Bodat R et al. GAIMS J Med Sci 2024;4(2) (Jul-Dec):83-87
Online ISSN: 2583-1763

Original Research Article

Comparison of Outcomes of Endoscopic Fat Plug Myringoplasty and Chemical Cauterization for Closure of Small Central Tympanic Membrane Perforations

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ABSTRACT

Background
Various graft materials have been used for closure of small tympanic membrane perforations with varying success rates. This study was done to compare the success rates of endoscopic fat plug myringoplasty (EFPM) and chemical cauterization for managing small TM perforations.

Methodology
This was a prospective study conducted in ENT Department of a teaching hospital of western Gujarat from November 2020 to December 2022. 50 patients with small central dry perforation were randomly divided into 2 groups. 25 patients in Group A underwent endoscopic fat plug myringoplasty (EFPM) and 25 in Group B underwent trichloroacetic acid (TCA) application (chemical cauterization). At the end of 3 months (last follow-up) the perforation closure rates and hearing improvement were compared between the two groups.

Results
Out of 50 participants, 20 (40%) were males and 30 (60%) females. 36% participants belonged to 31-40 years of age group. The perforation closure with EFPM was significantly higher than chemical cauterization (92% vs 64%, p=0.0168) measured at 3 months follow-up. Similarly, the post operative hearing improvement was significantly better with EFPM that with chemical cauterization (p=0.0168).

Conclusions
EFPM is an effective method for managing small central tympanic membrane perforations. It is a day-care procedure and success rate is equal or even better than other modalities of managing small TM perforations. This method should be used more often.

Keywords: Chemical cauterization, CSOM, Endoscopic Fat Plug Myringoplasty, TCA, Tympanic membrane perforation

INTRODUCTION

Chronic Suppurative Otitis Media (CSOM) is a long-standing infection of a part or whole of the middle ear cleft characterized by ear discharge and a permanent perforation.[1] A perforation is small when it involves only one quadrant of the tympanic membrane (TM). Management of small central perforation ranges from no intervention to surgical repair. Various graft materials have been used to close the tympanic membrane perforations with varying success rates. During the period from the 17th to the 19th century, several methods have been attempted at closing the tympanic membrane perforation. At first, closure of the perforation was tried with a prosthesis. Ivory tube (Banzer 1640), rubber disc (Toynbee1853), paper disc

(Blake 1887) and various other materials were used.[2] In 1876, Roosa used cauterizing agents to promote the healing of tympanic membrane perforations and he used a silver nitrate bead,[3] while trichloroacetic acid (TCA) was first advocated in 1895 by Okuneff and it still remains the most popular chemical used for this purpose.[4] In 1919 Joynt combined both cautery and paper patch technique and Linn used a moist cotton ball with repeated cautery at weekly intervals. Both these techniques were very effective. The method by Linn was modified and popularized by Derlacki and Wright in 1953.[5] In CSOM with small perforations, Endoscopic Fat Plug Myringoplasty (EFPM) can be done with lesser morbidity. It can be done as an office procedure and patients are sent home on the same day of procedure.[6]

This study was done to compare the outcomes of chemical (TCA) cauterization and EFPM for closure of small central TM perforations.

METHODOLOGY

This was a prospective study conducted in ENT Department of a teaching hospital of western Gujarat from November 2020 to December 2022. IEC approval was taken before starting the study (Letter No. GAIMS/IEC/Approval/2021/40). Clinical evaluation of the patients included history, ENT examination and pure tone audiometry (PTA). Pre-operative blood reports and X-Ray Schuller's view were done for all patients. 50 patients with small central dry perforation were randomly divided into 2 groups. 25 patients in Group A underwent endoscopic fat plug myringoplasty (EFPM) and 25 in Group B underwent TCA application. Informed consent was obtained prior to procedures.

Group A (EFPM): All the cases were done under local anesthesia with 2% xylocaine with adrenaline injected in post-aural region and in the external auditory canal. An additional amount was injected on ear lobule. An 8-10 mm incision was made on the posterior or inferior aspect of the ear lobule. A single piece of fat, approximately twice the size of the perforation, was harvested (Figure-1) taking care not to make a buttonhole on the anterior surface of the lobule. The skin incision was sutured with silk. Using a zero-degree endoscope, the margins of the perforation were trimmed and de-epithelialized using a sickle knife. Small pieces of gel foam were placed in the middle ear through the perforation. The piece of fat was positioned in such a way that equal proportion lied medially and laterally to the tympanic membrane and fit the perforation snuggly like a dumbbell or hourglass (Figure-2). The fat plug was overlaid with antibiotic soaked gel foam. These gel foam pieces prevent the displacement of the fat plug by supporting it from the both sides. The patient was discharged after 2-3 hours with the instructions to keep the ear dry.

