

## Outcomes of Minimally Invasive Tympanoplasty: Fat Graft Myringoplasty

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### Abstract

#### Introduction:

Fat tympanoplasty is repair of small dry tympanic membrane perforations using fat as graft material. It is a simple office procedure with minimal morbidity and manipulation of the middle ear.

#### Materials and Methods:

The present study was a prospective review of 60 patients who underwent fat tympanoplasty over the period of 15 months. In all the patients fat was harvested from ear lobule.

#### Results:

Patients were kept on follow up for 3 months and evaluated for graft uptake and hearing gain. 86.66% closure rate of tympanic membrane defect was achieved. Postoperative air conduction was  $29.6 \pm 5.3$  while air bone gap was  $13.2 \pm 6.1$ .

#### Conclusion:

The study concludes that fat plug myringoplasty is a simple, quick, less invasive method to repair small tympanic membrane defects.

**Keywords:** Chronic suppurative otitis media, Endoscopic ear surgery, Minimally invasive surgery

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## Introduction

Discharging ears has been a widely known problem affecting many people especially in developing countries. Wormold has defined the surgical closure of the tympanic membrane perforation without ossicular reconstruction as myringoplasty (1). It is one of the most common surgical procedures in otology. First myringoplasty was performed by Marcus Bancroft in 1640 (2). All along during the evolution of tympanoplasty various grafts have been used. In 1961, Storrs used temporalis fascia to close tympanic membrane perforation. Temporalis fascia has been the most popular and widely used graft material. Ringenbergs was the first one who reported the use of fat as a graft in tympanoplasty (3). Ever since various studies have used fat for small tympanic membrane perforation reconstruction (4-9). Fat graft can be easily obtained from the ear lobules

of the operated ear as well as from abdominal fat (10).

Fat Graft Myringoplasty (FGM) is usually performed as a day-care office based procedure under local anaesthesia. During the procedure, the middle ear remains untouched. The technique is thus cost effective and produces minimal discomfort to the patient.

The present paper reports our firsthand experience with fat graft myringoplasty using transcanal endoscopic repair with fat graft.

## Materials and Methods

In our prospective intervention study, 60 patients were selected, operated and followed up. Study period: Study was conducted between June 2022- September 2023

Inclusion criteria: The selection criteria applied was published by Fiorio and Barbieri for their study in 2007 (Table 1) (6).

**Table 1:** Criteria followed for admission to fat graft myringoplasty

1. Period of time elapsed from previous surgery equal to or longer than 6 months.
2. Perforation of the pars tensa no larger than 5 mm.
3. Non-marginal localization, i.e. not involving the annulus or exposing the malleus handle.
4. Absence of calcific plaques or atrophic areas adjacent to the perforation.
5. Normal appearance of mucosa in the tympanic cavity.
6. Absence of any acute inflammation.
7. No history of middle ear discharge in the last 3 months.
8. No evidence of cholesteatoma.
9. No planned ossicular reconstruction.
10. Absence of major Eustachian tube dysfunction.

Exclusion criteria: Those patients not fulfilling the above criteria were excluded from the study.

Informed consent was obtained after thoroughly explaining the procedure. Before the surgery all patients underwent complete ENT checkup to exclude any nasal or eustachian tube dysfunction. Audiometric evaluation and basic haematological tests were done preoperatively. All of the operations were performed under local anaesthesia by the same surgeon. The evaluation of hearing was done preoperatively and in the 3rd postoperative

month. The amount of closure of the air bone gap at 0.5, 1, 2, 4 kHz was the parameter of hearing improvement.

### Surgical technique

The ears were prepared with standard antiseptic precautions. Xylocaine 2% with adrenaline 1 in 200,000 infiltrations was used to achieve local anaesthesia in ear canal and ear lobe. The margin of perforation was de-epithelialized circumferentially. A curvilinear incision was given on the posterior aspect of the lobule and fat was harvested. The graft size

harvested was at least double the size of the perforation. The middle ear was filled with gel foam soaked in antibiotic drops, delivered via perforation to make a bed for the graft. The fat was wedged into the perforation in a dumb bell shape in order to avoid any inadvertent injury to middle ear structures. The graft was supported with antibiotic soaked gel foam filling the external auditory canal.

