

Nasal septal cartilage allograft for myringoplasty – Our observations

Siva Subba Rao Pakanati¹, Uma Pokala^{2*}

¹Associate Professor, ²Assistant Professor, Department of ENT, Mamata Medical College, Khammam, Telangana, INDIA.

Email: pakanati.sivasubbarao@gmail.com

Abstract

Aim: The purpose of the study was to analyze the morphological and functional outcomes in a series of 54 patients for whom type 1 tympanoplasty or myringoplasty was done using alcohol preserved nasal septal cartilage allograft through permeal route. **Materials and Methods:** The study was a prospective study of 54 patients between August 2015 and January 2017. Patients were operated under microscope through permeal route. 70% ethyl alcohol preserved allogenic nasal septal cartilage with thickness of around 0.5 mm was used for grafting. At the end of 3 months final assessment of morphological outcome i.e. intact tympanic membrane [TM] and functional outcome i.e. reduction in airborne gap [ABG] was done. **Results:** At the end of 3 months 51 patients [94.44%] had intact tympanic membrane, 49 patients [90.74%] had airborne gap less than 20 dB. The operative time taken for taken for 37 patients [68.51%] was 30 – 45 min. 38 patients [70.37%] had returned to normal activity in 3 – 5 days. **Conclusion:** Allogenic nasal septal cartilage can be safely and effectively used for myringoplasty with good morphological and audiological results with benefits of reduced operating time, morbidity and no scar.

Key Words: Myringoplasty, Type 1 tympanoplasty, Nasal septal cartilage, Allograft.

* Address for Correspondence:

Dr Uma Pokala, Assistant Professor, Department of ENT, Mamata Medical College, Khammam, Telangana, INDIA.

Email: naveenpokala@yahoo.com

Received Date: 14/12/2017 Revised Date: 10/01/2018 Accepted Date: 15/02/2018

DOI: <https://doi.org/10.26611/1016524>

Access this article online

Quick Response Code:



Website:

www.medpulse.in

Accessed Date:
19 February 2018

INTRODUCTION

Different types of graft materials have been tried to repair the tympanic membrane [TM] since tympanoplasty was introduced by Wullstein¹ and Zoellner². The various types of materials for closure of TM perforations like skin³, perichondrium^{4,5} vein⁶, temporalis fascia⁷, dura⁸ and cartilage⁹⁻¹² have been tried by otorhinolaryngologists. Temporalis fascia remains the most commonly used material for tympanic membrane reconstruction with a success rate of 93 – 97% in primary tympanoplasties¹³. Even in hands of experts, failures occur as fascia and perichondrium have been shown to undergo atrophy and

subsequent failure in postoperative period regardless of placement technique¹⁴⁻¹⁷. These observations revived the interest in cartilage as grafting material, as cartilage is more compliant and stiff preventing the retraction and resorption of neotympanic membrane in postoperative period. There has been an increase in the use of cartilage tympanoplasty by surgeons reporting improved outcomes when compared with temporalis fascia used alone¹⁸. Cartilage was first introduced in middle ear surgery and has been described for the limited management of retraction pocket¹⁹⁻²⁴ and more recently, for reconstruction of TM in cases of recurrent perforation with encouraging results. Despite the thickness of the grafts the hearing results appeared to be good²⁵⁻²⁶. In our study we used 70% ethyl alcohol preserved nasal septal cartilage allograft as graft for tympanoplasty.

MATERIALS AND METHODS

This study was conducted in the department of Otorhinolaryngology, Mamata Medical college, Khammam, Telangana State, from August 2015 – January 2017. All patients presenting in ENT OPD with complaints of ear discharge and decreased hearing were examined. In a period of 18 months 120 patients were

screened but based on inclusion criteria 54 patients were selected for the study. Patients of both sex equal to and more than 10 years of age with small to large central perforations, dry perforations, good cochlear reserve and willing for surgery, regular follow up have been included in this study. Patients with subtotal, total perforations, unsafe ears, otitis externa, uncontrolled Diabetes mellitus, URTI have been excluded from this study. Size of perforation was recorded according to the number of quadrants involved. Pure tone audiometry [PTA] was done and their hearing loss, airborne gap [ABG] were recorded preoperatively and 3 months after the surgery. All the patients were operated under microscope through permeal route. 70% ethyl alcohol preserved allogeneous nasal septal cartilage with thickness of around 0.5 mm was used for grafting Patients under 15 years of age were operated under general anaesthesia and patients of age 15 years and above were operated under local anaesthesia with IV sedation in the presence of senior anaesthetist. Patient placed in supine position with head turned to opposite side. Local infiltration of 2% lignocaine solution with 1: 1,00, 000 adrenaline was used for all patients irrespective of local or general anaesthesia. 0.5ml of anaesthetic was infiltrated in each four quadrants of external auditory canal at 3, 6, 9, 12 O' clock positions. Post aural region and incisura terminalis were also infiltrated. Under microscope the edges of the perforations were freshened with curved pick. Canal incision was made 6 mm lateral to the tympanic annulus from 1-4 O' clock for right ear and 11-8 O' clock for the left ear with a circular knife. The tympanomeatal flap was elevated and raised superiorly. Ossicular mobility was checked. A single piece of 70% ethyl alcohol preserved allogeneous nasal septal cartilage was taken and sliced to 0.5 mm thickness for grafting. Diameter of cartilage was kept slightly more than perforation. The cartilage graft was placed by underlay technique above the handle of malleus after keeping the gelfoam in the middle ear cavity. Tympanomeatal flap was replaced and gelfoam was kept in the external auditory canal. All patients were followed up for 3 months. At the end of 3 months, final assessment of morphological outcome i. e. intact tympanic membrane was done by visualisation with 0 degree endoscope in OPD. Functional outcome was measured with pure tone audiometry at 3 months, was compared with preoperative PTA records. An intact mobile TM at the end of 3 months with airborne gap less than 20 dB was taken as a successful outcome.

