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Endoscopic inlay butterfly cartilage Myringoplasty for central perforation

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Abstract
Type of study: a prospective study.
Objective: To evaluate the effectiveness of Endoscopic Inlay Butterfly Cartilage Myringoplasty by assessing the take rate and hearing gain.
Background: Since the introduction of tympanoplasty, various graft material and methods have been described to close central dry perforation of the tympanic membrane (TM).Cartilage graft represents one of the most commonly used materials.To avoid postauricular incision, Eavey introduced the Inlay Butterfly Cartilage Myringoplasty as a minimally invasive technique in children with small central perforations.
Patients and Methods: 25 patients with dry central perforation and Air-Bone Gap (ABG) of ≤ 30dB were operated by the Endoscopic Inlay Butterfly cartilage Myringoplasty between 2013-2016. All patients had small to medium sized perforations with inactive mucosal disease. The Follow-up period ranged from 1 to 14 months. All patients were assessed clinically to evaluate healing of TM, discharge, granulation tissues and complications. Postoperative ABG was used as the key parameter for hearing evaluation by calculating the average Pure Tone Audiometry (PTA) improvement.
Results: A total of 25 patients were involved in this study; 14 males (56%) and 11 females (44%). The graft was taken in 19 patients that represent success rate (76%); this rate was comparable with other many studies in the literature. Preoperative mean (±SD) of ABG was 22.4 (±6.14), While postoperative mean (±SD) of ABG was 14.8 (±10.2) with statistically significant difference ($P < 0.001$).
Conclusions: Inlay Butterfly Myringoplasty is a simple technique for repair of small to medium-sized TMs perforation with good results. It carries many advantages over the usual conventional methods of tympanoplasty.

Keywords: myringoplasty, butterfly-cartilage, endoscopic

1. Introduction

Since the 1600s, several trials were done to close the perforation of the tubotympanic type of chronic suppurative otitis media (CSOM) & restore hearing loss.

Although the temporalis muscle fascia has been widely used, it can eventually become thin and atrophic. Also, due to the lack of elasticity and resistance to pressure changes in the external ear canal, several authors have suggested that temporalis muscle fascia should be replaced by cartilage [1].

Cartilage has been proved to be well tolerated by the middle ear and survives for long periods [2, 3]. Long-term survival is achieved as cartilage grafts are nourished mainly by diffusion [4]. Cartilage maintains its rigid quality and resists resorption and retraction even in cases of severe ET dysfunction. Thus; its use has been established, particularly in cases of chronic ET dysfunction, adhesive process, draining ears, or recurrent perforations of the TM [5, 6].

In 1998, Roland Eavey described his technique in children; Inlay Butterfly Cartilage Tympanoplasty. The graft resembled butterfly wings, which covered with split-thickness skin graft. Eavey reported a successful take rate and improvement of hearing in 100% of patients [7].

This technique had been evaluated after that in some studies with and without applications of the split-thickness skin graft in both children and adults with reported results varies from 43% up to 100%.

The aim of our study is to test the effectiveness of Inlay Butterfly Cartilage Myringoplasty without application of split-thickness skin graft by assessing the take rate and postoperative audiometric results.

2. Patients and Methods

The study was conducted as a prospective study from May 2013 to April 2016. It included 25 patients with dry central perforation, being inactive for at least one month and with Air-Bone Gap (ABG) of ≤ 30 dB. The Patients were chosen from the E.N.T Clinic of Assiut University Hospital during the study period regardless of sex and age.

We excluded the following patients; Patients presented with active discharging perforation, patients with cholesteatoma. Moreover, we excluded Patients with Large more than 50% of the total TM diameter. Lastly, we excluded patients having ABG > 30 dB suggesting ossicular pathology.

2.1 Surgical method

As regards the surgical procedure; all cases were performed under general anesthesia. We used Endoscopic Transcanal approach instead of Microscopic approach. The 1st step was tragus infiltration with a mixture consisting of lidocaine 0.05% and 1:1,00,000 epinephrine followed by harvesting the tragal cartilage with intact perichondrial layer on its both sides. The rim of the perforation was refreshed using a sharp needle to remove the fibrotic edges (Fig. 1). Then, the size of the perforation was measured using a 4mm right-angled hook and the cartilage fashioned using a sharp scissor to be 1–2 mm larger than the actual size of the perforation. The cartilage

edge grooved circumferentially using a scalpel size 15 midway between the two perichondrial layers (Fig. 2). The cartilage inserted through the perforation, so the upper half of cartilage is present outside the TM and the lower half lies inside the TM (Figs. 3 & 4). In the final step, the canal was packed with medicated Gelfoam, and sterile gauze was put in the external meatal opening.