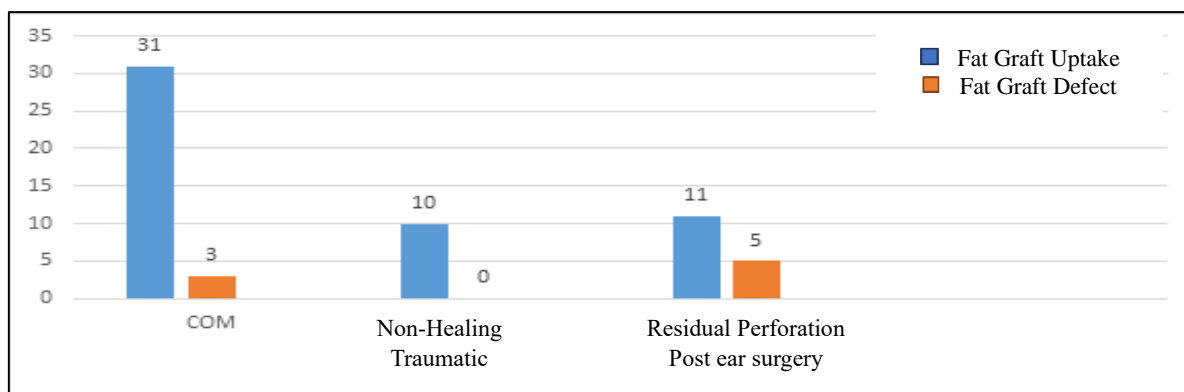
*Post operative care and follow up*

Patients were discharged two hours after the procedure with oral antibiotics and decongestants. Patients were instructed to keep their ears dry and to avoid blowing nose or straining. 1st postoperative follow up was done 1 week after surgery to inspect the wound. The gelfoam pieces in the ear canal were removed

at the end of the first month. Post-operative follow up was arranged once a week for the first month and every two months thereafter.

**Results**

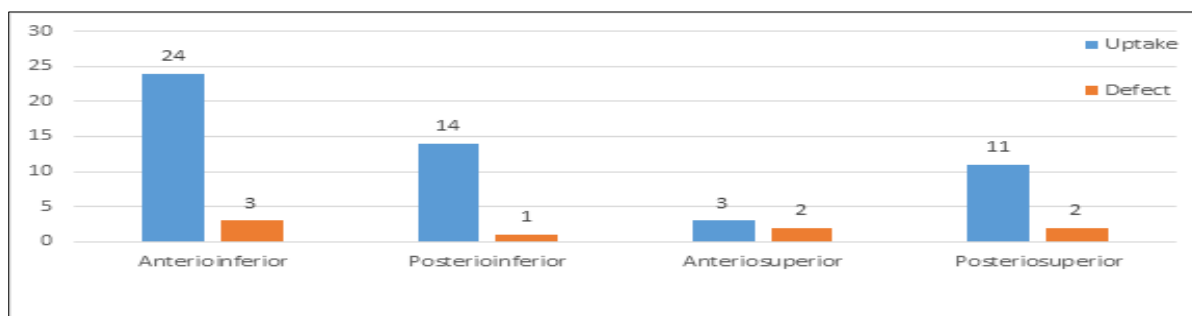
The present study was conducted on 60 cases over a period of 15 months. The gender distribution was nearly identical with 34 females and 26 males. The patients were aged between 15 -60 years with 45% patients in the age group of 31-45 years. 52 patients had unilateral, while 8 patients had bilateral perforations. 60% cases were primary (due to chronic otitis media or non healing traumatic perforations) and 40% were those with any residual perforation from previous ear surgery (Figure 1).



**Fig 1:** Relationship between cause of perforation and graft uptake

The association between gender, age, marginal myringosclerosis and graft uptake was statistically not significant ( $p > 0.05$ ). Graft

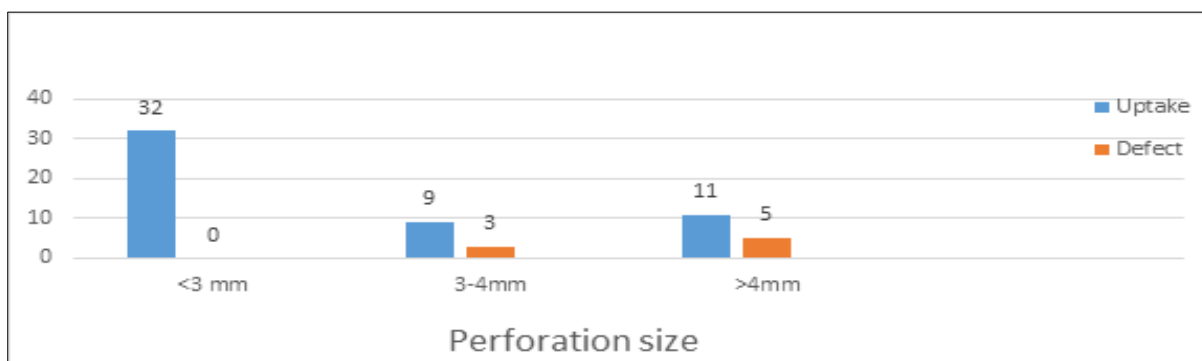
uptake was 93% ( $n=41$ ) when the perforation size was less than 4mm but only 68% when size was 4-5mm ( $n=11$ ) (Figure 2).



