



## A Comprehensive Study of Fat Graft Myringoplasty

### KEYWORDS

small central perforation, Fat graft myringoplasty.

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**ABSTRACT** A prospective cohort clinical study was conducted at Dr. D. Y. Patil Hospital, Kolhapur from May 2013 to March 2015. The aim was to evaluate the operative outcome of fat myringoplasty with respect to graft uptake, hearing improvement and complications. Total of 50 cases with tubo-tympanic type of CSOM with small central perforation (involving one quadrant and size not exceeding 25% of pars tensa) were operated for fat myringoplasty. Patients were followed up with ear microscopy at each follow up visit and an audiometry at the end of 6th month. Statistical analysis was done by 'Graphpad-Instat' software using unpaired t-test, all category variables are compared by using Z-test for proportion and chi-square test for p values. 42 (84%) cases had a successful graft uptake. The mean pre-operative audiometry AC threshold was 35.30dB +/- 4.05, the mean post-operative AC threshold was 24.43dB +/- 6.04 with a audiometric gain of 10.87dB +/- 5.28 which was statistically significant (2test, p< 0.0001\*). Except for residual perforation in 5 cases and AOM in 3 cases, no other complications were noted in rest of patients. Thus we conclude that fat graft myringoplasty has an excellent results with respect to graft uptake and hearing improvement in cases of small central perforation (less than 25% of pars tensa).

### INTRODUCTION

Ear forms one of the most important sensory organs of the body. It helps in the function of hearing and balance. It is divided anatomically into the external ear, the middle ear and the inner ear. Of the many diseases affecting various parts of the ear one common disease is Chronic Suppurative Otitis Media (CSOM) which affects the middle ear cleft<sup>(1, 2)</sup>. CSOM has a major impact on the social life of a person in the form of hearing disability<sup>(3)</sup>. Tympanic membrane perforations are as a result of infection (otitis media), trauma, tympanostomy tube insertion.

Tympanic membrane (TM) closure is one of the most common surgical procedures in otologic practice, myringoplasty has long been used for this purpose. Many reconstructive materials have been used for myringoplasty, but the use of autogenous materials began at the end of the 19th century<sup>(4)</sup>. Commonly used grafts are temporalis fascia<sup>(5)</sup>, fascia lata, vein graft, perichondrium & dura. Ringenber&Fornato<sup>(6)</sup> in 1962 reported primary closure of perforation of TM using fat graft in 86% of patients.

Myringoplasty is a surgical procedure to repair uncomplicated small perforations of the tympanic membrane. Fat graft myringoplasty (FGM) has many advantages compared with conventional myringoplasty using temporalis fascia:

- FGM is simple, cost-effective, and minimally invasive procedure.
- It can be performed under local anesthesia and as an day care/office based procedure.
- In this method possible complications of the classic techniques such as iatrogenic trauma and middle ear violation can be avoided<sup>(7)</sup>.

The present study was undertaken to evaluate the results

of fat graft myringoplasty with respect to graft uptake and hearing status. The objectives were to assess the graft uptake, to assess the improvement in hearing status after procedure, to assess operative outcome in relation to site of perforation of tympanic membrane and to study complications associated with fat graft myringoplasty.

### METHODOLOGY

A prospective cohort clinical study was carried out at D.Y.Patil Hospital and Research Institute, Kolhapur.

All patients between the age groups of 15-50 years attending to the ENT O.P.D. with complaints of ear discharge and deafness were screened by detailed history, clinical examination and otomicroscopy.

Those with a central perforation involving one quadrant of tympanic membrane were included in the study, the patients who had active disease were given a conservative treatment and were posted for surgery after the ear became inactive.

Routine investigations viz. Hb%, TC, DC, BT, CT, HIV, HbSAg etc. were done. Pure tone Audiometry was done in all cases. Patch test was done in all cases, in those cases which showed no improvement in hearing after patch test were excluded from the study due to possible involvement of ossicular chain and were advised tympanoplasty.

The detail procedure was explained in the vernacular language and those patients willing to give written consent underwent fat graft myringoplasty. All cases were operated under local anaesthesia with prior prophylactic oral antibiotic medication. Fat graft from ear lobule was used as a graft material. Patients were discharged on the same day. They received antibiotics for six days along with antihista-

mines. Analgesics were given as and when required.

All the cases were operated under local anaesthesia by endomeatal approach. The osseo-cartilaginous junction of the external ear canal was infiltrated with 2% xylocaine with 1 in 1,00,000 adrenaline. The ear lobule was also infiltrated in the posterior aspect. The margin of the perforation was denuded of epithelium circumferentially and excised with a sickle knife and cup forceps.

