

A COMPARATIVE STUDY OF TYMPANOPLASTY USING SLICED CARTILAGE GRAFT VS. TEMPORALIS FASCIA GRAFT

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ABSTRACT

BACKGROUND

The objective of the study was to compare the hearing improvement after using sliced cartilage graft with that of temporalis fascia and to compare the graft take-up between the two graft materials.

MATERIALS AND METHODS

A prospective clinical study including 60 patients with chronic mucosal otitis media, who were selected randomly from the outpatient department, after obtaining their consent were divided into 2 groups of 30 each, and evaluated according to the study protocol. Their pre-operative audiometry was recorded and both groups of patients underwent surgery with one of the graft materials- temporalis fascia or sliced tragal cartilage with a thickness of 0.5 mm. All patients were regularly followed up and post-operative audiometry was done at 3 months. The hearing improvement in the form of closure of air-bone-gap and graft take-up was analysed statistically.

RESULTS

The temporalis fascia graft group had a pre-operative ABG of 22.33 ± 6.24 dB and post-operative ABG of 12.33 ± 4.72 dB with hearing improvement of 10.00 dB. The sliced cartilage graft group had a pre-operative ABG of 20.77 ± 5.75 dB and post-operative ABG of 10.50 ± 4.46 dB with hearing improvement of 10.27 dB. In the temporalis fascia group, 28 (93.3%) patients had good graft take-up and in the sliced cartilage group 29 (96.7%) had good graft take-up. There was statistically significant hearing improvement in both of our study groups but there was no statistically significant difference between the two groups. There was no statistically significant difference in graft take-up also.

CONCLUSION

Sliced cartilage graft is a good auto-graft material in tympanoplasty, which can give good hearing improvement and has good graft take-up, which is comparable with that of temporalis fascia.

KEYWORDS

Tympanoplasty, Sliced Cartilage, Temporalis Fascia, Tragal Cartilage, Air-Bone Gap.

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BACKGROUND

The Tympanic Membrane is a part of hearing mechanism which has a significant role in the physiology of hearing and in the pathophysiology of inflammatory diseases of the middle ear. Otitis media is defined as "an inflammation of the middle ear". Otitis media also implies concomitant inflammation, of the mastoid air cell system, owing to its anatomic linkage to the middle ear cleft.¹

The perforations of tympanic membrane significantly impair the quality of life for millions of patients in the form

of repeated hospital visits, embarrassment caused by discharging ear and hearing loss.²

The treatment of tympanic membrane perforation is repair using a graft material in the place of perforation by surgery called "tympanoplasty". The fundamental principles of the surgical procedure were described by Wullstein.³ in 1952, using a free skin graft, and Zollner.⁴ in 1955, using a pedicle graft. Tympanoplasty is a surgical procedure which is done to eradicate the middle ear disease and to reconstruct the hearing mechanism with or without tympanic membrane grafting.

There are various graft materials used in tympanoplasty like skin, perichondrium, vein, temporalis fascia, dura and cartilage. The most frequently used technique for tympanoplasty is underlay grafting with temporalis fascia graft. In the cases of subtotal perforations, atelectatic ears, retraction pockets, mastoid surgeries - the long-term results of temporalis fascia as a graft material is not satisfactory. In this situation, cartilage.⁵ can be used as a grafting material, especially for repairing large perforations, scutum defects,

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for preventing or correcting the failure of previous procedures associated with chronic Eustachian tube dysfunction and atelectatic tympanic membranes. The perceived disadvantage of the cartilage graft is that being thick in consistency it may impair the sound conduction. Cartilage has lower compliance than fascia and hence, sudden pressure variations is not well regulated with a more rigid tympanic membrane.⁶

The current study has been taken up to compare the results of two grafting materials for type 1 tympanoplasty surgery. The graft materials used were - temporalis fascia and tragal cartilage, sliced to a thickness of 0.5 mm.^{7,8} using a cartilage slicer. The main aim of the study was to know whether reducing the thickness of cartilage can have better compliance, hearing improvement and graft take-up compared to temporalis fascia. A total of 60 cases were part of the study, with 30 cases of grafting with temporalis fascia and 30 cases with sliced cartilage grafting techniques.

Aims and Objectives-

1. To compare the hearing improvement after using Sliced cartilage graft with that of Temporalis Fascia graft in tympanoplasty.
2. To compare the uptake rate of sliced cartilage graft with Temporalis fascia graft in Tympanoplasty.

