

Original Research Article

Outcome of different graft materials used in Myringoplasty

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Abstract

Aim: To compare the result of graft materials i.e. temporalis fascia, tragal perichondrium and ear lobule fat in various aspects but the prime interest would be the closure of tympanic membrane perforation and postoperative hearing improvement.

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 (41.7%) was in the age group of 21-30 years. Female patients outnumber the male patients. The male female ratio was 1: 2. Rural population was more 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 (50%), in group B (45%) and in group C (55%) was having duration of ear discharge of 1-5 years. Dry ear of <3 months of duration in group A, group B and group C was 50%, 80%, and 70% of patients respectively. In group A, 50% of patients had more than 30dB AB gap while 45% of group B and 50% of group C had less than 20dB AB gap. Overall total AB gap was 10.33 ± 9.62 dB. Mean improvement in hearing was 12.32 ± 8.42 dB, 10.38 ± 5.73 dB and 12.62 ± 8.06 dB in group A B and C respectively.

Conclusion: Temporalis fascia graft has good improvement of hearing when compared to other grafts in study. Ear lobule fat when used in small perforations has encouraging results.

Key words

Myringoplasty, Temporalis fascia, Tragal perichondrium, Fat graft.

Introduction

The function of the middle ear is to transmit the sound pressure from air of external ear to the fluid of internal ear, is accomplished by tympanic membrane and ossicular chain composed of malleus, incus and stapes. Chronic suppurative otitis media is defined as a chronic infection of the mucosa lining the middle ear cleft. There are two types of chronic suppurative otitis media Tubotympanic disease (safe type), Atticoantral disease (unsafe type). It is one of the most common ear diseases encountered in developing countries due to poor socioeconomic status, lack of health education, unhygienic habits and poor nutrition. Perforation in tympanic membrane are most commonly caused by middle ear infections, trauma and less commonly iatrogenic. The type of perforation classified on the basis of size, shape and involvement of margin. It is a commonest cause of deafness in India [1, 2].

Myringoplasty is the term used for the reconstruction of tympanic membrane [3]. This procedure is unrelated to the size of perforation, the approach, the condition of the mucosa or the tubal function [4]. A few authors found higher rate of reperforation and less reduction in air-bone gap following myringoplasty using temporalis fascia graft in comparison to perichondrial graft. Although the temporalis fascia has been widely used, it can eventually become thin and atrophic leading to reperforation. Because of this several authors have suggested that temporalis fascia should be replaced by perichondrium or strengthened by cartilage [5]. Keeping all this in view the study was undertaken to compare the autogenous graft materials i.e. temporalis fascia, tragal perichondrium and ear lobule fat. The study aimed 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, Government Medical College and Rajindra Hospital, Patiala 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 hemogram i.e. hemoglobin, bleeding time, clotting time, TLC, DLC and Urine complete examination was done.

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 permeal 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 0.5 cm 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, Anti-histaminics 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 12 weeks 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 up to 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 (41.7%) was in the age group of 21-30 years. Female patients outnumber the male patients. The male female ratio was 1: 2. Rural population was more as compared to urban in our study groups (**Table – 1**).

Left ear was more involved in all the groups. Maximum number of patients i.e. in group A (50%), in group B (45%) and in group C (55%) were having duration of ear discharge of 1-5 years. In group A, in group B, and in group C, total 50%, 80%, and 70% of patients had dry ear of <3 months of duration respectively (**Table – 2**).

Thus in group A, 50% of patients had more than 30dB AB gap while 45% of group B and 50% of group C had less than 20dB AB gap (**Table – 3**).

Majority patients of group A (70%) were operated by postaural route, 25% by permeal route and 5% by endaural route. 13(65%) cases of group B were taken under permeal route and rest all by post aural route. All the patients of group C were taken by permeal route. So permeal route was used in 63.3% of all cases (**Table – 4**).

BIQ were involved in 12(20%), BAQ in 6 (10%) and BPQ in 2 (3.3%) of patients. Thus PIQ (35%) was most commonly involved. The 4-6 mm central perforation was seen in 14 (70%) in group A, 7 (35%) in group B and 1 (5%) in group C. Subtotal perforation was seen in 4 (20%) of patients of group A. Pneumatic mastoid was observed in (49) 81.7% patients and sclerotic mastoid in 11 (18.3%) patients. There was history of past surgery in two patients (3.4%). There was history of SMR in one patient in group A and TR in one patient of group B. There was no previous surgery in any of patient

of group C. No effect of the past surgery was noted on outcome of operation (**Table – 5**).