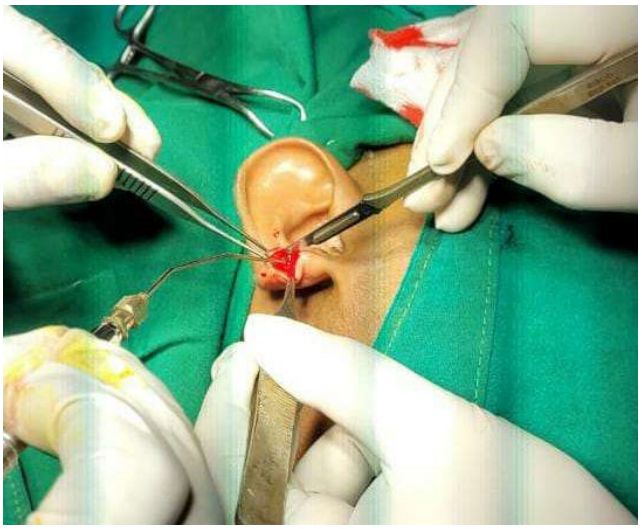

Figure-1: Harvesting fat from ear lobule

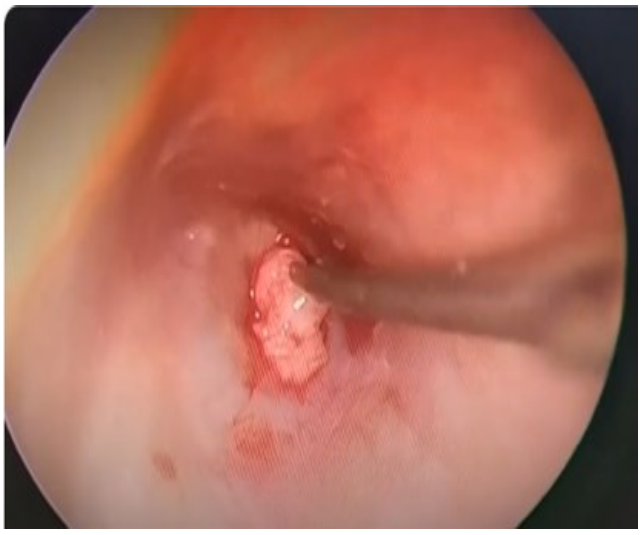

Figure-2: Under endoscopic view fat snuggly fit through small TM perforation (like a dumbbell or hourglass)

Group B: Cautery of perforation margin was carried out with 50% TCA. A small bead of cotton was tightly wound to the end of a fine metal applicator and moistened with TCA. The excess acid was removed from the applicator by touching it to an absorbent tissue paper or cotton. The applicator tip was stroke over the edge of perforation in an inward to outward direction producing a solid white eschar. The procedure was repeated at weekly intervals for 5 weeks. All patient were asked for follow up on every week for two weeks and every month for next 3 months. At 3 months follow up, perforation closure rate and hearing thresholds were measured.

The data so collected was entered in MS Excel sheet and statistical analysis was done using SPSS Software version 25.

RESULTS

Figure-3 shows the age and gender wise distribution of patients. Maximum participants (36%) belonged to 31-40 years of age group in which 5 were males and 13 were females. The minimum number of participants belonged to 11-20 years of age group in which 2 were males and 2 were females. Total 8 patients were within the 41-50 years of age group and 10 patients belonged to 21-30 years of age group. There were 10 patients above 50 years of age. In present study, there were 30 female patients (60%) and 20 male patients (40%). The F:M ratio was 1.5:1.

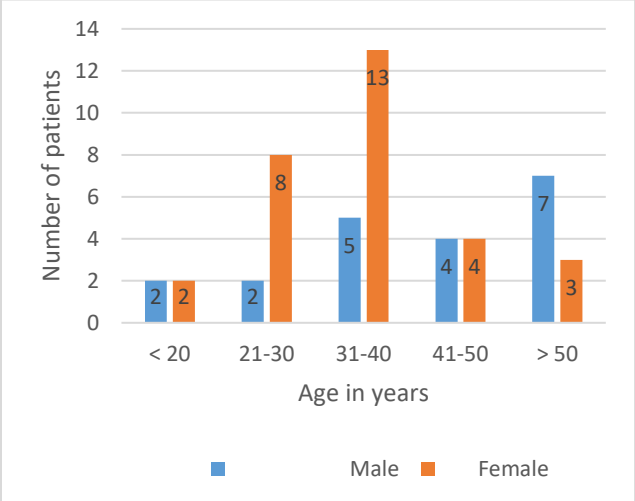

Figure-3: Age and Gender wise distribution of study participants

In the present study, there were more patients with right ear small central perforation as compared to left; 27 and 23 respectively. Out of 27 patients with right ear small central perforation, 12 had < 26 dB of hearing loss, while remaining 15 patients had > 26 dB of hearing loss. Out of 23 patients with left ear small central perforation 12 had < 26 dB of hearing loss, while remaining 11 patients had > 26 dB of hearing loss. There was no statistical association found between side of ear involved and pre-operative hearing loss (Table-1).

As can be seen in Table-2, the perforation closure with EFPM was significantly higher than chemical cauterization (92% vs 64%, p=0.0168). Table-3 compares the post-operative hearing status between two groups. 23 patients who underwent EFPM had post-operative hearing loss of < 26 dB as compared to 16 patients with chemical cauterization (p=0.0168).

