International Journal of Otorhinolaryngology and Head and Neck Surgery
Tyagi BS et al. Int J Otorhinolaryngol Head Neck Surg. 2017 Jan;3(1):91-94
http://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937

Original Research Article

DOI: http://dx.doi.org/10.18203/issn.2454-5929.ijohns20164807

Is cartilage- perichondrium composite graft tympanoplasty the ideal treatment for revision tympanoplasty

Brajpal Singh Tyagi[1]*, Sushant Tyagi[1], Mohit Srivastava[2], Amit Tyagi[1]

[1]Department of ENT, Harsh ENT Hospital, Rajnagar, Ghaziabad, UP, India
[2]Department of ENT, SIIMS, Ghaziabad, UP, India

Received: 23 September 2016
Accepted: 08 November 2016

***Correspondence:**
Dr. Brajpal Singh Tyagi,
E-mail: brajpaltyagi@gmail.com

ABSTRACT

Background: The objective of the study was to evaluate the anatomical and audiological outcomes of cartilage-perichondrium composite graft tympanoplasty by underlay technique in revision tympanoplasties.
Methods: A series of 55 patients who underwent revision tympanoplasty with cartilage-perichondrium composite Island graft, at the department of Otorhinolaryngology, Harsh ENT Hospital, Ghaziabad. Tympanoplasty with cartilage-perichondrium composite island graft was done using underlay technique after slicing the cartilage with help of slicer. Ossiculoplasty was performed as and when needed.
Results: Graft uptake rate was found to be 96.36% (53 of the 55 cases) in our study without any serious complications. Audiological outcomes with closure of 94.55% air bone gap within 0 to 30 dB was achieved ($p < 0.05$).
Conclusions: Nearly 97% success rate can be achieved with cartilage-perichondrium composite graft tympanoplasty for Revision tympanoplasty.

Keywords: CSOM, Revision tympanoplasty, Cartilage-perichondrium- composite graft

INTRODUCTION

Tympanoplasty has undergone tremendous evolution since it was first described by by Wullstein in 1952 and Zoellner in 1955.[1,2] Over the decades various autologus (temporalis fascia, fascia lata, periosteum, peri-chondrium, cartilage with or without peri-chondrium, veins, fatty tissue, and skin) and homologus (dura mater, pericardium, cartilage, amniotic membrane, skin, cornea, peritoneum, veins, and aortic valve) grafting materials and techniques were used in tympanoplasty operations.[3] Temporalis fascia remains the most commonly used material for tympanic membrane reconstruction, with a success rate of 93% to 97% in primary tympanoplasties.[4] In high risk situations such as the subtotal perforation, atelectatic ear, cholestetoma, and revision tympanoplasty, the results have not been found to be commendable. In these situations, fascia and perichondrium have shown to undergo atrophy and subsequent failure in post-operative period.[5] Heerman claimed to have used the cartilage palisade technique for middle ear and mastoid cavity reconstruction since 1960, in over 13,000 cases. Reconstruction of tympanic membrane with cartilage counteracts the tendency to retraction of soft autologus materials like temporalis fascia or perichondrium. Because of its low turn-over rate, cartilage is more resistant to infection.[6]

METHODS

55 patients who underwent revision tympanoplasty were taken from the department of Otorhinolaryngology, Harsh ENT Hospital, Ghaziabad. Data were collected from the record section and analysed in various aspects. A retrospective chart review was performed of all patients who underwent cartilage composite graft revision tympanoplasty. All the cases were thoroughly examined and investigated before taking them for surgery, findings

were recorded in the proforma. A detailed history regarding presenting complaints, history of present illness, past history and family history was taken.

