 100% graft uptake rate was seen in endoscopic tympanoplasty using tragal cartilage. The absence of graft necrosis or lateralization, along with long-term stability, indicate effective graft uptake. Regarding improvement in hearing, there was a 15.9 dB closure of the ABG.

KEYWORDS : Cartilage graft; tympanoplasty; graft uptake; air bone gap.**INTRODUCTION**

Tympanoplasty is the term for a procedure that involves either tympanic membrane grafting or clearing out middle ear disorders in order to repair the hearing mechanism. (1) When middle ear hearing mechanisms were damaged or obliterated by chronic ear illness, Wullstein used the term "tympanoplasty" in 1953 to describe surgical approaches for reconstructing them. Based on the degree of the ear drum perforation and the state of the middle ear, he divided tympanoplasty surgeries into distinct categories. Over the years, surgical techniques for tympanoplasty continued to evolve. Microscopic surgery, introduced in the 1960s, allowed for greater precision in working with small structures within the ear. This significantly improved the success rate of tympanoplasty. Tympanoplasty has come a long way from its early experimental stages to become a standard and effective surgical procedure for addressing various ear drum issues. Advances in technology, surgical instrumentation, and our understanding of ear anatomy have all contributed to the evolution of tympanoplasty techniques.

With the rise in popularity of endoscopic procedures in the latter part of the 20th century, surgeons were able to conduct tympanoplasty with fewer incisions. As a result, patients are experiencing less pain after surgery, recovering more quickly, and getting better cosmetic results.

A surgical treatment called endoscopic tympanoplasty is used to treat middle ear disorders and repair the tympanic membrane (eardrum). With this method, the middle ear structures are seen and operated on using an endoscope, a thin, flexible tube equipped with a light and a camera. By comparison, endoscopic tympanoplasty is a less invasive operation than standard open tympanoplasty, which necessitates a large incision behind the ear.

The purpose of the study is to evaluate the effectiveness of endoscopic tympanoplasty using tragal cartilage in terms of graft uptake and hearing improvement.

METHODOLOGY

In the otolaryngology department at MGM Medical College in Aurangabad, a prospective study was carried out. The study comprised 50 patients with central perforation in the csom. By the conclusion of three months after surgery, the study aims to determine whether endoscopic tympanoplasty using tragal cartilage improves the air bone gap and graft uptake rate. After surgery, each patient was checked one and three months later. One day before surgery and three months afterward, pure tone audiometry was performed.

Inclusion Criteria

Individuals suffering with mucosal chronic suppurative otitis media
Age group: 15–40 years
Dry central perforation
Patient giving consent

Exclusion Criteria

Patient with Ossicular Chain Discontinuity or Fixation
Patients with sensorineural hearing loss
Patients having squamosal csom
History of previous ear surgery
Patients with actively discharging ears
Patient not giving consent
Patient age: < 15 years and > 40 years

After taking written informed consent for participation in the study, a detailed history, routine examination, and necessary hematological and radiological investigations were done.

Surgical Technique

Patients underwent local anesthesia and intravenous sedation with a ratio of 1:1,000,000 adrenaline to 2% lignocaine during the procedure. General anesthesia was used during operations on younger individuals. Taken with a Tarabichi stitch. A segment of tragal cartilage measuring 10 mm by 10 mm was harvested; the margins of the perforation were freshened. Throughout the cartilage harvesting process, special attention was given to maintaining the tragus dome to prevent aesthetic problems. Along with the fibrous annulus, the tympanomeatal flap was raised. The continuity of the ossicles was evaluated. In order to give the graft medial support, a cartilage island graft was positioned lateral to the malleus handle. After that, the tympanomeatal flap was repositioned, anchoring its edge over the perichondrium. Gelfoam that has been medicated was placed inside the external auditory canal. The following day, the patients were discharged with the appropriate antibiotic and decongestant.

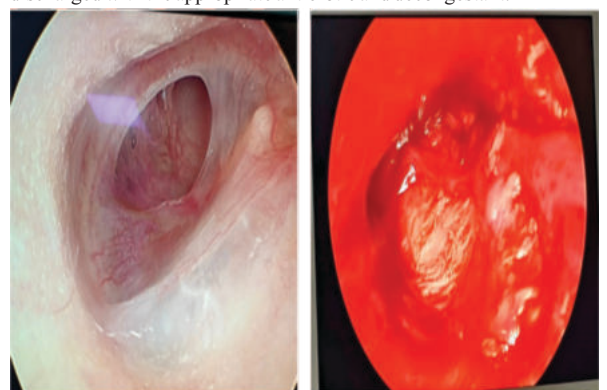


Fig. 1: Pre- and Post-Operative Pictures of Cartilage Tympanoplasty.

