

Significance of Autogenous Graft Using Temporalis Fascia in the Management of Tympanic Membrane Defect

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Abstract

Introduction: Myringoplasty is a surgical treatment used to repair perforations in the tympanic membrane, which improves hearing, keeps the ear dry, and lessens an individual's susceptibility to ear infections. Depending on whether the graft is placed medially or laterally on the remains of the tympanic membrane, myringoplasty can be performed using the underlay or overlay approach. Myringoplasties utilizing temporalis fascia, vascular grafts, cartilage, and perichondrium have a success rate of 81–91% in the literature.

Aims and Objectives: To find out the efficacy of using autogenous graft extracted from temporalis fascia in the management of tympanic membrane defect.

Methods: This prospective study was conducted on 50 patients with chronic suppurative otitis media. All cases underwent standard tests, including pure tone audiograms (PTAs) to evaluate preoperative hearing loss and X-rays of the paranasal sinuses and mastoids. Temporalis fascia was most frequently harvested by extending a post-aural Wilde/end aural Lempert incision and was used to create cast. The graft was then reintroduced and the malleus handle passed through the slit which anchors the graft and prevents subsequent medial or lateral displacement. The elevated vascular strip and elevated skin of canal were repositioned. After 3 months of surgery, the follow up was done to evaluate the status of the graft.

Results: Most patients had a small to a moderately sized central hole that was unilateral. The sclerotic type of mastoid is the most prevalent, and the average preoperative air-bone gap (AB gap) is 23.12. All the patients were approached by postural route only. The study found that the VG (72%) and TFG (92%) are both intact in first 3 months. AB gap post-operatively is 64% in the VG group and 60% in the TFG group.

Conclusion: The study concluded that that fascia form graft technique is the technique of choice in large tympanic membrane perforations. Anatomic and functional results are significantly positive and the postoperative complications are minimal.

Keywords: Graft, Tympanic Membrane Defect, Temporalis Fascia.

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Introduction

Human skeletons from ancient times have been found to contain signs of chronic otitis media (COM) [1]. It is one of the most prevalent illnesses in otorhinolaryngology practice that requires medical attention, especially in children from low socioeconomic backgrounds who have previously had insufficient treatment and careless medical attention [2]. A panel at the "Seventh Following Symposium Research Conference of the International Symposium on Recent Advances in Otitis Media" stated that otorrhea lasting at least six weeks while having a perforation in the tympanic membrane (TM) is what is considered chronic otitis media [3].

Through the ossicular chain, an undamaged tympanic membrane sends vibrations from its whole surface to the footplate of the stapes. It additionally guards against infection and serves as a shield for the round window niche, which aids in generating a phase difference during the transmission of sound waves through the middle ear. In COM, perforation happens, affecting at least 0.5% of the population. Ossicular coupling is reduced due to perforation because the large sound pressure differential across the TM is lost [4,5].

There is typically a rise in air propagation threshold and normal bone conductivity thresholds in patients with COM who have hearing loss. The size and location of the tympanic defect, impairment of the ossicular chain, and middle ear status that affect the sound conduction mechanism are all factors that affect the kind and degree of deafness [6,7]. While many authors hold the view that the location of the hole is related to the degree of hearing loss, few have also noted that there is no real connection. Because of additional clinical alterations in the middle ear, it is difficult to correlate the effects of tympanic membrane perforation on sound transmission and its dynamics [8,9].

Myringoplasty is a surgical treatment used to repair perforations in the tympanic membrane, which improves hearing, keeps the ear dry, and lessens an individual's susceptibility to ear infections. Depending on whether the graft is placed medially or laterally on the remains of the tympanic membrane, myringoplasty can be performed using the underlay or overlay approach [10,11]. Myringoplasty success is often measured in terms of hearing improvement and perforation healing. Shea provided the initial description of myringoplasty using vein grafts. The first person to do a myringoplasty using temporalis fascia was Heerman. Since that time, myringoplasty surgery has advanced significantly, adopting numerous graft materials and procedures to repair perforations in the tympanic membrane [12-15].

Even though there are many various types of procedures and graft materials employed, a review of the literature does not prove conclusively that one approach is better than another. Myringoplasties utilizing temporalis fascia, vascular grafts, cartilage, and perichondrium have a success rate of 81–91% in the literature. Conflicting reports assert that one approach is preferable to the other [16].

