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Original article

FAT PLUG MYRINGOPLASTY: ANALYSIS OF A SAFE PROCEDURE FOR SMALL TYMPANIC PERFORATIONS

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Summary

Objective: Assessment of value of fat plug myringoplasty as office-based procedure in small tympanic membrane perforations.

Material and Methods: Prospective study of consecutive patients undergoing fat plug myringoplasty under local anesthesia. Minimum follow-up considered was 6 months, which included several microscopic examinations. All data were recorded and analyzed statistically.

Results: 33 patients matched the inclusion criteria; the mean perforation size was 2.8 mm. No change in PTA was noted after surgery in the whole series. Recurrence of perforation was detected in 7 cases (21%), which was statistically related with the cause of perforation rather than location or size (p-value <0.01).

Conclusions: Fat plug myringoplasty is a safe procedure with very low rate of complications, and it is an office-based procedure well tolerated by all patients. Results in case of primary surgery are excellent, with a high success rate (90%). In case of recurrent perforation after traditional surgery, success rate get decreased.

Introduction

Fat Plug Myringoplasty (FPM) has been employed since 1962 in repair of small tympanic membrane perforations (1). Ringenberg in its original paper described a technique which included: raising of a tympanomeatal flap for exploration of the middle ear and placement of fat graft lateral to tympanic membrane perforation (2). FPM operation is done without entering into middle ear or raising of tympanomeatal flap. It is performed under local anesthesia as an office-based procedure. Fat graft is plugged in through the perforation. Furthermore, is very cost effective and is well tolerated by patients. There is least fear of getting revision surgery done (if previous operation was performed under general anesthesia) as all maneuvers are approached by external auditory canal without violating the middle ear with incision or flap elevation. It is

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widely accepted that FPM is most suitable for small perforations involving not more than 25-30% of the tympanic membrane (3-6). As evidenced by Landsberg et al. the success rate of FPM is not related to the size of perforation, and not reported the statistical significant difference between perforation sized 1 to 4 mm and those sized 4 to 6 mm (7).

In this prospective study, we reported our experience on fat plug myringoplasty, focusing also on causes of recurrence.

Material and Methods

All consecutive patients with tympanic membrane perforation referring to our institutions were evaluated for this study, which included: personal data recording, addressed detailed history, thorough nose and throat, with microscopic ear examination, and pure tone audiometry. The inclusion criteria to undergo FPM were: perforation of the pars tensa of the membrane, size of perforation (between 2 to 5 mm), and duration (at least 3 months). There should be clear transcanal localization of perforation with no active infection, with intact ossicles, normal or near-normal hearing (threshold < 30 dB). There should be no history of cholesteatoma surgery. The surgical procedure was done under local anesthesia, and patients were discharged 1 hour after surgery with postoperative oral antibiotics for seven days. The postoperative follow-up was scheduled with periodical microscopic examination at: 7-10 days, 20-25 days, two months, three months and six months. The last visit included pure tone audiometry.

Data were entered in a database created within EpiInfo 3.5.1 software. All the data were analyzed using the R statistical software package. Absolute and relative frequencies were calculated for qualitative variables, while quantitative variables were summarized as mean (\pm standard deviation and range). Categorical variables were analyzed using the chi-square test (Mantel-Haenszel). Odds ratio (OR) with 95% confidence intervals (95% CIs) were also calculated. Differences in means were compared with the Student t-test. The significance level chosen for all analysis was 0.05, two-tailed. All patients

signed an informed consent before the treatment and our Review Board approved study.

Surgical Technique

The procedure was performed under local anesthesia with topical application of a cotton ball soaked in lidocaine, and 2% lidocaine with 1:100.000 of adrenaline is injected at the donor site of fat. Fat is harvested from the ear lobule (posteriorly). The cotton ball is removed from the ear canal and the residual fluid is aspirated. The margins of the perforation are refreshed by removal of the epithelium along the perforation margins. The fat is sized about twice of the perforation diameter and is plugged through the perforation as an hourglass, keeping in mind that no space has to be left between the graft and margins of the perforation. The ear canal is left without dressing and the patient is instructed to maintain the ear dry, with avoidance of nose blowing and physical efforts.