Patient visits to the outpatient department were then recommended after one and three months. A three-month post-operative pure tone audiogram (PTA) was performed on every patient. Frequencies of 250,

500, 1000, 2000, and 4000 Hz were used to calculate the bone conduction threshold and air conduction.

Significant improvement was defined as one that was greater than 10 dB in the air bone gap and air conduction threshold when comparing the preoperative and postoperative audiograms. At each follow-up visit, the operating ears were examined under a microscope to evaluate graft uptake and potential problems. When doing research with human subjects, all procedures followed the ethical guidelines of the institution.

RESULTS:

Out of 50 patients, 36 (72%) were women and 14 (28%) were men.

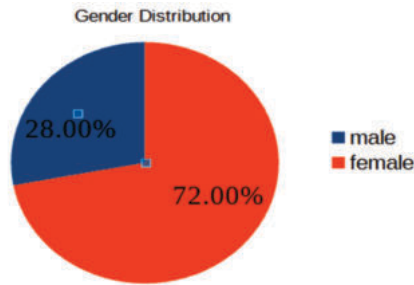


Table 1: Description of Preoperative and Postoperative Data in The Study Population.

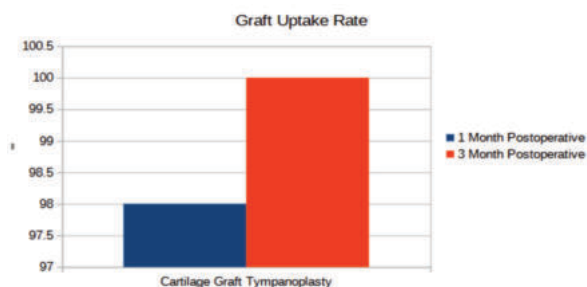
Criteria	
Male	14
Female	36
Age(year)	31
mean	
Range	19-40
Follow-up[month]	3 months
Surgical outcomes	100%
Graft uptake rate (6 months)	
Preoperative PTA	31 ± 7.1 db
Postoperative PTA	15.1±6.4 db

Out of 50 patients, 36 female and 14 male, At the conclusion of one month, 49 patients (98%) showed full closure of the perforation, with the cartilage displacement responsible for the failure. The remaining perforation also repaired conservatively after three months, increasing the graft absorption rate to 100%.

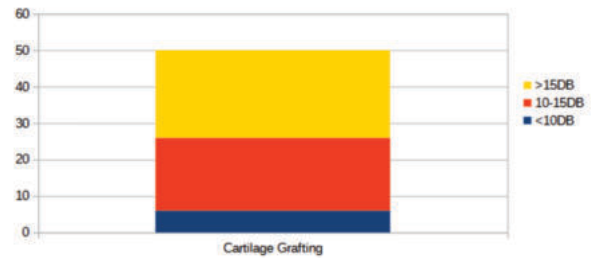
The average air conduction thresholds for preoperative and postoperative procedures were found to be 31 ± 7.1 dB and 15.1 ± 6.4 dB, respectively, with a 15.9 dB closure of the ABG, in terms of hearing improvement. ABG closure was ≥ 15 dB in 48%(24) of the patients—14 females and 10 males—while 40% (20) of the patients—18 females and 2 males—showed closure of ABG between 10 and 15 dB, and the remaining 12% (6) of the patients—4 females and 2 males—showed minimal improvement in hearing (ABG 10 dB). When it comes to air bone closure and healing, there is no sexual preference for men over women.

There were no noteworthy problems observed during or after the procedure.

Endoscopic cartilage tympanoplasty demonstrates successful graft uptake characterized by optimal vascularization, seamless integration with surrounding tissues, sustained viability, absence of necrosis or lateralization of graft, appropriate sizing, effective sealing, minimized shrinkage, freedom from infections, and long-term stability. These collective features contribute to the overall success of the tympanoplasty procedure, ensuring a durable and functional repair of the tympanic membrane.