Materials and methods

Study design

This is prospective study study was conducted on 50 patients with chronic suppurative otitis media of inactive tubotympanic type having small to moderate size central perforations from August 2021 to July 2022. All cases underwent standard tests, including pure tone audiograms (PTAs) to evaluate preoperative hearing loss and X-rays of the paranasal sinuses and mastoids (Law's view). For grafting, anaesthesia was done with xylocaine 2% with 1:200000 adrenaline, a classic quadratic injection

was made into external auditory meatus with 26 no. gauge needle. Temporalis fascia was most frequently harvested by extending a post aural Wilde incision. This cast was used to create temporal fascia fasciaform mold. Correct fitting correlates directly to the quality of the impression. Impression should be carried out using minimum force over a gelfoam or soft cotton pack in middle ear. This does not need any 'setting time'. Finally, the impression was removed from the ear and checked under operating microscope to correct and convert its negative contours to positive shape and appearance. The fascia was placed on special fasciaform moulds that are shaped like positive casts of tympanic membrane and medial external auditory canal and kept for drying. For overlay technique, a vascular strip was created in the external auditory canal by making incisions at tympano-squamosal and tympano-mastoid suture lines. The graft was introduced into its correct anatomical position and marked with a methylene blue dot on its lateral surface opposite the midpoint of the malleus handle. It was then removed and a slit was cut over the mark. The graft was then reintroduced and the malleus handle passed through the slit which anchors the graft and prevents subsequent medial or lateral displacement. The elevated vascular strip and elevated skin of canal were repositioned. Canal was then packed with gel foam soaked in antibiotic ointment. Wound closed in layers and tight mastoid dressing was given.

After 3 months of surgery, the follow up was done to evaluate the status of the graft, improvement in hearing, mean air-borne gap, post-operative air-borne gap and failure in graft status. This is the outcome assessment.

Inclusion and exclusion criteria

Patients who came to the outpatient department of our hospital who follow the study protocol and give informed consent for the study are included. Patients who provide informed consent for the study are included in the study. Of the total 50 patients included in the study.

Patients who did not follow the study protocol did not finish it, or did not provide consent were not included in the study. The study excluded patients with tympanosclerosis, significant tympanic membrane perforations, actively discharged ears, sensory neural or mixed hearing loss, attico-antral types of CSOM, and those with residual disease or recurrent perforation.

Statistical Analysis

Data entry and analysis were done using MS Excel software. The continuous data was expressed as mean \pm standard deviation while the discrete data was expressed as count and its respective percentage.

Ethical Approval

The patients were given a thorough explanation of the study by the authors. The patients' permissions have been gotten. The concerned hospital's ethical committee has accepted the study's methodology.

Results

The patients are divided equally among both the group vein graft (VG) and temporalis fascia graft (TFG). The most frequent presenting symptom was ear discharge and hearing loss (Table 1). Most patients had a small to a moderately sized central hole that was unilateral. The sclerotic type of mastoid is the most prevalent, and the average preoperative air-bone gap (AB gap) is 23.12

Table 1: Preoperative air-bone (AB) gap, damaged ear and X-ray findings for the mastoid before the surgical intervention

Findings	Vein graft group N=25		Temporalis Fascia Graft group N=25	
	Hearing loss	8	32	7
Discharge from ear	13	52	11	44
Earache	3	12	4	16
Ear affected (tympanic membrane perforation)				
Left	9	36	7	28
Right	13	52	14	56
Bilateral	3	12	4	6
Type of mastoid seen on the x-ray of operated ear				
Cellular	3	12	3	12
Sclerotic	17	68	16	64
Diploic	6	24	7	28
Pre-operative AB gap (dB)				
Maximum	43		41	
Minimum	11		9	
Mean	23.12		22.01	
Pre-operative AB gap range				
<25	15	60	16	64
25-40	6	24	8	32
>40	2	8	1	4

All the patients were approached by postural route only. Table 2 shows after 3 months from surgery, it was found that "Vein graft" group had 28% failure while

"Temporalis Fascia Graft" group had 8% failure. The study found that 72% of patients in VG and 92% of patients in TFG group are both intact in first 3 months.