Results

Of the 51 patients referred from March 2010 to March 2012 with eardrum perforation, only 33 matched the inclusion criteria. The mean age of the series was 45 years with 17 females and 16 males. The side most frequently involved was the left in 20 patients and the right in 13 patients. The mean perforation size was 2.8 ± 0.99 mm (range: 2 – 5 mm) with the following distribution: 2 mm in 18 patients (54.5%), 3 mm in 6 patients (18.2%), 4 mm in 7 patients (21.2%) and 5 mm in 2 cases (6.1%). The mean follow-up was 11.6 ± 4.8 months (range: 6 – 21 months). There was no change in PTA postoperatively in the whole series. All the data are summarized in Table 1, including location and cause of perforation. No scar of the ear lobule was found after follow-up. Postoperative period was uneventful. A recurrence of perforation was detected in 7 cases (21%), and this was statistically related with the cause of perforation rather than location or size as showed in Table 2. The prevalence of recurrent perforation after FPM in those cases done after traditional myringoplasty failure was statistically signifi-

cant p-value <0.01 (Figure 1).
 Recurrence of perforation occurred in 7 cases out of which 2 had a previous tube insertion, 1 had a residual perforation as complication of purulent otitis media, and 4 had a history of previous myringoplasty operation. Among 7 patients

with recurrence 4 underwent to cartilage myringoplasty and 3 refused further treatment.

Discussion

The true myringoplasty is a repairing of eardrum without elevation of the annulus

Age, mean in years ± SD (range)	45.1 ± 18.5 (12-73)
Gender, n (%)	
- Male	16 (48.5)
- Female	17 (51.5)
Side, n (%)	
- Left	20 (60.6)
- Right	13 (39.4)
Size diameter, mean in mm ± SD (range)	2.8 ± 0.99 (2-5)
Follow-up, mean in months ± SD (range)	11.6 ± 4.8 (6-21)
Pre PTA, mean in dB ± SD (range)	21.8 ± 8.9 (10-35)
Post PTA, mean in dB ± SD (range)	21.8 ± 8.9 (10-35)
Location, n (%)	
- Central	15 (45.5)
- Anterior	12 (36.4)
- Posterior	6 (18.2)
Cause, n (%)	
- Tube	14 (42.4)
- Infection	8 (24.2)
- Trauma	6 (18.2)
- Surgery	5 (15.2)
Complication, n (%)	
- Recurrence	7 (21.2)
- No	26 (78.8)

Table 1: Sociodemographic characteristics, audiometric outcomes and tympanic perforation characteristics of the patients (n=33)

or entrance into the middle ear. The repairing of small to medium perforation of the tympanic membrane could be obtained in several ways with myringoplasty. Chemical cauterization of the perforation margins as described in 1953 may promote the healing and the closure of defect, but may require several appli-

cations (average of 3.7 treatments) (8). The paper patch myringoplasty was found effective for small perforation (under 5 mm) also for patients with chronic otitis (9), but compared with fat graft it is having less efficacy to prevent recurrence (10). The FPM is known since its first descrip-

	Perforation complication		p-value
	Recurrence (n=7)	Not Recurrence (n=26)	
Side, n (%)			
- Left (n=20)	3 (42.9)	17 (65.4)	0.25
- Right (n=13)	4 (57.1)	9 (34.6)	
Location, n (%)			
- Central (n=15)	1 (14.3)	14 (53.8)	0.08
- Anterior (n=12)	3 (42.9)	9 (34.6)	
- Posterior (n=6)	3 (42.9)	3 (11.5)	
Cause, n (%)			
- Tube (n=14)	2 (28.6)	12 (46.2)	<0.01
- Infection (n=8)	1 (14.3)	7 (26.9)	
- Trauma (n=6)	0 (0)	6 (23.1)	
- Surgery (n=5)	4 (57.1)	1 (3.8)	