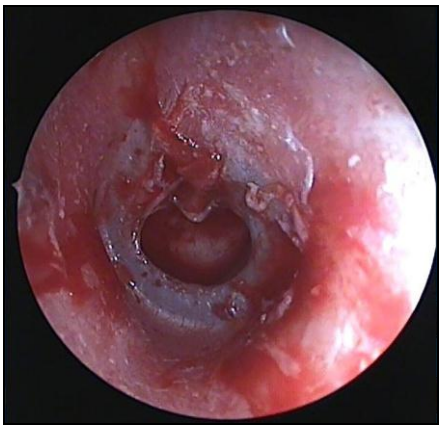

Fig 1: Intra-operative Endoscopic view of central perforation of the left ear

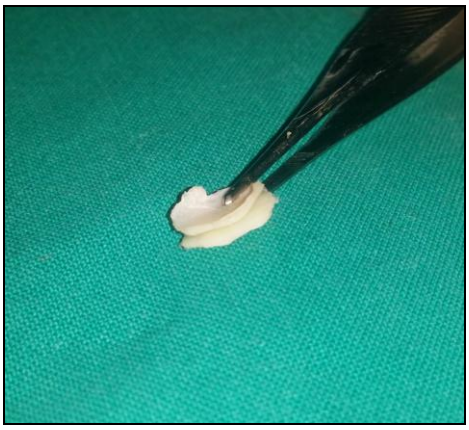

Fig 2: The final shape of the grooved tragal cartilage

Fig 3: The graft is fitted into the perforation

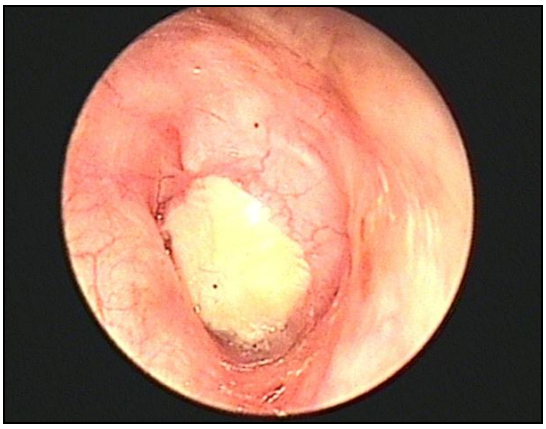

Fig 4: Endoscopic view of TM postoperatively

2.2 Postoperative follow-up

All the patients were instructed to avoid wetting of the ear for at least one month. We removed the dressing & the pack one week after surgery. Local drops (A mixture of antibiotic with steroid) usually started twice daily. The 2nd visit was usually by the end of the 2nd postoperative week were the graft status was checked, and local drops were continued if needed. Postoperative follow-up was done by endoscopic evaluation once monthly until the end of the 1st year. The patient was told to come back if having ear discharge, drop of hearing, obstruction in the ear canal.

The postoperative clinical assessment included; healing of TM, ear discharge, granulation tissues or complications and evaluation of subjective hearing improvement.

We used the postoperative ABG as the key parameter for hearing evaluation. We also calculated the average PTA improvement.

2.3 Statistical analysis

The data of our study were recorded and analyzed by using Statistical Package for Social Sciences (SPSS) version 19. Preoperative and postoperative hearing status of the patients was compared by the paired sample T test.

3. Results

A total of 25 patients presented by CSOM with dry central perforation were involved in this study; they were 14 males (56%) and 11 females (44%) (Table 1).

The follow-up period postoperatively ranged from 1 to 14 months. The mean follow-up interval for both groups was 11.4 months.

Out of the 25 patients, the graft was taken in 19 patients that represent success rate (76%), while in the rest six patients; there was a residual perforation with a failure rate (24%). Causes of failure were; upper respiratory tract infection in two patients, acute otitis media in one patient & infection of the graft in three patients. The preoperative ABG was ≤15 dB in seven patients (25%), 16 to 20 dB in six patients (24%) and 21 dB and above in 12 patients (48%). The postoperative hearing gain was 5-10 dB in seven patients (28%), 11-15 dB in six patients (24%), 16-20 dB in five patients (20%), ≥ 21 in one patient (4%) & seven patients represent (28%) did not improve at all (Table 2). Preoperative mean (±SD) of ABG was 22.4 (±6.14) While postoperative mean (±SD) of ABG was 14.8 (±10.2) with statistically significant difference ($P < 0.001$) (Table 3).