DISTRIBUTION OF PATIENTS ACCORDING TO CLOSURE AIR-BONE GAP



DISCUSSION:

Restoring the ear's normal structure and function while addressing illness is the main goal of tympanoplasty. To do this, the tympanic membrane must remain intact, an air-containing middle ear lined with mucous tissue must be established, and a conduit between the tympanic membrane and inner ear fluids must be secured. These objectives are to keep the ear environment healthy, get rid of infections, and enhance hearing and ear function in general. (3, 4).

Endoscopic tympanoplasty is a procedure in which an endoscope is inserted through the ear canal to provide a magnified and illuminated view of middle ear structures. This technique is suitable for various middle ear conditions, including tympanic membrane perforations, chronic otitis media, and other disorders. For tympanoplasties, temporalis fascia is the most often used graft material, with areolar tissue and tragal/auricular cartilage also frequently utilized. Additionally, perichondrium, fat, scar tissue (5, 6), acellular dermal homografts, and xenografts are reported grafting options. Cartilage shield grafts from concha cymba are preferred for total perforation, cholesteatoma, atelectasis, and revision cases. Temporalis fascia and perichondrium may atrophy, posing a risk of failure. Although even in the case of eustachian tube insufficiency, conchal and tragal cartilage are favored due to their resistance to resorption and retraction. These cartilaginous grafts also offer the advantage of facilitating ossicular reconstruction during the grafting procedure.

Tragal cartilage was initially reported in 1959 (7) and has a natural curve that makes the graft easier to position and secure. Tragal cartilage, which receives nutrition through its perichondrium and is more likely to survive than temporalis fascia, is inflexible and devoid of fibrous tissue (8). (9). Conversely, conchal cartilage has the potential to be erratic and and fragile (10). In order to harvest tragal cartilage for tympanoplasty, an island flap of cartilage about 15 mm long and 10 mm wide is made and inserted using the underlay technique.

Endoscopic cartilage tympanoplasty offers a comprehensive view of the middle ear and external structures in contrast to methods aided by a microscope (11, 12). More access to the majority of middle ear structures is available, and the learning curve is brief. Adhesion risk is decreased when tragal cartilage is used, as it removes the requirement for middle ear packing (13). With both tragal and conchal cartilage, scarring is usually minor; however, because the incision is made in the ear's natural fold, tragal cartilage frequently leaves a less apparent scar.

However, complications related to endoscopic procedures include difficulties manipulating objects with one hand, heat dissipation from the light source, and potential ototoxicity from anti-fog therapies (14, 15).

The prevention of trauma to the ossicular chain, the complete removal of epithelium to prevent cholesteatoma formation, and the avoidance of implantation cholesteatoma during the insertion of large cartilaginous grafts are all important intraoperative considerations. With certain benefits and things to keep in mind for the best results, endoscopic tragal cartilage tympanoplasty has generally shown results that are equivalent to those of older techniques.

Research comparing cartilage tympanoplasty to temporalis fascia grafting procedures consistently generates much higher average hearing improvements (16–19). The least amount of auditory transmission loss was found in grafts with a thickness of less than 0.5 mm, according to Zahnert et al.'s evaluation of the frequency response function of tragal cartilage grafts using a laser Doppler interferometer

(20–23). Multiple studies, including the referenced one, indicate that cartilage tympanoplasty has a higher success rate in terms of graft uptake compared to temporalis fascia tympanoplasty.

Cartilage is highlighted as a superior grafting material due to its strength, reduced susceptibility to infection and rejection compared to temporalis fascia's soft tissue, and superior vascular properties that facilitate better nourishment by the body. The ability of cartilage to conform to the membrane provides better structural integrity than fascia. Overall, cartilage tympanoplasty not only demonstrates a higher rate of graft uptake but also achieves comparable hearing outcomes, making it a preferred choice in tympanoplasty procedures.

CONCLUSION

The minimally invasive procedure known as endoscopic cartilage tympanoplasty offers advantages including quicker recovery and less pain following surgery for fixing tympanic membrane perforations. Improved hearing outcomes are consistent across perforation sizes and locations. High patient safety and comfort are among its benefits, which are made possible by its broad visibility, simple application, quick operation time, and minimally invasive technique.

According to the referenced study, the graft uptake rate is reported as 100%, indicating a high level of success in the procedure. Additionally, the study found a significant closure of the air-bone gap, with an average improvement of 15.9 dB in terms of hearing. Overall, endoscopic cartilage tympanoplasty demonstrates effectiveness in achieving positive surgical outcomes with enhanced patient comfort and reduced recovery time.

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