A small incision was made on the posterior aspect of the ear lobule and a large piece of fat (double the size of perforation) was harvested. The incision was closed using 4-0 chromic catgut. The middle ear was then packed with a single piece of gelfoam. The fat graft was inserted through the perforation in a dumb-bell fashion so that it covered both sides of the margins. The fat graft was thus positioned so that it fills the depth of the middle ear with a small part lateral to the tympanic membrane. The graft was supported with tiny gelfoam pledges soaked in antibiotic solution.

Follow up visits were scheduled as follows: every week for 1 and half month then after every fortnight for next 1 and a half month, followed by monthly once for next 3 months post operatively. Cases were subjected to pure tone audiometry pre operatively and 6 months post operatively to assess hearing improvement.

Results were tabulated and statistical analysis was done by using "Graphpad-Insat" software. All continuous variables are compared using unpaired t – test. All category variables are compared by using Z-test for proportion and chi-square test for p values. Graphs were prepared by using MS-Excel options. Probability value (p<0.05) is considered to be statistically significant.

**RESULTS**

**Table 1 : Graft uptake**

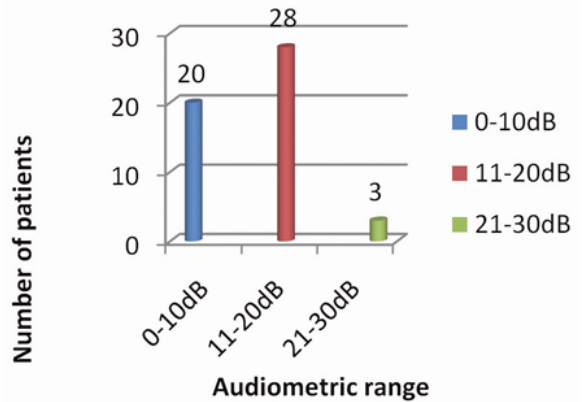
RESULTS	NO. OF CASES (%)
Graft taken	42 (84%)
Graft failure	08 (16%)

**Table 2 : Pre-operative audiometry**

CONDUCTIVE HEARING LOSS IN (dB)	NO. OF PATIENTS (%)
20-30	08 (16%)
31-40	40 (80%)
41-50	02 (4%)

**Table 3 : Post-op hearing gain**

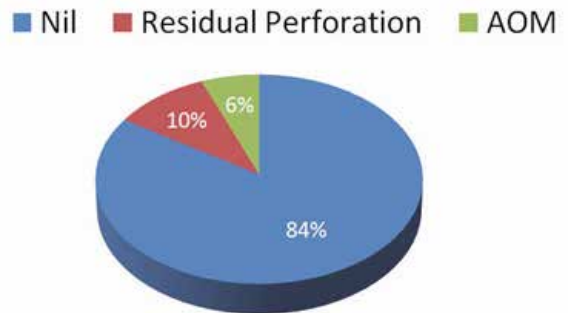
HEARING GAIN IN dB	NO. OF PATIENTS (%)
0-10	20(40%)
11-20	28(56%)
21-30	02(04%)



**Fig. 1 : Post operative audiometric gain**

**Table 4 : Post-operative complications**

POST-OP COMPLICATIONS	No. OF CASES
PRESENT	08
ABSENT	42



**Fig. 2 : Complications**

**DISCUSSION**

The prospective cohort clinical study was carried out on 50 patients attending ENT OPD of Padmashree D.Y.Patil Hospital and Research Centre, Kolhapur in the period from May 2013 to March 2015. The minimum age in the study was 19 years and the maximum was 50 years with a mean age of 34.06 years and a standard deviation of 9.92. Maximum number of patients were found in the age group between 25 to 34 years -20 cases (40%) and 35 to 50 years – 18cases (36%). Males comprised 74% (35 cases) and females comprised 26% (15 cases) showing male preponderance with a male-female ratio of 2.3:1, and the difference was statistically significant (p=0.0047\*).

All patients had complains of ear discharge and associated with one of following symptom i.e reduced hearing in 39 (78%) cases and pain in 25 (50%) cases.

Monoj et al(8) in his study found, All patients having complaint of ear discharge i.e 100% of cases followed by pain in 86% of cases and reduced hearing in 60% of cases. Seepana K et al(9) in his study reported that all patients had discharge and reduced hearing in 100% of cases followed by ear pain in 25% cases.

Our study had successful graft uptake in 42(84%) cases (Table 1,5), graft uptake with respect to site was as follows-higher posterior perforation closure rates i.e. 93.3% while

anterior perforation had closure rate of 80% and the difference was statistically significant (2test,  $p < 0.0005^*$ ).