There were no postoperative complications such as SNHL,

tympanosclerosis, facial nerve paralysis or thin atrophic areas.

Table 1: Patient demographics

	No.	%
Age		
Range	13-65	
Mean±SD	26.9±12.8	
Gender		
Male	14	56.0
Female	11	44.0
Causes of Perforation		
Inflammation	19	76.0
Trauma	4	16.0
Tympanostomy Tube (T)	2	8.0

Table 2: Audiometric Results

Mean hearing loss	Preoperative: n (%)	Postoperative: n (%)
≤ 15 dB	7 (25)	17 (68)
16 –20 dB	6 (24)	3 (12)
≥ 21 dB	12 (48)	5 (20)
Total	25	25

Table 3: Comparison between preoperative and postoperative ABG.

	Audiogram		P. value
	Pre-operative Mean±SD	Post-operative Mean±SD	
Patients N = 25	22.4±6.14	14.8±10.2	0.001**,S

** Statistically significant difference ($p<0.01$)

4. Discussion

Inlay Butterfly Myringoplasty represents one of the recent methods of cartilage tympanoplasty. This method has many advantages: ease of learning, graft take rates ranging from 68% up to 100% in different studies. In our current study, the overall graft take rate was 76%. Although the 76% success rate was lower than some studies, our success take rate still higher than others which showed 67.6% [8], 71**%** [9] & 73.3% [10] (Table 4).

Table 4: Results for Inlay Butterfly Myringoplasty in the literature.

Author (year of publication)	Number of ears	Graft healing n (%)
Eavey (1998) [7]	11	100
Lubianca-Neto (2000) [11]	20	90
Mauri (2001) [12]	40	88.2
Couloigner (2005) [9]	59	71
Wang (2008) [13]	28	82.1
Omran (2012) [10]	30	73.3
Riss (2016) [14]	28	87.5

In our study, the main cause of broken graft is its infection. It occurred in four patients out of the six failure cases (66.67%) and usually occurred within the 1st two weeks postoperatively. Regarding the hearing improvement, we noticed that hearing gain (≥10 dB) was achieved in 15 patients (78.95%) out of the 19 successful cases, the hearing gain was satisfactory and compatible with the studies mentioned above.

Regarding the surgical procedure, we used the Endoscopic approach instead of the Microscope. The Endoscopic permeatal approach is practical & minimally invasive technique. It does not require skin incision with no risk of injury to the chorda tympani in comparison to the traditional surgical approaches. The Endoscopic view usually shows the whole entire rim of perforation which may be difficult to be visualized with Microscope especially in the presence of anterior canal wall hump (Fig. 5).

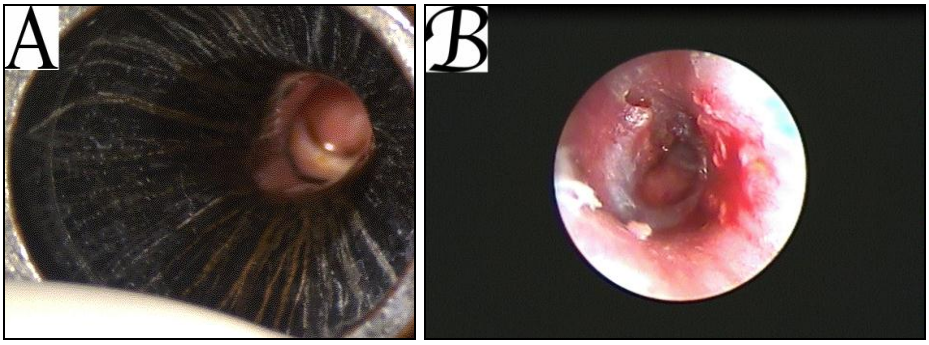

Fig 5: (A) Microscopic picture of central perforation in the right ear with a presence of anterior canal wall hump hindering adequate visualization of the anterior margin of the perforation (B) Endoscopic picture showing the whole margins of the perforation of the same patient.