Improvement in hearing at 3 months post-operatively was as per **Table - 6**. 5% in group A,

5% in group B, and 20% in group C and 10% of total patients showed no hearing improvement. 36.7% of total patients had <10 dB, 38.3% had 11-20 dB and 15% of patients had >20 of dB hearing improvement (**Figure – 1**).

Table - 1: Demographic details.

Age (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 - 2: Ear involved, duration of ear discharge, and dry ear in Study.

		Groups					
		A		B		C	
Ear involved	Left ear	12	60%	11	55%	11	55%
	Right ear	8	40%	9	45%	9	45%
Duration of ear discharge							
<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%
Duration of dry ear							
<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%

Discussion

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. In patients early timely myringoplasty had good chances of restoring function with the potential for reducing further complications and deterioration [6].

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) [7, 8]. It is the most commonly used autogenous graft material. It is most popular for several reasons.

Although temporalis fascia has been widely used it can eventually become thin and atrophic. Tragal perichondrial graft avoids amputation of the tarsus thereby facilitating dissection of the

perichondrium from the cartilage as compared to the traditional method. Fat myringoplasty nevertheless is a simple, cost effective, outpatient procedure.

Table - 3: Pre-operative AB gap.

Pre-OP AB GAP	Group A		Group B		Group C		Total	
	No	%	No	%	No	%	No	%
<20 dB	3	15%	9	45%	10	50%	22	36.6
20-30 dB	7	35%	8	40%	4	20%	19	31.6
>30 dB	10	50%	3	15%	6	30%	19	31.6
Total	20	100	20	100	20	100	60	100

Table - 4: Surgical approach.

			Group			Total
			A	B	C	
Surgical Approach	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%	

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. Comparison with other studies was done as per **Table – 7.**

In our series there was female preponderance as compared to male patients [9, 10]. In group A 55%, in group B 80% and in group C 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 [11]. In study by Konstantinidis, et al. (2010) [12], male preponderance in the subjects was seen. There were 66.7% males and 33.3% females.

In our study more number of patients were from rural background. Overall 61.7% were from rural background and 38.3% were from urban background. In the study by BJ Singh, et al. (2009), there were more subjects (60%) from rural background [10]. 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%) patients. Altogether there was 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.

Table - 5: Details of site, size of perforation, radiologic findings and past surgery.

			Group			Total
			A	B	C	
Site of perforation	AIQ	No	4	3	6	13
		%	20.0%	15.0%	30.0%	21.7%
	ASQ	No	1	1	2	4
		%	5.0%	5.0%	10.0%	6.7%
	BAQ	No	5	1	0	6
		%	25.0%	5.0%	.0%	10.0%
	BIQ	No	7	4	1	12
		%	35.0%	20.0%	5.0%	20.0%
	BPQ	No	1	1	0	2
		%	5.0%	5.0%	.0%	3.3%
	PIQ	No	2	10	9	21
		%	10.0%	50.0%	45.0%	35.0%
	PSQ	No	0	0	2	2
		%	.0%	.0%	10.0%	3.3%
Size of perforation	1-3mm	No	2	13	19	34
		%	10.0%	65.0%	95.0%	56.7%
	4-6mm	No	14	7	1	22
		%	70.0%	35.0%	5.0%	36.7%
	Subtotal	No	4	0	0	4
		%	20.0%	.0%	.0%	6.7%
Radiologic condition of mastoid	Sclerotic	No	4	3	4	11
		%	20.0%	15.0%	.0%	18.3%
	Pneumatic	No	16	17	16	49
		%	80.0%	85.0%	80.0	81.7%
Additional past surgery	-	No	19	19	20	58
		%	95.0%	95.0%	100.0%	96.7%
	Post SMR	No	0	1	0	1
		%	.0%	5.0%	.0%	1.7%
	Post TR	No	1	0	0	1
		%	5.0%	.0%	.0%	1.7%

In our study, endaural, permealal and postaural approaches were employed. Endaural approach was used in only one case (5%). Post-aural

approach was used in 21 cases (35%) and permealal approach was used in 38 cases (63.3%). Permealal approach was preferred in