**Table 5 : Graft uptake rates in recent studies**

Study	Year	No. of cases	Closure rates (%)
Fiorino et al <sup>(10)</sup>	2007	31	87.1
Vikas sinha et al <sup>(11)</sup>	2009	24	95.8
Peng Li et al <sup>(12)</sup>	2010	64	92.1
Dong- Kee-Kim et al <sup>(13)</sup>	2011	46	87
Monoj et al <sup>(8)</sup>	2012	50	92
Kelvin M Kwong et al <sup>(14)</sup>	2012	28	100
Udaipurwala et al <sup>(15)</sup>	2013	22	95.2
Manabendra et al <sup>(16)</sup>	2013	33	90.9
Peter L et al <sup>(17)</sup>	2014	21	80.9
Taylun Gun et al <sup>(18)</sup>	2014	172	84.7
Chandni et al <sup>(19)</sup>	2014	20	80
Seepana et al <sup>(9)</sup>	2015	12	83
Our study	2015	50	84

Out of 50 cases, the pre-operative pure tone audiometry showed that 8 cases had hearing threshold between 20-30dB, 40 patients had hearing threshold between 31-40 dB and 2 patients had hearing threshold between 41-50 dB (Table 2). The mean pre-operative pure tone average mean was 35.30 +/- 4.05dB (Table 6).

Post operative gain showed majority of patients 28 (56%) cases had gain in the range of 11-20dB, 20 (40%) cases had gain in the range of 0-10dB and remaining 2(4%) cases had gain in the range of 21-30dB. (Table 2) (Fig.1)

**Table 6 : Mean Audiometric Values**

STUDY	Mean Pre-op hearing threshold (dB)	Mean Post-op hearing threshold (dB)	Mean Audiometric gain (dB)
Manabendra et al <sup>(16)</sup>	33.83 +/- 4.41	17.83 +/- 2.84	16 +/- 4.02
Seepana et al <sup>(9)</sup>	31.67 +/- 3.21	21.09 +/- 2.72	10.58 +/- 4.81
Brown et al <sup>(20)</sup>	35 +/- 3.07	25.67 +/- 5.32	9.33 +/- 5.11
Our study	35.30 +/- 4.05	24.43 +/- 6.04	10.87 +/- 5.28

In our study we found, the mean pre operative hearing threshold (dB) was 35.30 +/- 4.05 and after procedure the mean hearing threshold (dB) was 24.43 +/- 6.04 and there was a mean gain of 10.87 +/- 5.28 (Table 6), which was statistically significant (2test,  $p < 0.0001^*$ ).

Manabendra et al(16) in their study found, the mean pre-operative hearing threshold (dB) was 33.83 +/- 4.41 and after procedure the mean hearing threshold (dB) was 17.83 +/- 2.84 and there was a mean gain of about 16 +/- 4.02, which was comparable to our study.

Seepana et al(9) in their study found following observations , the mean pre-operative hearing threshold (dB) was 31.67 +/- 3.21 and after procedure the mean hearing threshold (dB) was 21.09 +/- 2.72 and there was a mean gain of about 10.58 +/- 4.81, the values were similar to our study.

In study by Brown C et al(20) the mean pre-operative hearing threshold (dB) was 35 +/- 3.07 and after procedure the mean hearing threshold (dB) was 25.67 +/- 5.32 and there was a mean gain of about 9.33 +/- 5.11 and was in comparison with our study.

Out of 50 cases complications took place in 8 patients , 5 had residual perforation and 3 had developed Acute Otitis Media (Table 4,7)(Fig. 2)

**Table 7 : Complications**

COMPLICATION	Fiorino et al <sup>(10)</sup>	Peng Li et al <sup>(12)</sup>	DK Kim et al <sup>(13)</sup>	Our study
AOM	1	1	2	3
Resd.Perforation	3	4	4	5

Fiorini and Barbieri(10) in their study had 4 failures out of which 1 had ear discharge and 3 had residual perforation ,the cause of the failure was attributed to active infection with purulent discharge occurring immediately after the procedure, such cases were managed conservatively. Peng Li et al(12) in their study had 5 failures out of which 1 had ear discharge and 4 had residual perforation. Dong- Kee-Kim et al(13) had 6 failures out of which 2 had ear discharge and all ended up with residual perforation. Of which 4 had small pin point perforation which did not require any treatment and remaining 2 had to undergo tympanoplasty.

In our study 3 cases had active ear discharge on first follow up visit due to acute otitis media, discharge stopped with conservative treatment but finally ended up with residual perforation, they were advised tympanoplasty, 5 other cases had residual perforation, Failure in these 5 cases may be due - anteriorly located perforations, inadequate graft support, incomplete visualization of margins due to anterior canal bulge and proximity to Eustachian tube opening. All these cases were surgically managed by classical type I tympanoplasty.