The procedure needs a shorter time (30 - 40 minutes) than the usual conventional tympanoplasty. There is no post auricular incision and hence minimal post-operative pain with no disfigurement from fibrosis of the scar and stitches behind the ear. High improvement of hearing results and excellent patient compliance.

Also in some recent studies in patients with bilateral chronic ears when one ear at least is favorable for transcanal Inlay Butterfly Myringoplasty, the surgeon can operate on both ears on the same day. Where one ear can be done by conventional methods of tympanoplasty/ mastoidectomy, the contralateral ear can be done by transcanal Inlay Butterfly Myringoplasty or both done by the same technique if the perforation is small to medium sized.

It could be done under local anesthesia in adult so that we could decrease the cost and time of surgery with the advantage of rapid recovery and return to work or school.

5. Conclusion

Inlay Butterfly Myringoplasty is a simple technique for repair of small to medium-sized TMs perforation. It could easily replace other materials used in managing small perforations as fat. Also, it carries many advantages over the usual conventional methods of tympanoplasty. Moreover, the results are comparable with those studies in which temporalis fascia grafts were used [15].

6. References

1. Ferekidis EA, Nikolopoulos TP, Kandiloros DC, Ferekidou EE, Yiotakis JE, Tsangaroulakis A. *et al.* Chondrotympanoplasty: a modified technique of cartilage graft tympanoplasty. Medical Science Monitor. 2003; 9(2):CR73-CR8.
2. Don A, Linthicum FH. The fate of cartilage grafts for ossicular reconstruction in tympanoplasty. Annals of Otology, Rhinology & Laryngology. 1975; 84(2):187-91.
3. Glasscock ME, Jackson CG, Nissen AJ, Schwaber MK. Postauricular undersurface tympanic membrane grafting: A follow-up report. The Laryngoscope. 1982; 92(7):718-27.
4. Levinson RM. Cartilage-perichondrial composite graft tympanoplasty in the treatment of posterior marginal and attic retraction pockets. The Laryngoscope. 1987; 97(9):1069-74.
5. Milewski C. Fascia or perichondrium/cartilage in tympanoplasties. A comparative study regarding hearing results and recurrence of perforations in 1529 cases. Cholesteatoma and mastoid surgery M Toss, Kugler & Ghedini Publications, Amsterdam. 1989, 1113-4.
6. Hildmann H, Luckhaupt H, Schmelzer A. Die verwendung von Knorpel in der Mittelohrchirurgie. HNO. 1996; 44(10):597-603.
7. Eavey RD. Inlay tympanoplasty: cartilage butterfly technique. The Laryngoscope. 1998; 108(5):657-61.
8. Monfared A, Bergeron CM, Ortiz J, Lee H, Kamine K, Dray T. *et al.* Bivalve cartilage inlay myringoplasty: an office-based procedure for closing small to medium-sized tympanic membrane perforations. Otolaryngology-Head and Neck Surgery. 2008; 139(5):630-4.
9. Couloigner V, Baculard F, El Bakkouri W, Viala P, François M, Narcy P. *et al.* Inlay butterfly cartilage tympanoplasty in children. Otology & Neurotology. 2005; 26(2):247-51.
10. Omran AA. Endoscopic bivalve inlay cartilage myringoplasty for central perforations: Preliminary report. Egyptian Journal of Ear, Nose, Throat and Allied Sciences. 2012; 13(1):37-42.
11. Lubianca-Neto JF. Inlay butterfly cartilage tympanoplasty (Eavey technique) modified for adults. Otolaryngology--Head and Neck Surgery. 2000; 123(4):492-4.
12. Mauri M, Neto JFL, Fuchs SC. Evaluation of inlay butterfly cartilage tympanoplasty: a randomized clinical trial. The Laryngoscope. 2001; 111(8):1479-85.
13. Wang W-H, Lin Y-C. Minimally invasive inlay and underlay tympanoplasty. American journal of otolaryngology. 2008; 29(6):363-6.
14. Riss JC, Roman S, Morredu E, Farinetti A, Nicollas R, Triglia JM. Butterfly-cartilage tympanoplasty in children: A 28-case series and literature review. Eur Ann Otorhinolaryngol Head Neck Dis. 2016; 133(3):179-82.
15. Dornhoffer JL. Hearing results with cartilage tympanoplasty. The Laryngoscope. 1997; 107(8):1094-9.