MATERIALS AND METHODS

This prospective clinical study was carried out from 1st January, 2016 to 31st July, 2017 on the patients attending the ENT outpatient department of our tertiary care centre. The approval and permission from the ethics committee and authority was obtained prior to starting the study.

The total sample size of the study was taken as 60 as incidence of otitis media in Indian population was not available in comprehensive literature review. The total study population was randomised into 2 groups by lottery method. First group underwent type-1 tympanoplasty with cartilage shield which was obtained by slicing the harvested tragal cartilage using a cartilage slicer as graft material and the second group underwent tympanoplasty with temporalis fascia as graft material.

Patients with chronic mucosal otitis media in inactive state and with a moderate, large or subtotal sized central perforation, in the age group of 18 – 60 years were part of the study. Patients with small sized central perforation, mucosal otitis media in active stage, patients with squamosal otitis media and patients with diabetes and other immune-compromised state were excluded.

All patients were screened according to our protocol, pre-operative audiometry was done. The selected cases were operated for with, tympanoplasty. Anaesthesia used was either general anaesthesia or local anaesthesia with intravenous sedation. Post aural approach was used in all cases. Either temporalis fascia or tragal cartilage were harvested as graft material. The tragal cartilage harvested was sliced with an instrument set called "Cartilage slicer" to a thickness of 0.5 mm. The graft materials were used in surgery according to the group in which the patient belong. After surgery, all patients were given same sort of care, discharged from hospital after 48 hours and suture was removed on the seventh day after surgery, with postoperative advise and medications of same sort.

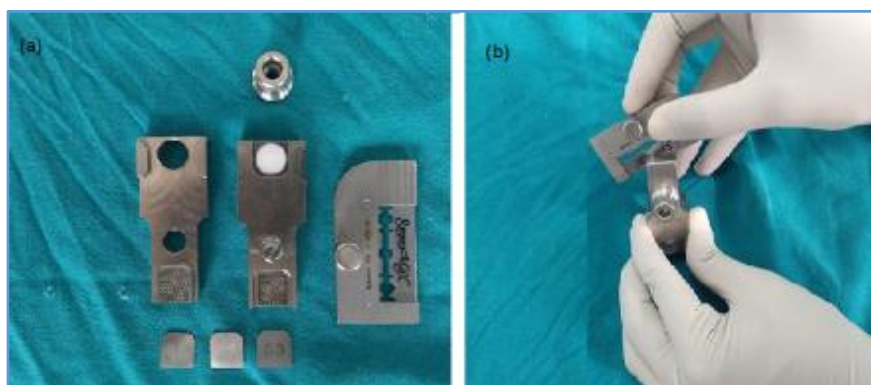


Figure 1. (a) Cartilage Slicer Set, (b) Process of Cartilage Slicing

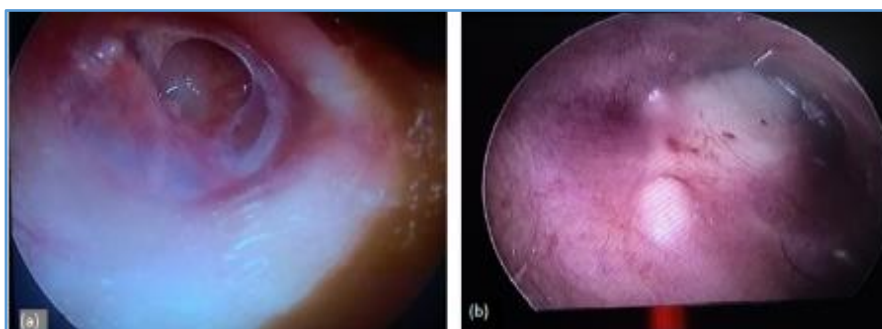


Figure 2. (a) Pre-operative image showing Tympanic membrane perforation, (b) Post-operative image showing healed neo-tympanum

All cases were regularly followed up. Post-operative audiometry was done at 3 months. The pre and Post-operative audiometry results were tabulated and analysed. The post-operative closure of air bone gap was considered as hearing improvement.

OBSERVATION AND RESULTS

The average age, gender distribution, pre-operative hearing loss and preoperative air bone gap in both the study groups were comparable. The post-operative air bone gap, graft take up and hearing improvement in both the groups were analysed. The results obtained were as follows.