## CONCLUSION

Fat Graft Myringoplasty has an excellent results with respect to graft uptake and hearing improvement in cases with a small perforation (less than 25% of pars tensa). Ear Lobule fat can be easily harvested in a very short time and there is no visible scar and minimal donor site morbidity. As there is virtually no manipulation of the middle ear structures, the risk of iatrogenic otological trauma is low. It avoids general anaesthesia and can be performed as an office based procedure. It causes minimal discomfort to the patient and is a cost effective technique with minimal complications. So, fat myringoplasty can be a preferred procedure in the management of cases with mucosal (Tubo-tympanic) type of COM with small, dry perforations of the tympanic membrane

## REFERENCES

- George G Browning, Saumil N Merchant, Gerard Kelly, Iain RC Swan, Richard Canter and William S McKerrow. Scott-Brown's otolaryngology, head and neck surgery. 7<sup>th</sup> edition. Chronic Otitis Media. Chapter 237c, Vol.3. Pages-3396-3445.
- Quinton Gopen. Glasscock-Shambaugh, Surgery of the ear. 6<sup>th</sup> edition. Pathology and clinical course of the inflammatory diseases of the middle ear. Chapter 25. Pages- 425-436.
- Y Matsuda, T Kurita, Y Ueda, S Ito, T Nakashima. Effect of tympanic membrane perforation on middle-ear sound transmission. The Journal of Laryngology & Otology (2009), 123 (Suppl. S31), 81-89.

4. Storrs L. Myringoplasty with the use of fascia grafts. *Archives of otolaryngology*, 1961; 74 : 45-49.
5. P.Misale, B.Patil, R.Mane, A.Mohite. A study of type I Interlay tympanoplasty. *Annual Journal of University Research* 2014 ; 4:181-89.
6. Ringenberg J.C, Fornato E.J. 1962 : The fat graft in middle ear surgery. *Archives of otolaryngology*, 76 : 407-413.
7. Terry RM, Bellini MJ, Clayton MI, Gandhi AG. Fat graft myringoplasty--a prospective trial. *ClinOtolaryngol Allied Sci* 1988;13:227-9.
8. MonojMukherjee, RanjanPaul. Minimizing myringoplasty: Repair of Small Central Perforation of Tympanic Membrane by Fat Graft: A Prospective Study Indian J Otolaryngol Head Neck Surg Feb.2012; 65(4) : 302-04
9. Seepana M Rao, P Ramesh Chandra, George pallapati-A comprehensive study of fat myringoplasty. *ORL journal* 2015; 5 : 8-13.
10. Fiorino F, Barbieri Fat graft myringoplasty after unsuccessful tympanic membrane repair *Eur Arch Otolaryngol* 2007; 264:1125-1128.
11. Vikas sinha, Viral A. Chhaya et al : Fat plug myringoplasty : Cost effective surgery with high success rate for small central perforation. Vol 2-2 oct10, 2009.
12. Peng Li, Qin-tai Yang, Yong-Qii, WeiLiu, Tao Wang , Yuan Li. The selection and strategy in otoendoscopic myringoplasty with autogenous adipose tissue . *Indian J Otolaryngol Head Neck Surg* 2010;62:25-28
13. Dong-Kee Kim, Shi-Nae Park, Sang Won Yeo, EunHye Kim, Ji-EunKim, Boo-Young Kim, Min-Ji Kim & Young-Ho Park . Clinical efficacy of fat-graft myringoplasty for perforations of different sizes and locations. *Acta Oto-Laryngologica*, 2011; 131: 22-26.
14. Kelvin M. Kwong , Matthew M. Smith, James M. Coticchia. Fat graft myringoplasty using umbilical fat. *International Journal of Pediatric Otorhinolaryngology* 2012; 1098-1101
15. Udaipurwala IH, Farrukh MS, Shaikh SM, Haq EU, Farooq U. Efficacy of fat plug myringoplasty in small and dry perforations of pars tensa. *Med Channel J* 2013;16:1-5.
16. Manabendra Debnath, Swagat Khanna .A Comparative Study of Closure of Tympanic Membrane Perforation between Chemical Cauterization and Fat Plug Myringoplasty. *International Journal of Otolaryngology and Head & Neck Surgery* 2013; 2: 248-252
17. Peter L. Santa Maria, John S. Oghalai . Is Office-Based Myringoplasty a Suitable Alternative to Surgical Tympanoplasty? *The Laryngoscope* 2014; 124:1053-54
18. Taylan Gun , TefvikSozen , Osman FatihBoztepe , OzerErdemGur , Nuray Bayar Muluk , CemalCingi. Influence of size and site of perforation on fat graft myringoplasty. *AurisNasusLarynx* 2014;41:507-512.
19. Chandni Sharma, Jagat Singh, Vikas Kakkar, S. P. S. Yadav, Priya Malik, Surender Bishnoi. Fat graft myringoplasty in small central Perforations. *Indian Journal of Otology* 2014 ; 20 : 211-14.
20. Brown C, Yi Q, McCarty DJ. The success rate following myringoplasty at the Royal Victorian Eye and Ear Hospital. *Australian Journal of Otolaryngology*; 2002 Apr.