

Tympanoplasty with Homologous Graft (Maleus Ossicles)

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ABSTRACT

Background: Adhesive otitis media is a subtype of chronic suppurative otitis media (CSOM), characterized by complete adherence of the tympanic membrane to the medial wall of the middle ear due to fibrous adhesions. This condition results from untreated otitis media with effusion caused by prolonged Eustachian tube dysfunction. **Purpose:** This study aims to evaluate the efficacy of tympanoplasty, particularly with homologous grafts, in improving middle ear function in adhesive otitis media. **Case Report:** A 47-year-old male patient presented with complaints of a wet sensation in his right ear for three months following a cold and intermittent cough. Symptoms persisted, accompanied by hearing loss over the past three weeks. Audiometric testing revealed normal hearing thresholds in the right ear, while the left ear demonstrated severe hearing loss at 75 dB and moderately severe loss at 60 dB. Tympanometry results before tympanoplasty showed a right ear volume of 2.0 ml (compliance -37, peak 0.65, Type A) and a left ear volume of 1.8 ml (compliance -23.4, peak 0.3, Type C). The patient underwent tympanoplasty using a homologous graft. **Results:** Postoperative tympanometry indicated improvements. The right ear volume increased to 2.4 ml (compliance -45, peak 1.09, Type A). Similarly, the left ear volume increased to 2.4 ml (compliance -35, peak 0.51, Type A), indicative of significant functional recovery of middle ear mechanics. **Conclusion:** Tympanoplasty with homologous graft effectively improves ear volume, compliance, and peak values in patients with adhesive otitis media, supporting its role as a reliable surgical intervention to restore middle ear function.

Keywords: chronic otitis media; hearing loss; tympanoplasty.

INTRODUCTION

Otitis media is an infection occurring in the middle ear and is characterized by the rapid onset of inflammatory symptoms, including ear pain. While it predominantly affects children under the age of 5, it can also impact a notable portion of adults, with an incidence rate of 1.5 per 100 individuals aged 35 to 44 years and 2.34 per 100 individuals aged 75 to 84 years.¹ Adhesive otitis media is a persistent type of middle ear inflammation in which a delicate, retracted eardrum is drawn into the middle ear and becomes firmly attached there, resulting in adhesions forming among various structures. Adhesive otitis media accounts for 3-5% of cases requiring surgical intervention for chronic otitis media. Adhesive otitis media is a significant ear-related ailment due to its potential for serious complications, including recurring infections, damage to the ear's ossicles, and the development of cholesteatoma.^{1,2}

Individuals dealing with adhesive otitis media often exhibit full or partial adhesions forming between the thin, retracted, and weakened pars tensa and the inner wall of the middle ear. Furthermore, soft tissue debris may surround the middle ear ossicles. Adhesive otitis media can manifest unilaterally or bilaterally, and it is identified by the presence of a

thick, viscous secretion resembling glue that accumulates within the middle ear, hence commonly referred to as "glue ear."³ Adhesive otitis media is a complication stemming from untreated middle ear fluid buildup caused by long-term dysfunction of the eustachian tube (ETD). This condition is triggered by negative pressure within the middle ear due to inadequate ventilation, combined with the thinning and weakening of the eardrum, known as 'myringomalacia,' and the inward pulling, leading to the development of adhesive otitis media.^{1,2}

Many patients dealing with adhesive otitis media tend to experience recurring adhesive tympanum, which poses a challenging scenario for ear specialists. The presence of air within the tympanic cavity after surgery is an indicator of a successful procedure for adhesive otitis media. Eustachian tube dysfunction serves as the primary cause of adhesive tympanum, causing a lack of air within the tympanic cavity and the formation of new adhesions due to the inward folding of the tympanic membrane.¹

Tympanoplasty is a surgical procedure aimed at eliminating middle ear ailments and restoring the auditory system, whether or not it involves the grafting of the tympanic membrane.

