

# Comparative Study of Different Graft Materials used in Myringoplasty

Ramagiri Vijay Kumar<sup>1</sup>, Ramakrishnaiah P<sup>2</sup>, Radha Krishna N<sup>3</sup>, S Indira<sup>3</sup>

## ABSTRACT

**Introduction:** Tympanic membrane perforation is most commonly a result of infection, trauma or a sequel to tympanostomy tube insertion. Reconstruction of tympanic membrane using fascia or perichondrium aims to achieve anatomic and functional reconstruction of tympanic membrane.

**Materials and methods:** The study was carried out on 60 patients admitted for myringoplasty as per selection criteria in the Department of Ear Nose and Throat for a period of 1 year in patients autogenous graft materials was used and they were divided into three groups. In Group A 20 patients in which temporalis fascia was used as graft, Group B 20 patients in which tragal perichondrium was used as graft and Group C 20 patients in which ear lobule fat was used as graft.

**Results:** Maximum number of patients 25(41.7%) were in the age group of 21-30 years. Female patients outnumber the male patients. The male female ratio was 1:2. rural population as compared to urban in study groups. Left ear was more involved in all the groups. Maximum number of patients i.e. in group A 10(50%), in group B 9(45%) and in group C 11(55%) were having duration of ear discharge of 1-5 years. Dry ear of <3 months of duration in group A 10(50%), in group B 16(80%) and in group C 14(70%) of patients. Graft uptake at 3 months postoperatively, It shows that in group A graft take up rate was 90%, in group B it was 95% while in group C it came out to be 80%.

**Conclusions:** The success rate was in terms of graft uptake rate is 90% with temporalis fascia, 95% with tragal perichondrium and 80% with fat graft. The overall success rate was 88.3%. Thus our study shows that though temporalis fascia is most commonly used graft material in myringoplasty, tragal perichondrium is an equally good alternative.

**Keywords:** Myringoplasty, Temporalis fascia, Tragal perichondrium, Fat graft.

## INTRODUCTION

Chronic suppurative otitis media is an important middle ear disease since prehistoric times. CSOM is the commonest cause of persistent mild to moderate hearing impairment in children and young adults in developing countries.<sup>1</sup> Tympanic membrane is unique structure vital to sound transmission, a key in impedance matching for sound travelling from air to fluid and only true closing membrane which remains in fully developed human fetus.<sup>2</sup>

Tympanic membrane perforation is most commonly a result of infection, trauma or a sequel to tympanostomy tube insertion. Although 88% of traumatic perforations of any size heal without intervention the remainders require treatment.<sup>3</sup> Reconstruction of tympanic membrane using fascia or perichondrium aims to achieve anatomic and functional reconstruction of tympanic membrane. Chronic eustachian tube dysfunction with secondary negative middle ear pressure is underlying pathological process

in majority of tympanic membranes that perforate or develop recurrent atelectasis with or without cholesteatoma.<sup>4</sup>

In the literature, there are many classifications of myringotympanoplasties.<sup>5</sup> Some of these are minor modifications of the original Wullstein classification, while others take the size of the perforation into consideration, using the term myringoplasty only for the act of closing small perforation.<sup>6</sup>

Myringoplasty is an operation used to repair and reconstruct the perforation in tympanic membrane. Different surgical approaches, surgical techniques and graft materials are in practice. Most commonly employed graft materials are tragal perichondrium with or without cartilage and temporalis fascia. Other materials like fat, periosteum, vein graft and cadaveric dura as allograft and bovine tissue as xenograft are also used depending upon size of defect and availability of tissues.

Autogenous graft materials are the most popular grafts. They are usually easily available, don't involve any immunological problems, are inexpensive and most important of all, there is no risk of HIV infection.<sup>7</sup>

Success rate is highly variable from centre to centre. Tragal perichondrium is mainly preferred due to its easy harvesting technique, decreased time consumption, minimal scarring and no significant postoperative morbidity. Tragal cartilage with perichondrium is preferred in case of large or anteriorly placed perforations or associated eustachian tube dysfunction but at the cost of delayed hearing restoration for six months.

Temporalis fascia is generally considered to be superior with respect to the take rate probably due to its low basal metabolic rate.

Fat from ear lobule is used to plug small perforations with highly encouraging results. It is also minimally invasive and particularly useful for residual perforations because of angiogenic properties of fat. As regards the surgical techniques modifications are still in progress without a common consensus from underlay and overlay to a combination of both or a sandwich technique where the graft is placed between squamous and mucosal layers of tympanic membrane. However outcome is not significantly altered.