PTA-Air Bone Gap (dB)	Temporalis Fascia (in dB)	Sliced Cartilage (in dB)	Total (in dB)	P value
Pre-op Air Bone Gap	22.33 ± 6.24	20.77 ± 5.75	21.55 ± 6.00	0.316
Post-op Air Bone Gap	12.33 ± 4.72	10.50 ± 4.46	11.42 ± 4.65	0.128
Difference	10.00	10.27	10.19	-
P value	<0.001**	<0.001**	<0.001**	-

Table 1. Comparison of ABG in Two Groups of Patients Studied

Student t test (Two tailed, Independent) used for between group analysis; Student t test (Two tailed, Dependent) used for within group analysis.

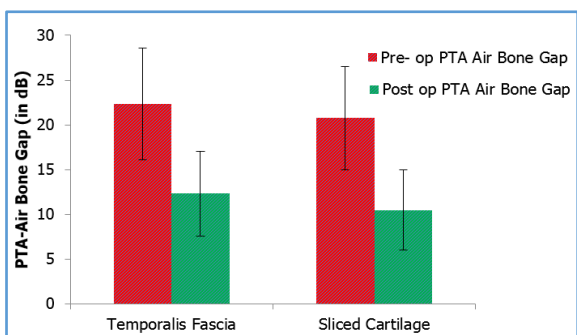


Figure 3. Comparison of Pre and Post-operative ABG and Hearing Improvement

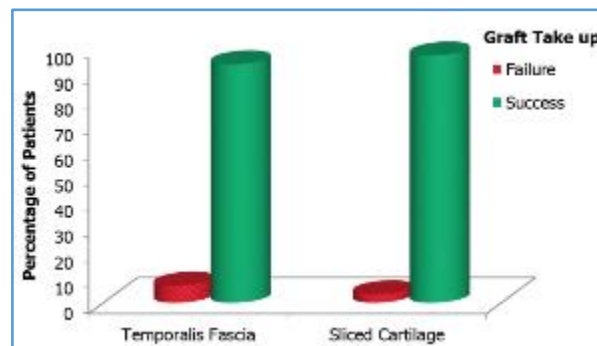


Figure 4. Graft Take up

Graft Take up	Temporalis Fascia Graft	Sliced Cartilage Graft	Total
Failure	2 (6.7%)	1 (3.3%)	3 (5%)
Success	28 (93.3%)	29 (96.7%)	57 (95%)
Total	30 (100%)	30 (100%)	60 (100%)

Table 2. Graft Take up

P= 1.000, Not Significant, Fisher Exact Test.

DISCUSSION

Pre and post-operative air bone gap (ABG) of the both study groups were analysed. The temporalis fascia graft group had a pre-operative ABG of 22.33 ± 6.24 dB and post-operative ABG of 12.33 ± 4.72 dB with improvement in hearing of 10.00 dB. The sliced cartilage graft group had a pre-operative ABG of 20.77 ± 5.75 dB and post-operative ABG of 10.50 ± 4.46 dB with improvement in hearing of 10.27 dB. The total study population had a mean pre-operative ABG of 21.55 ± 6.00 dB and post-operative ABG of 11.42 ± 4.65 dB with improvement in hearing of 10.19 dB. The hearing improvement was significant in 2 groups and the total population with P value <0.001. Further analysis proved that the difference in ABG closure between the 2 study groups were insignificant (P value >0.05).

Study Name	Cartilage Group		Temporalis Fascia Group	
	Pre-Op ABG (in dB)	Post- Op ABG (in dB)	Pre-Op ABG (in dB)	Post- Op ABG (in dB)
Aidonis et al ⁹	32.4 ± 14.1	24 ± 13.7	—	—
Cavaliere M et al ¹⁰	43.79 ± 7.07	10.43±5.25	—	—
Khan MM, Parab SR ¹¹	32.46±5.022	9.21±3.28	—	—
Our study	20.77±5.75	10.50±4.46	22.33±6.24	12.33±4.72

Table 3. Table Showing Comparison between Pre-op and Post-op ABG in Various Studies

Study Name	Graft take-up	
	Temporalis Fascia Group	Cartilage Group
Yu et al ¹²	80 %	92.4%
Aidonis et al ⁹	—	98.4%
Ozbeck et al ¹³	70.2%	100%
Kazikdas et al ¹⁴	75%	95.7%
Cavaliere M et al ¹⁰	—	99.35%
Khan M, Parab S R ¹¹	—	98.20%
Onal K et al ¹⁵	65.9%	93.2%
Our study	93.3%	96.7%

Table 4. Table Showing Graft Uptake in Various Studies

Among the 60 patients who took part in the study 57 (95%) had good graft uptake. In the temporalis fascia group which had 30 patients 28 (93.3%) had good graft take up. In the sliced cartilage group of 30 patients 29 (96.7%) had positive results. The difference in graft uptake between the 2 groups was found to be statistically insignificant.