Table 2: Relation between tympanic perforation recurrence with side, location and cause of perforation (n=36)

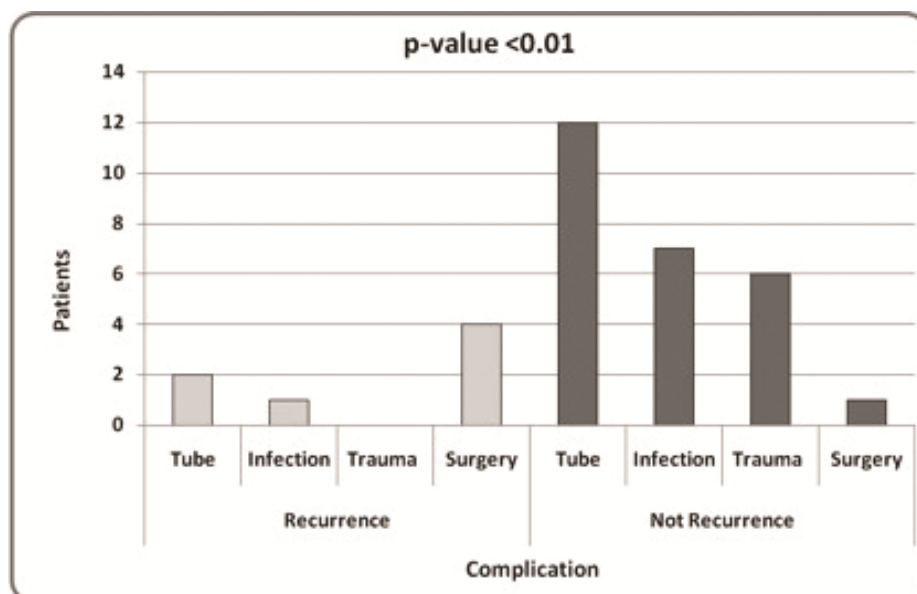


Figure 1: Relation between tympanic perforation recurrence and cause of perforation (n=33).

tion in 1962 (1), but it is not so widely adopted (10). This procedure is cost effective and less traumatic for the patients, and is done under local anesthesia as office base procedure.

The fat grafted seems to epithelialize over 2 to 3 weeks. In the first week the fat atrophies and the external portion get necrosed, but at 3 to 4 weeks a significant volume of fat can still be seen within the epithelialized medial and lateral surface of the tympanic membrane. Very little remnants of fat are still detectable within the middle layer of the tympanic membrane 6 to 8 weeks after operation (11) (Figures 2a and 2b).

The results of our series are in agreement with those reported in literature ranging from 80 to 90% (5,7,12,13). Our results showed 79% of success rate. If we exclude patients with post-surgical perforation, the success rate rises to 90%. This high success rate is not because of size of perforation (7), but is due to adequate blood supply of the external meatal skin. Both above factors are compromised in traditional myringoplasty. Furthermore, there are biological factors that favors adipose tissue by: repairing stimulation of the fibrous layer of the tympanum, promotion of revascu-

larization and production of growth factors that favors the healing of the graft by adipose-derived stem cells (14). The risk of infection is less, because fat itself has been reported to have inherent immunoreactive properties that prevent infection (15-16). All these features are not present with paper patch application as it is a non-biological material which is susceptible of infection and having no property of promoting revascularization.

The FPM should be limited to those patients with normal or near-normal hearing, and in whom there is little or no possibility of associated ossicular chain disease that requires treatment (4,5).

This procedure can also be performed in both the ears simultaneously, because middle ear space is not violated, and thus, the risk of hearing loss is virtually not present (3,5).