Biological graft materials act as scaffolds of tissue matrix which are applied to seal perforation and this subsequently revascularises in readiness for migration of fibroblasts and epithelium. Autogenous graft materials varied regarding their ease of harvesting, preparation time, placement ease, viability, graft uptake

<sup>1</sup>Associate Professor, <sup>2</sup>Assistant Professor, <sup>3</sup>Professor, Department of ENT, Bhaskara Medical College, Moinabad, Hyderabad, India

**Corresponding author:** Dr. Ramagiri Vijay Kumar, Department of ENT, Bhaskara Medical College, Moinabad, Hyderabad.

**How to cite this article:** Ramagiri Vijay Kumar, Ramakrishnaiah P, Radha Krishna N, S Indira. Comparative study of different graft materials used in myringoplasty. International Journal of Contemporary Medical Research 2016;3(3):797-800.

and hearing improvement. Such abundance of material implicitly implied that there is no clear favorite and choice of graft depends on individual surgeon preference.

Keeping all this in view the study will be undertaken to compare the autogenous graft materials i.e. temporalis fascia, tragal perichondrium and ear lobule fat. The study will also aim to compare the result of these grafts in various aspects but the prime interest would be the closure of tympanic membrane perforation and postoperative hearing improvement.

## MATERIAL AND METHODS

The study was carried out on 60 patients admitted for myringoplasty as per selection criteria in the Department of Ear Nose and Throat from June 2013 to October 2014.

**Inclusion Criteria:** Age >12 years and <50 years, CSOM with central perforation, the ear should be dry for at least 3 weeks, Mild to moderate conductive hearing loss.

**Exclusion Criteria:** Other disease condition which could affect the result of study except the ear disease.

In the 60 selected patients autogenous graft materials was used and they were divided into three groups.

**Group A** –20 patients in which temporalis fascia was used as graft.

**Group B** –20 patients in which tragal perichondrium was used as graft.

**Group C** – 20 patients in which ear lobule fat was used as graft.

A written consent was taken from the selected patients. A detailed clinical history of each patient was taken and recorded as per proforma. All patients were examined clinically and investigations carried out were tuning fork tests, PTA (pure tone audiometry), X-ray both mastoids lateral oblique view. Complete haemogram i.e. haemoglobin, bleeding time, clotting time, TLC, DLC and Urine complete examination

The operation was performed under general or local anesthesia. For local infiltration 2% xylocaine with 1:100000 adrenaline was used

The myringoplasty was performed through endaural, post aural or permeatal approach; inlay or outlay technique was used.

**Harvesting Temporalis fascia:** After shaving and draping supra-auricular area temporalis fascia graft was harvested by giving supra-auricular incision. Skin and subcutaneous tissue were retracted to expose the white shining fascia covering temporalis muscle. Infiltration was done with xylocaine underneath the fascia and it was harvested according to size of perforation. Wound stitched with 3-0 mersilk.

**Harvesting tragal perichondrium:** After anesthetizing tragal area

a skin deep incision was made on anterior lip of tragus and it was separated from the perichondrium. The perichondrium was cut and separated from underlying cartilage with the help of an elevator/scissor. Perichondrium was then harvested out and wound was stitched with 3-0 mersilk.

**Harvesting fat:** After anesthetizing the lobule of ear a 0.5cm incision was given on the medial surface and a skinless fat graft, 2 to 3 times larger than the perforation was harvested. It was shaped like an hourglass for better stabilization. The fat graft was inserted through the perforation and was covered with a small piece of absorbable gelatin sponge (Gelfoam). Stitching was done with 3-0 mersilk.

Post operatively the patients were given Broad spectrum antibiotics, Analgesics, Antihistaminics and Steroids if needed

Any postoperative complication was noted. Stitches were removed after 7 days and EAC pack was removed after 10-14 days. Patients were observed for graft uptake and any complications after 4wks and 12wks of operation. PTA was done, 3 months after surgery to assess the hearing level and was compared with the preoperative audiogram.

## RESULTS

The present study was carried out in 60 patients upto age of 50 years presented with perforation. They were divided into 3 groups each comprising into 20 patients each in which different graft materials were used temporalis fascia, tragal perichondrium and fat respectively.

Maximum number of patients 25(41.7%) were in the age group of 21-30 years.

Female patients outnumber the male patients. The male female ratio was 1:2. rural population as compared to urban in our study groups.

This shows that left ear was more involved in all the groups. Maximum number of patients i.e. in group A 10(50%), in group B 9(45%) and in group C 11(55%) were having duration of ear discharge of 1-5 years. In group A 10(50%), in group B 16(80%) and in group C 14(70%) of patients had dry ear of <3 months of duration.

Majority patients of group A 14(70%) were operated by postaural route, 5 (25%) by permeatal route and 1 (5%) by endaural route. 13(65%) cases of group B were taken under permeatal route and rest all by post aural route. All the patients of group C were taken by permeatal route. So permeatal route was used in 63.3% of all cases.