The results of the graft uptake of the sliced cartilage group was comparable with that of the study conducted by and which used cartilage by Yu et al¹² in (2001), Aidonis et al⁹ in 2005, Kazikdas et al¹⁴ in 2007, Ozbeck et al¹³ in 2008, Cavaliere M et al¹⁰ in 2009, Khan M M, Parab S R¹¹ in 2011 and Onal K et al¹⁵ in 2011.

The graft uptake result in the temporalis fascia group in our study was comparably better than the studies mentioned in table IV. Other studies which were reviewed showed better outcome with cartilage than with temporalis fascia in type 1 tympanoplasty, when it was used in the repair of subtotal perforations only. Our study included large and medium sized central perforations also, which might have increased the graft uptake in the temporalis fascia group.

CONCLUSION

1. The study proved that tympanoplasty using sliced cartilage graft is having better outcome in the form of hearing improvement and graft uptake.
2. The hearing improvement and graft uptake is comparable with that of temporalis fascia graft.
3. Sliced cartilage graft is a good auto-graft material that can be used for tympanoplasty.
4. Long term follow-up is needed to see whether sliced cartilage graft has favourable benefit over temporalis fascia.

REFERENCES

- [1] Chen DA. Glasscock-Shambaugh surgery of the ear, 5th edn. *Otology & Neurotology* 2003;24(3):520.
- [2] WHO. Chronic suppurative otitis media - burden of illness and management options. Geneva: World Health Organization 2004: p. 84. http://www.who.int/pbd/publications/Chronicsuppurativeotitis_media.pdf
- [3] Wullstein HL. Functional operations in the middle ear with Split-thickness skin graft. *Arch Otorhinolaryngol* 1952;161:422-435.
- [4] Zollner F. The principles of plastic surgery of the sound-conducting apparatus. *J Laryngol Otol* 1955;69(10):637-652.
- [5] Kerr AG, Byrne JET, Smyth GDL. Cartilage homografts in the middle ear: a long-term histological study. *J Laryngol Otol* 1973;87(12):1193-1199.
- [6] Yetiser S, Hidir Y. Temporalis fascia and cartilage-perichondrium composite shield grafts for reconstruction of the tympanic membrane. *Ann Otol Rhinol Laryngol* 2009;118(8):570-574.
- [7] Khan MM, Parab SR. Average thickness of tragal cartilage for slicing techniques in tympanoplasty. *J Laryngol Otol* 2015;129(5):435-439.
- [8] Mürbe D, Zahnert T, Bornitz M, et al. Acoustic properties of different cartilage reconstruction techniques of the tympanic membrane. *Laryngoscope* 2002;112(10):1769-1776.
- [9] Aidonis I, Robertson TC, Sismanis A. Cartilage shield tympanoplasty: a reliable technique. *Otol Neurotol* 2005;26(5):838-841.
- [10] Cavaliere M, Mottola G, Rondinelli M, et al. Tragal cartilage in tympanoplasty: anatomic and functional results in 306 cases. *Acta Otorhinolaryngol Ital* 2009;29(1):27-32.
- [11] Khan MM, Parab SR. Sliced island tragal cartilage perichondrial composite graft in type I tympanoplasty: early results and experience. *J Rhinolaryngo-Otologies* 2014;2(1):4-9.
- [12] Yu L, Han C, Yu H, et al. Auricular cartilage palisade technique for repairing tympanic membrane perforation. *Zhonghua Er Bi Yan Hou Ke Za Zhi* 2001;36(3):166-168.
- [13] Ozbek C, Ciftci O, Tuna EE, et al. A comparison of cartilage palisades and fascia in type 1 tympanoplasty in children: anatomic and functional results. *Otol Neurotol* 2008;29(5):679-683.
- [14] Kazikdas KC, Onal K, Boyraz I, et al. Palisade cartilage tympanoplasty for management of subtotal perforations: a comparison with the temporalis fascia technique. *Eur Arch Otorhinolaryngol* 2007;264(9):985-989.
- [15] Onal K, Arslanoglu S, Songu M, et al. Functional results of temporalis fascia versus cartilage tympanoplasty in patients with bilateral chronic otitis media. *J Laryngol Otol* 2012;126(1):22-25.