RESULTS

The male to female ratio in our study was 1.25 : 1 [30 male, 24 female]. The age distribution ranged from 13-60 years and maximum patients were in 3rd decade. Most of

the patients had medium size perforations. 10% of patients had bilateral perforations. The operative time taken by most of the patients [68.51%] was 30 – 45 min [Table 1]. In rest of the patients [31.48%] surgery got over by 60 min. None of the surgery took more than 1 hour. 38 patients [70.37%] returned to the normal activity within 3-5 days [Table 2]. 4 patients [7.40%] returned to normal activity within 3 days of the surgery. 12 patients [22.22%] returned to normal activity in 8 days. At the end of 3 months 51 patients [94.44%] had intact tympanic membrane and 3 patients [5.55%] had residual perforations [Table 3]. At the end of 3 months postoperatively 49 patients [90.74%] had airborne gap less than 20 dB [Table 4].

Table 1: Operative time [n = 54]

Operative time [minutes]	Number of cases	Percentage [%]
30 – 45 min	37	68.51
45 – 60 min	17	31.48
60 – 90 min	0	0

Table 2: Return to normal activity [n = 54]

Return to normal activity [Days]	Number of cases	Percentage [%]
< 3 days	4	7.40
3 – 5 days	38	70.37
6 – 8 days	12	22.22

Table 3: Morphological outcome [n = 54]

Morphological outcome [at the end of 3 months]	Number of cases	Percentage [%]
Intact tympanic membrane	51	94.44
Residual perforation	3	5.55

Table 4: Functional outcome - PTA results [n = 54]

Airbone gap [dB]	Number of Preoperative cases	Number of postoperative cases
0 – 10	0 [0%]	22 [40.74%]
11 – 20	20 [37.03%]	27 [50%]
21 – 30	30 [55.55%]	5 [9.25%]
31 – 40	4 [7.40%]	0 [0%]

DISCUSSION

Otologists have been venturing for newer graft materials in view of failures of temporalis fascia in tympanoplasty. Causes of tympanoplasty failure using a temporalis fascia graft include tympanosclerosis large central perforation, pathology of malleus handle, anterior perforation, tobacco smoke exposure and bilateral disease. Since the temporalis fascia is composed of irregularly arranged elastic fibres and fibrous connective tissue, the postoperative dimensions of the graft are usually unpredictable. A more rigid more compliant, retraction

resistant graft material is being searched. The rigidity and stiffness of cartilage resists retraction of tympanic membrane resulting in better morphological outcome. However various studies have shown that it does not dampen the acoustic transfer of sound. Thus hearing improvement is not adversely affected and is comparable with that of temporalis fascia. A comparative study performed by Gerber *et al.*²⁵ in which cartilage was compared to fascia in frequency specific manner and no significant difference was seen with graft uptake of 100%. Duckert *et al.*²⁷ reported 97% graft take up with cartilage and excellent hearing results. Amadee *et al.*²⁸ reported on 52 cases of cartilage tympanoplasty of which 18% were type 1 in which postoperative ABG was 4 dB, with TM closure in all patients. Adkins reported 55 cases of cartilage tympanoplasties for retraction with postop ABG of less than 10 dB and TM closure in all patients²⁴. In our study 94.44% patients had positive morphological outcome 90.74% patients had ABG less than 20 dB, which is comparable with temporalis fascia graft tympanoplasty. In our study we have used a single cartilage disk of 0.5mm and placed it by underlay technique. Zahnert *et al.*²⁹ demonstrated that ideal acoustic thickness of cartilage should be about 0.5 mm compared to the full thickness harvest of 0.7 – 1 mm. Allograft is tissue transplanted between genetically non identical members of the same species e.g. cadaveric tympanic membrane graft, septal cartilage graft. Various methods have been used for preservation of graft materials like 70% ethyl alcohol, 0.02% aqueous cialit, 4% buffered formaldehyde fixation and 0.5% buffered formaldehyde preservation etc. Allogeneous nasal septal cartilage was introduced by Jansen [1963] for ossiculoplasty. Kerr *et al.*³⁰ studied nasal septal cartilage allografts [alcohol preserved] for middle ear reconstruction and concluded that in most of the grafts, morphology of the graft was maintained. According to Froot Ko the immune rejection responses to allograft tissue across major histocompatibility barriers are muted in deep external auditory canal and middle ear. These sites are immunologically privileged sites, favourable for graft acceptance. Preservation of otological allograft makes them less susceptible for rejection, by altering the molecular configuration of antigenic determinants. This appears to diminish the graft's ability to immunize the recipient but does not alter their specificity. Use of preserved allograft reduced our operative time considerably. It avoids the time taken for harvesting temporalis fascia graft.

CONCLUSION

Allograft nasal septal cartilage can be safely and effectively used for type 1 tympanoplasty or

myringoplasty with benefits of reduced operating time, morbidity, pain and no scar.

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Source of Support: None Declared
Conflict of Interest: None Declared