Results were taken as positive if graft was taken up and negative if it was not taken up. Graft uptake at 3 months postoperatively.

Age In Years	Group A		Group B		Group C		Total	%
	No	%	No	%	No	%		
12-20	4	20%	1	5%	4	20%	9	15
21-30	7	35%	9	45%	9	45%	25	41.7
31-40	4	20%	4	20%	4	20%	12	20
>40	5	25%	6	30%	3	15%	14	23.3
Sex								
Male	9	45%	4	20%	7	35%	20	33%
Female	11	55%	16	80%	13	65%	40	66%
Rural Versus Urban Distribution								
Rural	13	65%	12	60%	12	60%	37	62%
Urban	7	35%	8	40%	8	40%	23	38%

Table-1: Demographic Details

It shows that in group A graft take up rate was 90%, in group B it was 95% while in group C it came out to be 80%. P Value is significant <0.05 in all A, B,C groups

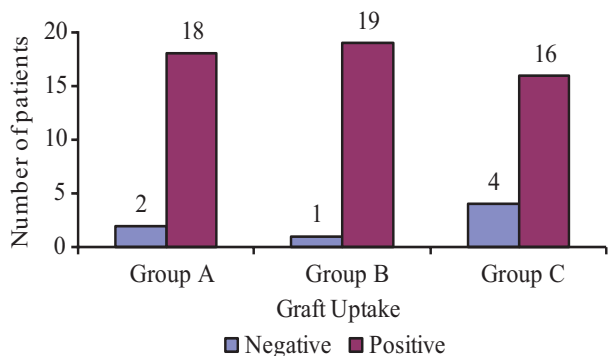


Figure-1: Graft Uptake

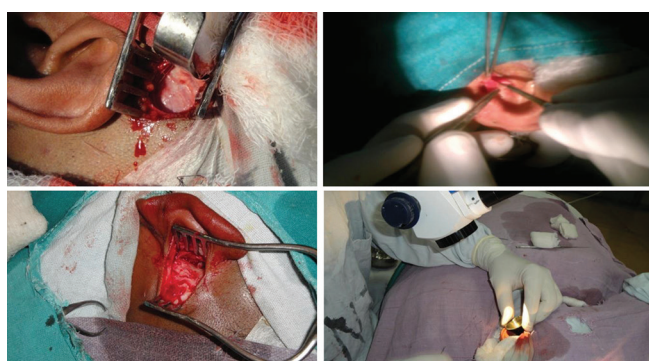


Figure-2: Temporal Fascia Being Harvested, Tragal Perichondrium Graft Harvested, Myringoplasty being done by Post Auricular Approach and Permeatal Approach

Ear Involved	Group					
	A		B		C	
L/E	12	60%	11	55%	11	55%
	8	40%	9	45%	9	45%
<b>Duration Of Ear Discharge</b>						
<1 Month	2	10%	3	15%	9	45%
1-5 Years	10	50%	9	45%	11	55%
5-10 Years	2	10%	3	15%	0	0%
>10 Years	6	5%	5	25%	0	0%
<b>Duration Of Dry Ear</b>						
<3 Months	10	50%	16	80%	14	70%
3-6 Months	7	35%	1	5%	4	20%
6-12 Months	3	15%	3	15%	2	10%

**Table-2:** Ear involved duration of ear discharge and dry ear in study

DISCUSSION

Myringoplasty is one of most frequently performed procedure in otorhinolaryngology. Great variability exists not only in surgical technique but also in its outcome throughout the world. It is an effective and simple procedure for the closure of tympanic membrane perforations.

Since publication of Zollner and Wullstein different graft materials have been promoted in myringoplasty. Temporalis fascia was first used in myringoplasty by Ortegren(1958-59), Heermann (1961) and Storrs (1961).<sup>8,9</sup> It is the most commonly used autogenous graft material. It is most popular for several reasons:

1. It is easy to harvest.
2. It can be used as onlay or underlay graft
3. For primary operation as there is no size limitation.
4. It has low basal metabolic rate similar to tympanic membrane.

Although temporalis fascia has been widely used it can eventually become thin and atrophic. In addition due lack of elasticity and resistance to pressure changes in external ear canal several authors suggests that it could be replaced by an alternative.

Tragal perichondrium was introduced into myringoplasty by Goodhill V (1964).<sup>10</sup> Tragal perichondrial graft avoids amputation of the targus thereby facilitating dissection of the perichondrium from the cartilage as compared to the traditional method. The approach described is technically easier, and removes any potential for cosmetic deformity associated with tragal cartilage amputation and reimplantation. Furthermore, both the anterior tragal perichondrium and the temporalis fascia remain intact if further surgery is required.