A detailed otologic examination was performed. The amount, colour, consistency, smell and other characteristics of the discharge were noted. Tympanic membrane was examined for perforation, retraction pocket, granulation, cholesteatoma and polyp. The condition of middle ear mucosa and ossicular status was noted. Tuning fork test- Rinne, Weber and Absolute bone conduction tests carried out using 256, 512, 1024 Hz tuning fork. X-ray Mastoid done to assess the cellularity of mastoid bone and to rule out presence of cavity. The presence of dural plate and sinus plate was noted. Computed Tomography scanning was performed in selected cases which had doubt about the presence of cholesteatoma. Tympanoplasty was done on patients who had chronic suppurative otitis media with recurrent perforation of tympanic membrane and a preoperative conductive deafness. In adult, tympanoplasty was done in local anesthesia while in children general anesthesia was preferred. Tympanoplasty with cartilage-perichondrium composite island graft was done using underlay technique after slicing the cartilage with help of cartilage slicer. Ossiculoplasty was performed as and when needed.

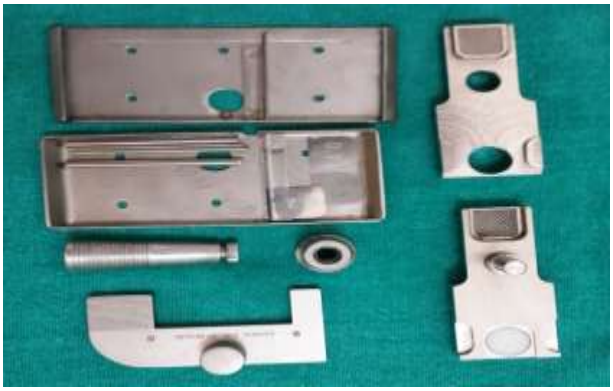

Figure 1: Cartilage slicer.

Figure 2: Composite island graft.

Postoperatively patients were kept on broad-spectrum I.V antibiotic, systemic decongestants, analgesics and vitamins. Patients were advised to keep the operated ear up, avoid forceful blowing of their nose, jerky and sudden movements of head and avoid water over dressing. Mastoid dressing was removed on 8th postoperative day. Patient was thoroughly instructed to follow all precautions and to come immediately on follow-up in case of any discomfort and URTI.

Figure 3: Postoperative photograph.

The observations were recorded on 3months, 6 months and 9 months follow-up. Postoperative pure tone audiometery was done after 6 months. Postoperative photographs were taken with video-otoendoscopy on subsequent postoperative OPD visits.

RESULTS

The study comprised of 55 patients, of which 32 were male and 23 were females. The age of the patients varied from 9 to 58 years. All the patients underwent revision tympanoplasty with cartilage-perichondrium composite island graft, done using underlay technique after slicing the cartilage with help of cartilage slicer. Ossiculoplasty was performed as and when needed.

Table 1: Number of patients underwent tympanoplasty.

Total revision tympanoplasty	No of up-take	No of no-take
55	53	2

Postoperative pure tone audiometry was done at 6 months after surgery. Closure of air-bone gap in different types of tympanoplasty was recorded and documented and compared with preopeartive pure tone audiograms.

After a postoperative period of 6 months on re-evaluating the hearing profile of the patients we found that 18 cases (32.72%) achieved excellent post-op hearing results, 20 cases (36.36%) achieved comparatively good hearing level and 14 cases (25.45%) achieved moderately better hearing level as compared to their pre-operative hearing levels. Audiological outcomes with closure of 94.55% air bone gap within 0 to 30 dB was achieved ($p < 0.05$).

Table 2: AB gap closure in different types of tympanoplasty (after 6 months postoperative).

Air bone gap closure (AB)	Type I		Type II		Type III		Type IV	
	No.	%	No.	%	No.	%	No.	%
0 – 10	12	46.15	3	21.42	2	18.18	1	25.00
11 – 20	8	30.76	7	50.00	3	27.27	2	50.00
21 – 30	5	19.23	2	14.28	6	54.54	1	25.00
> 30	1	3.84	2	14.28	-	-	-	-

Table 3: Overall air bone gap closure in dB.