This surgery can be performed in conjunction with either an intact canal wall (ICW) or a canal-wall-down (CWD) mastoidectomy to eliminate issues in the mastoid region.⁴ During the 1950s, Wullstein introduced his classification system for tympanoplasty, which organized the restoration of the middle ear into five categories according to the condition of the tympanic membrane (TM) and the ossicular chain. Type I encompassed cases with a straightforward TM perforation and intact ossicles, type II restoring the TM and the middle ear when the malleus is damaged. Tympanoplasty includes the procedure of attaching a graft between the TM and the incus bone, while type V dealt with issues like stapes footplate fixation and the fenestration of the lateral semicircular canal.⁵

The primary goal of reconstructing the ossicular chain is to enhance the middle ear's ability to efficiently transmit sound energy from the external environment to the inner ear fluid, minimizing any loss. Various materials, which may be natural or biologically inert, are utilized for hearing reconstruction, such as reshaped ossicles, cartilage, cortical bone, titanium prostheses, hydroxyapatite, and synthetic plastipore. Several factors related to the patient, including the size of the perforation, condition of the ossicles, eustachian tube function, surgical approach considerations, and graft placement in conjunction with mastoidectomy, all play a crucial role in determining the success of the hearing restoration surgery.⁴

Endoscopic ear surgery (EES) offers an enhanced visual perspective of the surgical site. The illuminated distal portion of the device features angled lenses, improving the view of the operative area. By transforming the external auditory canal into a surgical conduit, EES grants a broader field of vision, advanced imaging capabilities, increased magnification, and the ability to examine previously hard-to-reach regions within the middle ear. Additionally, EES enables surgeons to adopt a minimally invasive approach in ear-related procedures. In certain instances, endoscopic tympanoplasty has been found to require less surgical time compared to procedures assisted by a microscope.³

Using autologous materials for grafting in ear surgery is a common practice due to their ready availability, biocompatibility, and cost-effectiveness, making them the preferred choice over artificial alternatives. Autologous grafts are typically derived from sources like temporal fascia or tragal/conchal perichondrium, although other options such as fascia lata, canal skin, and periosteum have also been reported. While alloplastic grafts like acellular dermal matrix and absorbable gelatin sponge offer advantages such as reduced donor site morbidity, including less pain and improved cosmetic outcomes, their cost and the risk of infectious disease transmission can be limiting factors. In practice, many otologists prefer using autologous grafts. Temporalis fascia is commonly favored over cartilage, with success rates ranging from 93% to 97% in tympanoplasty.

However, in cases requiring enhanced stability, such as recurrent perforations or high-risk patients, cartilage and perichondrium can be harvested, albeit with potential concerns about mild, low-frequency hearing loss and misidentification as cholesteatoma due to their rigidity.⁶ This research has the primary objective of thoroughly evaluating the efficacy of a specific surgical procedure known as tympanoplasty, specifically when it involves the use of homologous grafts. This research has the purpose of contributing valuable insights into the clinical application of tympanoplasty with homologous grafts, ultimately benefiting patients with ear-related conditions and potentially guiding medical practices in the field of otology.

CASE REPORT

A 47-year-old man complained that his right ear often feels wet since 3 months ago, the complaint started with a previous cold cough, intermittent and self-healing. At this time the ears still feel wet in the last 3 weeks. Currently, there are complaints of decreased hearing and no complaints of coughing colds, fever, headaches, spinning dizziness, facial expressions, ringing in the ears, and ear pain. After further examination, the patient was diagnosed with adhesive otitis media and planned tympanoplasty. Audiometric examinations before and after the procedure was carried out, the right ear threshold was 20 dB (normal) and 16.25 dB (normal) and the left ear had a hearing threshold of 75 dB (severe hearing loss) and 60 dB (moderately severe hearing loss). Tympanometry examination before and after the procedure was the ear volume of the right ear 2.0 ml and 2.4, compliance of the right ear -37 and -45, peak of the right ear 0.65 and 1.09, type of right ear A and A. Tympanometry examination results before and after the procedure were left ear volume 1.8 ml and 2.4, left ear compliance -23.4 and -35, left ear peak 0.3 and 0.51, left ear type C and A.