The use of fat graft was first introduced by Ringerberg (1962)<sup>11</sup> and is usually an office based procedure. Fat myringoplasty nevertheless is a simple, cost effective, outpatient procedure.

In our study maximum patients lie into younger age. Exact cause was difficult to comment possibly the patients were more conscious about their hearing at this age. Remaining cases were of middle age worried about their social life. The table shows that study group in our series was comparable to the following studies.

Source	No of cases	Age group in yrs	Max no of subjects in range
Zhang et al <sup>12</sup> (2011)	117	12-51	20-30 (45%)
Singh BJ <sup>13</sup> (2009)	220	13-48	21-30(35%)
Zulkifal Awan et al <sup>14</sup> (2008)	215	17-40	21-30(46%)
Our study	60	12-50	21-30(41.7%)

Surgical Approach			Group			Total
			A	B	C	
Endaural	No		1	0	0	1
		%	5.0%	.0%	.0%	1.7%
	Permeatal	No	5	13	20	38
		%	25.0%	65.0%	100.0%	63.3%
	Postaural	No	14	7	0	21
		%	70.0%	35.0%	.0%	35.0%
Total	No	20	20	20	60	
	%	100.0%	100.0%	100.0%	100.0%	

**Table-3:** Surgical Approach

In our series there was female preponderance as compared to male patients. In group A 11(55%) in group B 16(80%) and in group C 13(65%) patients were females. Overall 66.7% were females while rest of patients was males. In the study carried by Zulkifal Awan et al (2008) there were 53.3% subjects were females while 46.7 were males.<sup>14</sup> In study by Konstantinidis et al (2010) male preponderance in the subjects was seen. There were 66.7% males and 33.3% females.<sup>15</sup>

In our study more number of patients were from rural background. Overall 37(61.7%) were from rural background and 23(38.3%) were from urban background. In the study by BJ Singh et al (2009) also there were more subjects (60%) from rural background.<sup>13</sup> The rural urban proportion seen in our study may be just reflection of rural-urban distribution of patients attending the outpatient department of our hospital. Also, lack of awareness about the disease and its sequel and lack of proper referral to specialized centers from the rural areas may be responsible for the higher proportion of patients from the rural areas in our study.

There was slightly more involvement of left ear in our study. In group A left ear was pathological in 12(60%) patients, in group B 11(55%) and in group C 11(55%). Altogether there is left ear problem in 34(56.7%) and in 26(43.3%) right ear was involved. In our study majority of the patients presented with history of discharge for 1-5 years i.e. 30(50%), 16 (26.7%) had discharge for more than five years and only 14(23.3%) had history of discharge less than one year. Longer duration of ear discharge shows lack of awareness about the disease and its complications and lack of proper and adequate referral services especially in those with rural background may have contributed to the delayed seeking of specialized care. All the patients were adequately treated with conservative treatment and had a dry ear for at least four weeks prior to surgery.

In our study, endaural, perimeatal and postaural approaches were employed. Endaural approach was used in only one case (5%). Post-aural approach was used in 21 cases (35%) and perimeatal approach was used in 38 cases (63.3%). Perimeatal approach was preferred in cases with wider external auditory canal and was used in all cases under group C where the endoscope was also used when required. While post aural approach provides better exposure and a wider operative field and overcomes the problem of narrow EAC or anterior prominent bulge. In our study, these approaches had almost equal success in terms of graft uptake.

According to Singh BJ et al (2009)<sup>13</sup> comparative study was conducted between different graft materials and success rate in terms of closure of tympanic membrane was observed which came out to be with temporalis fascia 95% and 9.3db hearing gain, ear lobule fat 90%, followed by tragal perichondrium 90% and areolar tissue 80%. Overall success rate was 91%.

According to Zhang et al (2011)<sup>12</sup> composite cartilage graft had 100% success rate followed by tragal perichondrium and temporalis fascia 95% each in terms of closure of tympanic membrane and hearing improvement.

Zulkifal Awan et al (2005)<sup>14</sup> had an overall success rate of 84% using tragal perichondrium without cartilage and in few cases with cartilage, temporalis fascia and fat from ear lobule. Individual success rate with each type of graft material was 85%, 75% and 100% respectively.

## CONCLUSION

In the present study, the success was defined as intact graft at

least 3 months postoperatively. The success rate was in terms of graft uptake rate is 90% with temporalis fascia, 95% with tragal perichondrium and 80% with fat graft. The overall success rate was 88.3%. Thus our study shows that though temporalis fascia is most commonly used graft material in myringoplasty, tragal perichondrium is an equally good alternative.

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**Source of Support:** Nil; **Conflict of Interest:** None

**Submitted:** 27-01-2016; **Published online:** 18-02-2016