**Fig 2:** Relationship between perforation size and graft uptake

Out of 60, 42 patients had inferior quadrant perforation while 5 had anterosuperior quadrant perforation and 13 patients had posteriosuperior quadrant perforation (Figure 3). In general, perforations present posteriorly and inferiorly fared better than anterior and superior

perforations with graft uptake. Marginal myringosclerosis was present in 35% perforations ( $n=21$ ), however no significant difference was seen with graft uptake from that without sclerosis.



**Fig 3:** Relationship between site of perforation and graft uptake

In our study, graft uptake was present in 86.66% (n=52), while 13.34% (n=8) had residual perforation. Postoperative air conduction was  $29.6 \pm 5.3$  while air bone gap was  $13.2 \pm 6.1$  (Table 2).

**Table 2:** Comparison of preoperative and postoperative air conduction and air bone gap

	Preoperative	Postoperative
Air conduction	38.5+/-8.5	29.6+/-5.3
Air bone gap	17.6+/-7.2	13.2+/-6.1

A slight improvement in post-operative AC threshold and air-bone gap (ABG) was observed, but the difference was not statistically significant with the Wilcoxon sign rank test.

**Discussion**

Fat myringoplasty is a technically expedient procedure with minimal surgical manipulation of the middle ear and requires limited post-operative care. This procedure does not require any sedation or endotracheal intubation thus it can be carried out as a daycare procedure (11,12). Owing to the following facts it allows for simultaneous repair of bilateral tympanic membrane perforations.

In 1967, Ringenberg compared three donor sites for fat- ear lobule, abdomen and buttock, and concluded that the fat harvested from ear lobule showed better epithelial and mucosal tympanic growth due to high density of adipose cells (13). Other advantages of using ear lobule fat include it's harvesting from the same surgical site thus requiring less time, it leaves no visible scar mark and has no donor site morbidity.

In our prospective study with 60 patients, outcomes of fat tympanoplasty were evaluated in terms of graft uptake and hearing improvement after the procedure.

Graft uptake rate in present study was 86.6% (Figure 4,5).



**Fig 4:** Picture showing fat graft Intraoperative



**Fig 5:** Graft uptake 1 month post operative

Similar results were observed by Ringenberg, Deddens et al and Kaddour et al in their studies where the success rate were 86.5%, 89% and 80% respectively (3,12,14). In our study; factors like age, gender, laterality and presence of marginal myringosclerosis did not affect the outcome of the procedure.

In our study, the size as well as site of the perforation were the main criteria affecting the outcome of fat tympanoplasty, we found a closure rate of 93% in cases where size of perforation were less than 4 mm. Many studies done on fat tympanoplasty also show a direct relationship between the defect size and the graft uptake. Kaddour et al noted a closure rate of 80% if size of perforation is less than 30% of size of tympanic membrane (12).

Terry et al cited a closure rate of 79.4% if the perforation accounted for <50% of tympanic membrane (15). Similar results were concluded by Dedden et al where they found that graft uptake was better if the size of perforation was less than one quadrant (14). Our study concluded graft uptake rate of 94.44% in cases with posterior perforation. Similar results were published by Bertoli et al, where closure rate for anterior perforations was 67.7% while it was 89.2% in posterior perforations. In the study conducted by Fiorino and Barbieri as well as BandarAl-qahtani et al has also concluded a better graft uptake in patients with posterior perforation (16). In our study we observed an average improvement of 9db in air conduction which was comparable to the result observed by Ringenberg. Ambani et al concluded that hearing gain after a fat tympanoplasty was less than that of conventional tympanoplasty using temporalis fascia (17).

Studies conducted by Mahajan, Gangwani, Hagemann reported an average gain of more than 15db (5,18,19).

Difference in the results can be attributed to the fact that the patients were followed up till 3rd postoperative month and upto 3rd month there is significant bulging of the fat graft which can make tympanic membrane bulky thus decreasing the hearing gain. After 5th postoperative month, fat graft gets converted to a sclerotic area thus increasing the postoperative hearing gain (9). Kim and Gun et al also concluded bad hearing outcome in cases with large perforation (20,21). Failure in the graft uptake presented as graft detachment,

infection or dehiscence. Most common cause of graft failure was the use of undersized graft. It was more in the cases with anteriorly placed perforation.

The presence of anterior bony bulge and relatively poorer blood supply of the anterior part also contributed to poor outcomes in such cases. It is recommended to use graft size twice the perforation size with adequate lateral bulge.