Some Authors adopted the FPM in revision surgery after failure of traditional myringoplasty with success rate of 87%, as compared with traditional revision surgery with success rate ranging from 43 to 66% (6). A failure of tympanic surgical repair is considered as recurrent if the perforation occurs after variable length of time after formation of healthy drum. It is residual if the perforation is found dur-

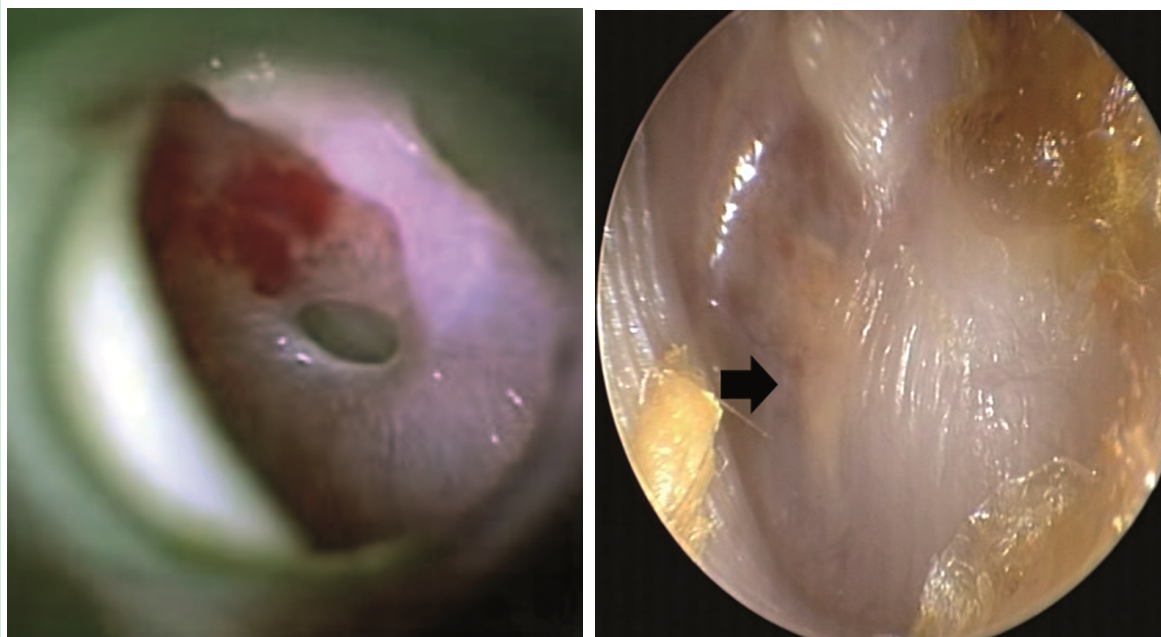


Figure 2: a) preoperative otoscopy of central tympanic perforation (left); b) 6 months postoperative otoscopy of the same patient, it is noticeable the fat remnants in the middle layer of the eardrum (right).

ing consecutive otoscopic examination immediately after surgery. FPM procedure could be a valid support for the surgeon in case of early or late onset of recurrent perforation. As showed in results, we performed a FPM as salvage treatment in recurrent perforation after traditional myringoplasty in 5 cases, but we had success only in one patient (20%). We hypothesized that these results were conditioned by two main factors: persistent Eustachian tube dysfunction and lack of vascular supply of the anterior-inferior border of the residual eardrum that was dissected in the previous operation. Although our number of post-surgical cases was limited, the statistical analysis showed a relationship between previous surgery and recurrence of perforation.

Conclusion

Fat plug myringoplasty is a safe procedure with very low rate of complications. The hearing damage is virtually absent. This procedure is cost safe and it is an office base procedure well tolerate by all the patients. Results in case of primary surgery are excellent, with a high success rate of 90%. Even in small recurrent perforation (after traditional myringoplasty) FPM can also be taken into consideration.

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