AB gap closure	Number of Cases	Percentage
0 – 10	**18**	**32.72**
11 – 20	**20**	**36.36**
21 – 30	**14**	**25.45**
> 30	**3**	**5.45**

DISCUSSION

In this study male cases (58.18%) were found to be more than female (41.82%) cases. Deafness (94.18%) was the most common complaint followed by Otorrhea (90.72%). In this series 58.72% were having central perforation on otoscopy and 26.9% cases were having subtotal perforation, 10.81% were having total perforation on otoscopy. Patients presenting with granulations/ cholesteatoma, were excluded from the study. In the present study middle ear mucosa was found normal in 60.9% cases and it was found fibrosed in 26.36%. Most of the cases (76.63%) have a moderate degree of conductive deafness.

In our study 16.90% patients were having AB gap level <30 dB, 32.81% patients were having AB gap level 31-40 dB, 36.81% were having AB gap level 41-50 dB and 13.48% patients were having AB gap level >50 dB found by recording hearing threshold of air and bone conduction at the frequencies of 500, 1000, 2000 and 3000 Hz.

Temporal muscle fascia has been the most commonly used graft material for tympanoplasty surgery, and the success rate is nearly 90% for closure of the tympanic membrane. Causes of tympanoplasty failure using a temporal muscle fascia graft included severe ear pathologies, pathology of the malleus handle and stapes arch revision surgery, atelectasis, cholesteatoma, tympanosclerosis, large (>50% of total tympanic membrane diameter) and anterior perforations, tobacco smoke exposure, perforation drainage during surgery, and bilateral disease.[12]

All the patients underwent revision tympanoplasty with cartilage-perichondrium composite island graft, done using underlay technique after slicing the cartilage with help of cartilage slicer. Ossiculoplasty was performed as and when needed. Type I tympanoplasty was done in maximum number (47.27%) of cases, type II tympanoplasty was done in 25.45% cases and type III tympanoplasty in 20.0% cases. Type IV tympanoplasty was done in 7.27% cases. In our study, graft up-take rate was 96.36% (53 of the 55 cases).

Table 4: Take up rate and hearing results of various authors in cases of tympanic membrane perforation closure done by using various grafts materials.

Authors	Graft used	Take up in %	Hearing results
Khan et al [13]	Shield-sliced tragal cartilage-perichondrium	97.67%	Air bone gap < 30 dB
Sismanis et al [14]	Revision cartilage tympanoplasty	93.5%	Air bone gap < 30 dB
Neuman et al [5]	Cartilage palisade	100%	Air bone gap < 30 dB
H.Chopra et al [9]	Temporalis fascia with anterior tucking	95%	Air bone gap < 30 dB
Dornhoffer et al [8]	Cartilage palisade	100%	Air bone gap < 20 dB
Ioanis Adonis et al [10]	Cartilage graft	98.4%	Air bone gap < 20 dB
K.Desarda et al [11]	Cartilage graft	96%	Air bone gap < 20 dB
Our study	Cartilage-perichondrium composite graft	96.36%	Air bone gap <30 dB

In this study 94.55% cases were found to have closure of air bone gap within 0 to 30 dB , 32.72% within 10 dB and 36.36% within 20dB and 25.45% had closure within 30db, 5.45% cases had >30 dB hearing gap. The main advantage of the cartilage graft has been thought to be its very low metabolic rate. It receives its nutrients by diffusion, is easy to work with because it is pliable, and it can resist deformation from pressure variations.[6] The perceived disadvantage of the cartilage graft is that it creates an opaque tympanic membrane, which could potentially hide a residual cholesteatoma.[7]

The results of our study were found to be comparable with other studies done by various authors. Neumann et al reported a graft take rate of 100% in their palisade cartilage tympanoplasty study, and they did not observe resorption or recurrent defects of the rebuilt tympanic membrane.[5] Khan et al used a shield-sliced tragal

cartilage-perichondrium composite graft, and their success rate was 97.67%.[13] Sismanis et al reported their revision tympanoplasty cases, and their success rate was 93.5%.[14] Dornhoffer et al, also reported 100% uptake rate.[8] Adonis et al found in their study a graft uptake rate of 98.4%.[10] Chopra et al and Desarda et al found an uptake rate of 95% and 96% respectively.[9,11] Authors have suggested that cartilage tympanoplasty provides sufficient structural stability during times of negative middle ear pressure and readily resists continued eustachian tube dysfunction.[15] Since its introduction approximately 50 years ago, cartilage tympanoplasty has been used in many challenging circumstances. The use of cartilage in cases of cholesteatoma and retraction has been known to give good results. Many authors have advocated its use in cases of recurrent perforations, bilateral perforations, and craniofacial abnormalities predisposing to eustachian tube dysfunction.[16]