### **Conclusion**

Fat graft myringoplasty is a useful but relatively unused method for repair of small tympanic membrane perforations.

It is a quick, minimal invasive, inexpensive, day care procedure which requires no intubation. During fat myringoplasty since annulus is not disturbed so the angle of tympanic membrane and anterior recess is maintained in the natural position. Unlike conventional tympanoplasty, postoperative recovery time as well as morbidity is minimal. Perforations larger in size and those which are anteriorly placed limits the use of fat graft tympanoplasty.

### **References**

1. Mohan B. Chronic suppurative otitis media and cholesteatoma, Diseases of ear, nose, throat, head and neck surgery. 1st edition.2013: 20.
2. Shambaugh and Glasscock. Surgery of the Ear. 1980. p. 411-412.
3. Ringenberg JC. Fat graft tympanoplasty. Laryngoscope 1962;72:188-192.44-51.
4. Kim DK, Park SN, Yeo SW, Kim EH, Kim JE, Kim BY, et al. Clinical efficacy of fat-graft myringoplasty for perforations of different sizes and locations. Acta Otolaryngol. 2011; 131:22-6.
5. Saliba I. Hyaluronic acid fat myringoplasty: how we do it. Clin Otolaryngol.2009;33(6):610-4.
6. Fiorino F, Barbieri F. Fat graft myringoplasty after unsuccessful tympanic membrane repair. Eur Arch Otorhinolaryngol. 2007; 264:1125-8.
7. Hagemann M, Hausler R. Tympanoplasty with adipose tissue. Laryngorhinootologie. 2003; 82(6): 393-6.
8. Liew L, Daudia A, Narula AA. Synchronous fat plug myringoplasty and tympanostomy tube removal in the management of refractory otorrhoea in younger patients. International journal of paediatric Otorhinolaryngology. 2002; 66:291-6.
9. Ozgursoy OB, YorulmazI. Fat graft myringoplasty: a cost-effective but underused procedure. J Laryngol Otol. 2005; 119:277-9.
10. Gross CW, Bassila M, Lazar RH, Long TE, Stagner S. Adipose plug myringoplasty: an alternative

to formal myringoplasty techniques in children. *Otolaryngol Head Neck Surg* 1989;101:617-20.

**11.** De S, Karkanevatos A, Srinivasan VR, Roland NJ, Lesser TH. Myringoplasty using a subcutaneous soft tissue graft. *Clin Otolaryngol Allied Sci* 2004; 29: 314-317.

**12.** Kaddour HS. Myringoplasty under local anaesthesia: day case surgery. *Clin Otolaryngol Allied Sci* 1992; 17:567-568.

**13.** Ringenberg JC. Closure of tympanic membrane perforations by the use of fat. *Laryngoscope*. 1978; 88: 982-93.

**14.** Deddens AE, Muntz HR, Lusk RP. Adipose myringoplasty in children. *Laryngoscope* 1993; 103:216-9.

**15.** Terry RM, Bellini MJ, Clayton MI, Gandhi AG. Fat graft myringoplasty- a prospective trial. *Clin Otolaryngol Allied SCI* 1998; 13:227-229.

**16.** Al-qahtani B, Al Tuwajiri M, Al Mokhatrish M. Fat myringoplasty and its impact on the Hearing Mechanism of Middle Ear. *Int J Otorhinolaryngol Clin* 2015;7(3):138-140.

**17.** Ambani KP, Gangwani RW, Bhavya BM, Vakhariya SD, Kataria AU. A comparative study between fat myringoplasty and temporalis fascia tympanoplasty in moderate to large central perforation of pars tension tympanic membrane. *Int J Otorhinolaryngol Head Neck Surg*. 2017 Oct; 3(4): 997-1001.

**18.** Mahajan R, Mahajan N, Kour B. Fat graft myringoplasty: A clinical study and review of literature. *Indian K Med Sci* 2021; 73:340-2.

**19.** Gangwani RW, Ambani KP, Vakharia SD, Bhavya BM, Kaatarkar AU. The efficacy of fat myringoplasty in small central perforation of pars tensa. *Int J Otorhinolaryngol Head Neck Surg* 2017; 3: 359-63.

**20.** Kim DK, Park SN, Yeo SW, Kim EH, Kim JE, Kim BY, et al. Clinical efficacy of fat-graft myringoplasty for perforations of different sizes and locations. *Acta Otolaryngol*. 2011; 131:22-6.

**21.** Gun T, Sozen T, Baztepe OF, Gur OE, Muluk NB, Cingi C. Influence of size and site of perforation on fat myringoplasty. *Auris Nasus Larynx*. 2014;41: 507-12.