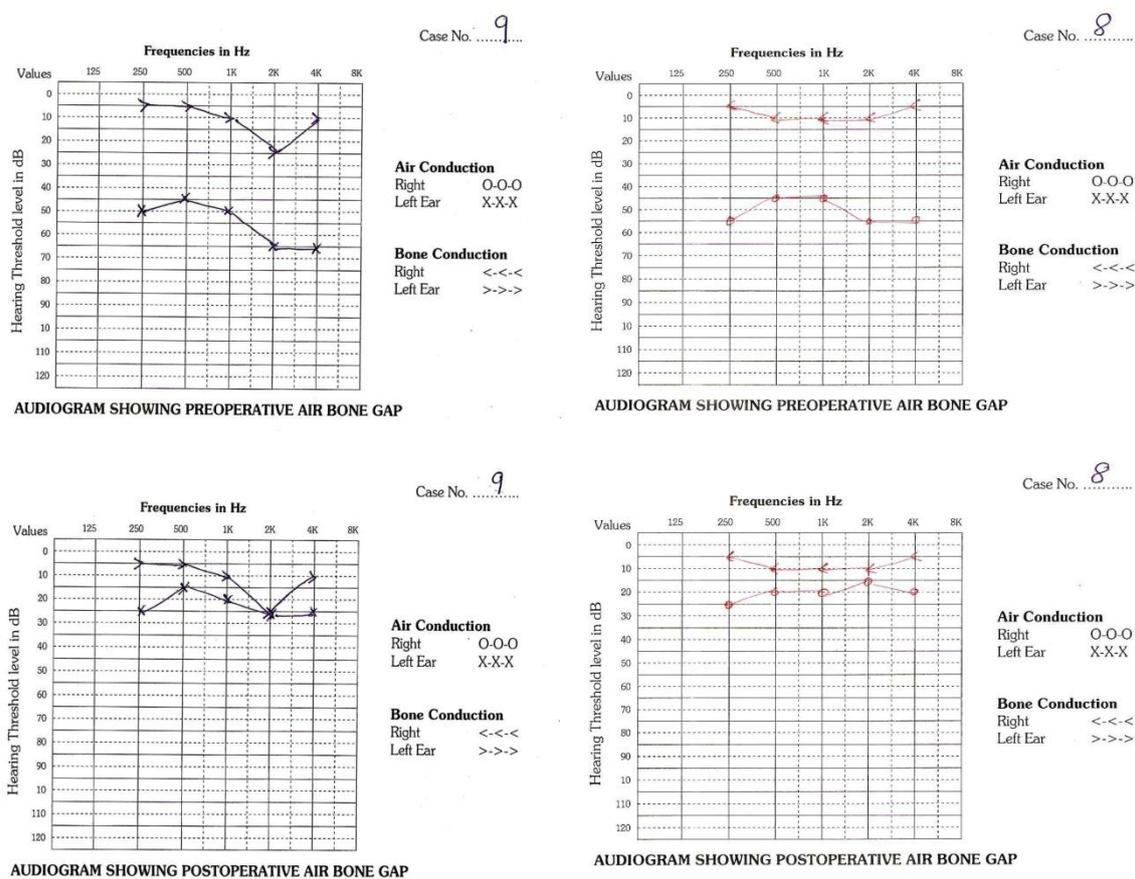
cases with wider external auditory canal and was used in all cases under group C where the endoscope was also used when required. While post aural approach provides better exposure and

a wider operative field and overcomes the problem of narrow EAC or anterior prominent bulge.

Table - 6: Improvement in hearing.

Improvement of hearing	Group A		Group B		Group C		Total	
	No	%	No	%	No	%	No	%
No change	1	5%	1	5%	4	20%	6	10%
< 10 Db	5	25%	10	50%	7	35%	22	36.7%
11-20 Db	10	50%	8	35%	5	25%	23	38.3%
>20 dB	4	20%	1	5%	4	20%	9	15%
Total	20	100%	20	100%	20	100%	60	100%

Figure - 1: Audiograms in study.



Mohamed and Nadia (2005) [13] conducted a study that showed that tympanic membrane healing rates were (80%) when they used fascial graft and it was better when they used perichondrial graft (88%) and even the best when

composite graft (92.3%) was used. They concluded that the use of perichondrium and cartilage composite graft is as successful in perforation closure and hearing improvement as temporalis fascia, as using these grafts does not

add to the operative time and does not carry the risk of atrophy and reperforation or retraction.