CONCLUSION

Cartilage-perichondrium composite graft tympanoplasty is an effective procedure for all types of revision tympanoplasty patients. It provides better graft up-take and hearing results. The postoperative closure rate of tympanic membrane perforations was significantly high and the audiologic improvement was socially acceptable and satisfactory with cartilage-perichondrium composite graft. Hence we can conclude that cartilage-perichondrium composite graft can be preferred in reconstruction of persistent tympanic membrane perforation because of its more rigid, and more resorption-resistant and retraction-resistant nature. It gives excellent result and success rate and the procedure is very effective in cases of recurrent perforations, total perforations, atelectasis and revision tympanoplasties.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Wullstein HL. Functional operations in the middle ear with split thickness skin graft. Arch Otorhinolaryngol. 1953;161:422-35.
2. Zoellner F. The principles of plastic surgery of the sound conducting apparatus. J Laryngol Otol. 1955;69:567-9.
3. Lee JC, Lee SR, Nam JK, Lee TH, Kwon JK. Comparison of different grafting techniques in type I tympanoplasty in cases of significant middle ear granulation. Otol Neurotol. 2012;33:586-90.
4. Sheehy JL, Anderson RG. Myringoplasty. A review of 472 cases. Ann Otol Rhinol Laryngol. 1980;89:331-4.
5. Neumann A, Schultz-Coulon HJ, Jahnke K. Type III tympanoplasty applying the palisade cartilage technique: a study of 61 cases. Otol Neurotol. 2003;24(1):33-7.
6. Yung M. Cartilage Tympanoplasty: Literature Review. J Laryngol Otol. 2008;122:663-72.
7. Ghanem MA, Monroy A, Alizadeh FS, Nicolau Y, Eavey RD. Butterfly Cartilage Graft Inlay Tympanoplasty for Large Perforations. Laryngoscope. 2006;116:1813-6.
8. Dornhoffer JL. Cartilage Tympanoplasty: Indications, techniques, and outcomes In a 1000 patient series. Laryngoscope. 2003;113:1844-56.
9. Chopra H, Chopra V. Technique of anterior tucking of graft in tympanoplasty. Indian J Otolaryngol. 2001;7:167-70.
10. Aidonis I, Robertson TC. Sismanis A. Cartilage shield tympanoplasty: A Reliable technique. Otol Neurol. 2005;26:838-41.
11. Desarda KK, Bhisegaonkar DA, Gill S. Tragal perichondrium and cartilage in tympanoplasty. Indian J Otolaryngol Head & Neck Surg. 2005;57:9-12.
12. Yurttas V, Yakut F, Kutluhan A, Bozdemir K. Preparation and placement of cartilage island graft in tympanoplasty. Brazilian J Otorhinolaryngol. 2014;80(6):522–6.
13. Khan MM, Parab SR. Primary cartilage tympanoplasty: our technique and results. Am J Otolaryngol. 2011;32:381–7.
14. Sismanis A, Dodson K, Kyrodimos E. Cartilage “shield” grafts in revision tympanoplasty. Otol Neurotol. 2008;29:330–3.
15. Altuna X, Navarro JJ, Algaba J. Island cartilage tympanoplasty in revision cases: anatomic and functional results. Eur Arch Otorhinolaryngol. 2012;269:2169–72.
16. Boone RT, Gardner EK, Dornhoffer JL. Success of Cartilage Grafting in Revision Tympanoplasty Without Mastoidectomy. Otology & Neurotology. 2004;25:678–81.

Cite this article as: Tyagi BS, Tyagi S, Srivastava M, Tyagi A. Is cartilage- perichondrium composite graft tympanoplasty the ideal treatment for revision tympanoplasty. Int J Otorhinolaryngol Head Neck Surg 2017;3:91-4.