Table-1: Pre-operative hearing status of patients

Pre-operative hearing thresholds (dB)	Right ear	Left ear	Total	*p*-value
< 26 dB	12	12	24	0.5855
26-40 dB	15	11	26	
Total	27	23	50	

Table-2: Comparison of perforation closure between two groups (at 3 months follow-up)

Intervention	Healed perforation	Residual perforation	p-value
EFPM	23 (92%)	2 (8%)	*P=0.0168*
Chemical cauterization	16 (64%)	9 (36%)	

Table-3: Post-operative hearing status of patients

Post-operative hearing thresholds (dB)	EFPM	Chemical cauterization	Total	*p*-value
< 26 dB	23 (92%)	16 (64%)	39	*P=0.0168*
26-40 dB	2 (8%)	9 (36%)	11	
Total	25	25	50	

DISCUSSION

In present study, maximum number of participants belonged to 31-40 years of age. The mean age of group A (EFPM) was 42.3 ± 16.6 years and the mean age of group B was 35.47 ± 12.37 years. In this study, there were 30 female patients (60%) and 20 male patients (40%). The F:M ratio was 1.5:1. The female preponderance was also observed in Sayed M et al,[7] Diaz AR et al.[8] While, in a study by Mourya et al,[9] male study participants were more in numbers than females. This may be due to different admission rate among various hospitals.

In the present study, there were more patients with right ear small central perforation as compared to left ear small central perforation, 27 (54%) and 23 (46%) respectively. In

a study by Rana AK et al,[10] 289 (37.50%) patients had right ear perforation and 342 (44.53%) left ear perforation. Out of 27 patients with right ear small central perforation 12 had < 26 dB of hearing loss, while remaining 15 patients had 26-40 dB of hearing loss. Out of 23 patients with left ear small central perforation 12 had < 26 dB of hearing loss, while remaining 11 patients had 26-40 dB of hearing loss. There was no statistical association found between side of ear involved and pre-operative hearing loss with p value of 0.585. Ibekwe TS et al[11] found that the most common locations of the TM perforations were 60 (77.9%) central, 6 (9.6%) antero-inferior, 4 (5.2%) postero-inferior, 4 (5.2%) antero-superior and 3(3.9%) postero-superior respectively with sizes ranging from 1.51%–89.05%, and corresponding hearing levels 30 dB-80 dB (59% conductive and 41% mixed). Fifty-nine percent had pure conductive hearing loss and the rest mixed. Hearing losses (dBHL) increased with the size of perforations (P = 0.01, r = 0.05). Correlation of location of perforations with magnitude of hearing loss in acute TM perorations was (P = 0.244, r = 0.273) and for chronic perforations (p = 0.047 & r = 0.31).

In the present study, the perforation closure rate with EFPM was significantly higher than chemical cauterization (p=0.0168). In the research done by Dhote, K. S et al,[12] Closure of perforation in patients undergoing fat plug myringoplasty was seen in 29 patients while fat got displaced in 1 patient and there was a residual perforation. Closure of perforation in patients undergoing TCA cauterization (Group B) was achieved in 29 patients while 3 patients did not show any signs of improvement even at the end of 5 sittings and hence the procedure was abandoned in them. The high failure rate of chemical cauterization might be because of defaulted patients who do not come for follow up. In current study, the post operative hearing improvement was significantly better with EFPM that with chemical cauterization (p=0.0168). Similar findings were seen in study by Dhote KS et al.[12]

Various grafting materials are used for myringoplasty with varying outcomes. The choice of graft affects not only the outcome of surgery, but also determines the complexity of the procedure and the time taken for the same. The purpose of this study was therefore to qualitatively and quantitatively assess the results of myringoplasty for small central perforations of the tympanic membrane using fat as grafting material, in terms of post-operative closure of the Air-Bone Gap and perforation closure. The results have been quite encouraging. The most critical factor that determines the outcome of this procedure is proper patient selection. Factors that can be responsible for failure include improper technique (especially of fat placement), anatomical factors (bony overhangs obscuring the view of the rim of the perforation) and post-operative infection. Table-4 summarizes the success rate of fat myringoplasty in different studies.

Table-4: Outcome of fat myringoplasty in previous studies

Author	Number of ears operated (n)	Success rate (%)
Terry RM et al[13]	50	76 % (at 12 months)
Chalishazar U[14]	20	90 %
Landsberg R et al[15]	38	81.6%
Mukherjee M et al[16]	50	92%
Present study	25	92%

CONCLUSIONS

EFPM is an effective method for managing small central tympanic membrane perforations. It is a day-care procedure and success rate is equal or even better than other modalities of managing small TM perforations. This method should be used more often.

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Source of support: Nil

Conflict of interest: None declared

How to cite: Bodat R, Pillai B, Hirani N, Khilnani AK, Sorathiya R, Parmar M. Comparison of Outcomes of Endoscopic Fat Plug Myringoplasty and Chemical Cauterization for Closure of Small Central Tympanic Membrane Perforations. GAIMS J Med Sci 2024;4(2):83-87.

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