DISCUSSION

In adhesive otitis media, hearing loss typically occurs in isolation, developing gradually over a period of several months or even years. This hearing impairment is primarily attributed to the erosion of the ossicular chain caused by the adherent skin. Nevertheless, there are instances when ossicular chain erosion remains asymptomatic due to the attachment of the retracted eardrum to the remaining ossicles. In our cases that underwent surgery, ossicular chain erosion was identified in 55% of the operated ears, with the incus being the most commonly affected ossicle (55%), followed by the stapes (21.8%).

The management of adhesive otitis media is still controversial. Since 1950, there have been numerous surgical approaches and materials explored for reconstructing the ossicular chain; however, there remains a lack of consensus on a standardized technique or universally accepted ideal material.⁷ There are three types of prostheses utilized: homografts, autografts, and allografts.

Autograft prostheses consist of materials like cartilage (from the septum or tragus), ossicles (such as incus or malleus), and cortical bone. The advantages of autografts include a low risk of extrusion, biocompatibility, and no disease transmission risk, but there is a potential drawback in the form of the possibility of harboring microscopic disease, which could lead to recurrence. The second category involves homografts, collected from cadavers or healthy individuals, preserved in alcohol to reduce antigenicity, and later employed in ossiculoplasty. Homograft ossicles were once convenient, especially for comprehensive reconstructions of the tympanic membrane and ossicular chain. However, they were largely abandoned due to concerns about the potential transmission of viral or prion diseases. The third category encompasses allograft prostheses, readily available and pre-sculpted, crafted from synthetic materials like hydroxyapatite, such as plastipore.⁴

The study by Li et al. found that a combination of tympanoplasty and fascia grafting catheterization is an effective approach for treating adhesive otitis media. The placement of a tympanic membrane ventilation tube during the procedure did not lead to an extended period of ear dryness or postoperative recurrence. This suggests that this combined surgical approach can provide successful outcomes in the management of adhesive otitis media without the added risk of prolonged postoperative issues. The results demonstrate that a significant proportion, specifically 80%, of postoperative hearing improved to a practical level within 40 dBnHL. This underscores the effectiveness of tympanoplasty combined with fascia grafting catheterization in enhancing postoperative hearing outcomes. Moreover, this combined surgical approach offers clear advantages by not only improving hearing but also reducing the likelihood of requiring reoperation.¹

In this study, the tympanometry examinations conducted before and after the procedure revealed notable changes in both ears. In the right ear, there was an increase in ear volume from 2.0 ml to 2.4 ml after the procedure, with compliance values changing from -37 to -45. Additionally, the peak value in the right ear increased from 0.65 to 1.09, and the type remained as type A before and after the procedure. On the other hand, the left ear showed an increase in volume from 1.8 ml to 2.4 ml after the procedure, along with compliance values changing from -23.4 to -35. The peak value in the left ear increased from 0.3 to 0.51, and the type changed from type C before the procedure to type A after the procedure. These changes suggest an improvement in middle ear function following the intervention. Babu et al found that the average preoperative and postoperative pure-tone audiometry (PTA) values at the six-month mark were 53.86 ± 6.69 dB and 29.35 ± 4.91 dB, respectively. Patients who underwent type III A tympanoplasty experienced a hearing improvement of 23.16 dB, while those who had type III B tympanoplasty saw an improvement of 25 dB.⁴

In 2010, Y.M. Shen and colleagues documented their study involving 18 ears that underwent tympanoplasty using tragus cartilage. Their findings revealed a significant reduction in the air-bone gap (ABG) of more than 10 dB within one month after the procedure, with an even more substantial decrease of over 25 dB observed one year postoperatively.⁸ In 2016, Larem et al. studied 55 cases of adhesive otitis media treated with tympanoplasty, and demonstrated a notable improvement in hearing outcomes. The mean preoperative ABG was 30.4 ± 4.0 , while the postoperative mean ABG decreased significantly to 8.6 ± 6.9 . These findings underscore the effectiveness of tympanoplasty in reducing the ABG and improving hearing in individuals with adhesive otitis media, highlighting the clinical benefits of this surgical intervention.⁹

CONCLUSION

Hearing loss is a complication of chronic otitis media. Hearing loss can be corrected through tympanoplasty. There were increases in ear volume, compliance, and peak values for both ears, indicative of improved middle ear function following the tympanoplasty.

DISCLOSURE

This author reports no conflicts of interest in this work.

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