Table 2: grafts status in the postoperative follow-up

Follow-up period	Vein graft group N=25		Temporalis Fascia Graft group N=25	
	Intact n (%)	Failure n (%)	Intact n (%)	Failure n (%)
14th day	25 (100)	0 (0)	25 (100)	0 (0)
1st month	25 (100)	3 (12)	25 (100)	0 (0)
3rd month	18 (72)	7 (28)	23 (92)	2 (8)

Post-operative AB gap <10 db is 64% in the VG group and 60% in the TFG group while 32% had more than 10 db post-operative AB gap in VG group and 40% in

TFG group. Other findings of post-operative outcome in hearing, mean air-borne gap, post-operative air-borne gap have been shown in Table 3 below.

Table 3: shows post-operative improvement in hearing, mean air-borne gap, post-operative air-borne gap

Post-operative variable	Vein Graft (VG) group N=25		Temporalis Fascia Graft (TFG) group N=25	
	Number	%	Number	%
Post-operative AB gap				
< 10 dB	16	64	15	60
>10 dB	8	32	10	40
Study groups				
Post-operative AB gap dB (1)	22.98		22.34	
Post-operative AB gap at 1 st month (dB)	11.67		11.45	
Post-operative AB gap at 3 rd month (dB) (2)	6.8		5.8	
Post-operative AB gap 1-2 (AB)	16.45		15.56	

Discussion

Myringoplasty reduces the risk of infection while improving or restoring the patient's hearing. The tragal perichondrium, vein, and temporalis fascia are often used graft materials. Both the overlay technique and the underlay technique can be used to perform myringoplasty. Only post-aural technique approach was used to implement the underlay method. Shea, who invented VG, cautioned against using it if the defect in the tympanic membrane took up more than 40.2% of its surface area. Using a vascular transplant to close a big perforation is challenging or impossible (VG). When VG was used to patch up significant tympanic membrane perforations, the failure rate was considerable [17,18].

Tympanic membrane repair (myringoplasty) can help restore normal middle ear function, fight infection, and restore normal hearing. Due to their simple body acceptance, autogenous graft materials are the most frequently employed graft materials in myringoplasty. For patients with tubo-tympanic dry perforation, a study was done to assess the effectiveness of temporalis fascia graft with fascia lata graft in myringoplasty. According to the survey, using temporalis fascia rather than a fascia lata graft is still the best and most reliable method of myringoplasty. Fascia lata, however, can be an excellent substitute for temporalis fascia, particularly in situations involving

revision myringoplasty, ears with significant perforation, or ears with nearly total perforation, where there is a high risk of residual perforation due to the small margin of the remaining tympanic membrane that overlaps the graft [19,20].

Surgery is a problem in treating anterior tympanic membrane perforations. The study's goal is to evaluate and contrast the outcomes of endoscopic composite cartilage perichondrium island (CCPI) and temporalis fascia grafts for anterior quadrant holes. The study finds that, despite the expertise needed for endoscopic ear procedures, the endoscopic composite cartilage perichondrium island graft is a useful approach for treating anterior quadrant holes [21-23].

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There is typically no residual tympanic membrane left behind from patients who need an operation for chronic otitis media with rupture and cholesteatoma that can be used for grafting treatments. Total

tympanic membrane reconstruction (TTMR), a unique procedure, is described that, in these circumstances, maximizes perforation closure rate while minimizing mucosalization, partial healing, and anterior blunting. The report's specific goal is to evaluate the safety and effectiveness of TTMR and to compare the outcomes with AlloDerm against temporalis fascia as a grafting material. 92.5% of perforations were closed overall. When grafting with AlloDerm against temporalis fascia, the closure rate showed no statistically significant difference. With AlloDerm grafting, a statistically significant reduction in healing time was seen. The study finds that TTMR is a very safe and effective technology[24,25,26].

Conclusion

The study concluded that that fasciaform temporalis graft technique is the technique of choice in all tympanic membrane perforations. The removal of epithelium on the medial surface of the tympanic remnant is essentially ensured. Complications have been minimal. The benefits of temporalis fascia include ease of harvest from same surgical incision, availability of large amount of graft and high graft take up rates.

Hence, we conclude that this technique is a solution, and has a required merit, and application of the above suggested algorithm has solved successfully most of the problems faced in treating the total and high risk tympanic membrane perforations.

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