V Sinha, et al. (2009) [14] used fat graft as an office based procedure in small perforations and

got 95% success rate. Jyothi P, et al. (2007) [15] compared temporalis fascia with tragal perichondrium and found tragal perichondrium as better alternative for myringoplasty [13].

Table - 7: Comparison with other studies.

Source	No. of cases	Age group (Years)	Max no. of subjects in range
Zhang, et al. (2011) [9]	117	12-51	20-30 (45%)
Singh BJ (2009) [10]	220	13-48	21-30(35%)
Zulkifal Awan, et al. (2008) [11]	215	17-40	21-30(46%)
Our study	60	12-50	21-30(41.7%)

Demirpehlivan, et al. (2011) [16] studied that in the perichondrium/cartilage island flap group, the pure-tone average was 36.36 dB, whereas the pure-tone averages for the fascia group and cartilage palisades group were 36.07 and 39.79 dB, preoperatively. The postoperative pure-tone averages were 24.54 dB for the perichondrium/cartilage island flap group, 24.51 dB for the fascia group and 23.23 dB for the cartilage palisades group. Cartilage grafting is not only more enduring against infection and negative middle ear pressure but also it has low re-perforation rates on long-term follow-up. Thus, cartilage may be preferred more often for primary tympanoplasties with high graft rate and hearing improvement [17].

Singh BJ, et al. (2009) [10] observed that PTA done in all cases had air conduction threshold range at 22.8-47.7 (mean: 32.3dB) and range of bone conduction threshold 6.6-13(mean 8.8dB). Average A-B gap were in a range of 16.2-41dB. In temporalis fascia mean hearing improvement was 9.3dB, tragal perichondrium 8.9dB, areolar tissue 8.9dB and in fat 6.8dB.

Saliba I (2008) conducted hyaluronic acid fat myringoplasty in 21 patients with hearing loss and safe perforation. They observed the mean AB gap improvement for operated ears was 17 dB and mean time of procedure was 10 min. Closure rate of perforation in this group was 100% so they concluded it as a n alternative to

traditional myringoplasty even for larger or total perforations [5].

S Harvinder, et al. (2005) [17] compared temporalis fascia with amniotic membrane in 50 patients. In the temporal fascia and human amniotic group, there was statistically significant difference between the preoperative and postoperative mean air conduction thresholds. In the temporal fascia group, of the 30 ears tested postoperatively, 22 ears (73.33%) demonstrated AB gap closure within 20dB, whereas in 20 ears tested in the human amniotic group, (95%), showed air bone gap closure within 20 dB.

Healing of perforation was complete in most of the cases in 2-3 month except in 2 cases where tragal perichondrium was used and it took about 4 months for healing. Failure rate in our study was 11.7%. Among the 7 cases of failure 2 were of temporalis fascia, 1 of tragal perichondrium and 4 of fat graft. Failure might be due to infection mainly and large perforation thereby getting poor blood supply and less attachment with the rim of perforation margins or may be due to poor hygiene and inattentive postoperative advice.

In our study, the most common post operative complication was the discharge from the ear which was seen in 2 cases of group A and 1 case of group B and 2 cases of group C. The discharging ears postoperatively responded to

conservative management. Another complication was granulation tissue formation at the tympanomeatal flap margin in 1 case of group A, and 1 case of group B who responded to curettage and TCA cautery and healing occurred. Aural polyp was seen in a case of group B which was managed by curetting it. There was no vertigo seen in any patient.

In our study preoperative mean A-B gap in group A, B and C was (26.01 ± 9.17 dB), (22.69 ± 12.43 dB), (18.97 ± 10.16 dB) respectively. Overall total pre-op AB gap was (23.56 ± 11.29 dB). Postoperatively mean AB gap was (12.32 ± 8.38 dB) in group A, (12.36 ± 12.40 dB) in group B and (6.33 ± 6.18 dB) in group C. Overall total AB gap was (10.33 ± 9.62 dB). Mean improvement in hearing was (12.32 ± 8.42 dB), (10.38 ± 5.73 dB) and (12.62 ± 8.06 dB) in group A B and C respectively. In our study we achieved satisfactory anatomical and hearing gain results which are comparable to other reported studies in the literature.

Conclusion

In temporalis fascia mean hearing improvement was 9.3 dB, tragal perichondrium 8.9 dB, and in fat 6.8 dB. Temporalis fascia graft has good improvement of hearing when compared to other grafts in study. Ear lobule fat when used in small perforations has encouraging results.

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