Simultaneous bilateral myringoplasty as a single-stage operation

Magdy A.S. El-Ahl, Hazem S. Amer and Mohammad W. El-Anwar

Departments of Otorhinolaryngology, and Head and Neck Surgery, Faculty of Medicine, Zagazig University, Egypt

Correspondence to Mohammad W. El-Anwar, Departments of Otorhinolaryngology, and Head and Neck Surgery, Faculty of Medicine, Zagazig University, 0552309843 Egypt
Tel: +002 010 0469 5197;
e-mail: mwenteg@yahoo.com

Received 4 August 2012
Accepted 20 September 2012

The Egyptian Journal of Otolaryngology
2013, 29:16–19

Background
Myringoplasty is a common otologic procedure that results in successful closure of the perforation in most cases; however, the theoretical risk of iatrogenic sensorineural hearing loss during surgery has induced a reluctance among otosurgeons to perform bilateral myringoplasty.

Objectives
The aim of this study was to evaluate simultaneous bilateral myringoplasty as a single-stage operation.

Patients and methods
A prospective study was carried out between December 2009 and March 2012 on 30 patients (60 ears) with bilateral tympanic membrane perforations. Bilateral myringoplasty was performed in the same sitting using an underlay technique.

Results
Of the 60 ears operated upon, perforation closure was achieved in 56 (93.3%) ears and 51 (80%) ears gained hearing. No worsening of hearing was observed in any ear.

Conclusion
Simultaneous bilateral myringoplasty is safe and effective as a single-stage operation, with a high success rate.

Keywords:
bilateral myringoplasty, chronic suppurative otitis media, hearing loss, tympanic membrane perforation

Egypt J Otolaryngol 29:16–19

1012-5574

Introduction

Myringoplasty, as a method of reconstruction of a tympanic membrane (TM) perforation, was developed for the first time by Berthold in 1879. He transferred a free skin flap onto the perforation of the TM [1]. By the 1980s, the majority of otosurgeons were convinced by experience that the use of transplants of mesodermal origin, such as fascia, vein, periosteum, or fat tissue, in myringoplasty is advantageous [2].

Myringoplasty aims at reconstruction of the TM; it restores sound to the round window protection by resulting in a cavity filled with air and restores the mechanisms that drive sound, improving hearing and causing cessation of otorrhea [3]. Myringoplasty is a common otorhinolaryngological procedure [4] that is simple and effective and results in successful closure of the perforation in most cases [5].

Traditionally, bilateral TM perforation is repaired in two stages to preclude chances of graft failure [6]. Bilateral same-day myringoplasty has rarely been performed because of the risk of postoperative complications [6]. A theoretical risk of iatrogenic sensorineural hearing loss (SNHL) during surgery has induced a reluctance to perform bilateral myringoplasty among some otosurgeons [7], although no SNHL was reported after myringoplasty by most surgeons and most complications reported were minor [5–9].

Iranfar and Iranfar [10] found that SNHL can be prevented by observing and considering the primary principles of ear surgery during myringoplasty, and the procedure can be performed without concern.

This study aims at evaluating simultaneous bilateral myringoplasty as a single-stage operation by assessing the take rate and postoperative audiometric results.

Patients and methods

Thirty patients with bilateral central TM perforations in the pars tensa, caused by tubotympanic chronic suppurative otitis media (CSOM), attending the Otorhinolaryngology Department, Zagazig University Hospitals, from December 2009 to March 2012 were included in this study.

All patients were subjected to full history taking, general and local examination, including otoscopic and microscopic ear examination with audiological evaluation to ensure diagnosis, and measurement of threshold level of hearing. Thereafter, routine preoperative laboratory tests were performed.

Patients with a dry central TM perforation and apparently healthy middle ear mucosa at least for 2 months before surgery were selected; hearing level corresponded to the size and site of the perforation (no suspicion of ossicular chain defect or other pathology) and good Eustachian tube function. Patients with an actively discharging central perforation, unsafe CSOM with cholesteatoma, or central perforations with ill-defined adhesive edges to the promontory; those who underwent any type of mastoidectomy; and those with suspected ossicular pathology having a more than 40-dB airbone gap (ABG) were excluded.

A formal consent form to participate in the study was signed by the patients or by their relatives.

The size of the perforation was the key factor determining the operative technique to be used. The TM is divided into four quadrants: anterosuperior, posterosuperior, anteroinferior, and posteroinferior. The TM perforation is classified as small perforation (involving a single quadrant), medium perforation (involving two quadrants), or large perforation (involving three or more quadrants) [11].

Patients were positioned in a supine position with their head up and turned to one side (second ear). After myringoplasty of one ear, external auditory canal (EAC) packs were inserted and the outer ear was left dressed. The head was then turned over the first ear, exposing the second ear for surgery. With regard to sterilization and draping, the patients were positioned in such a way that their first ear was exposed and sterilized first, followed by sterilization and draping of the second ear after changing the position of the head. Pressure dressing and bilateral ear bandages were then applied.

General anesthesia was administered using the controlled hypotensive technique for all patients. Bilateral myringoplasty was performed in the same sitting using the underlay technique for all patients. After the skin was infiltrated using adrenaline dissolved in saline at a concentration of 1 : 200 000, microscopic re-evaluation was performed.

The postauricular approach, tailored on the basis of the site and size of perforation, was used for large or moderate perforations, whereas the transcanal or permeatal approach was used for small perforations. The side with a larger perforation was operated upon first, and a large amount of grafting material, sufficient for both sides, was taken (Fig. 1).

Under microscopic visualization, the edge of the perforation was refined using a sharp curved needle, and the fibrotic edge was removed using a microcup or crocodile forceps. A piece of cottonoid soaked in adrenaline dissolved in saline at a concentration of 1 : 200 000 was placed over the edge of the perforation for hemostasis.

The graft was harvested such that its diameter was at least 2 mm larger than that of the perforation. The posterior tympanomeatal flap was elevated and the underlay graft technique was used in all cases.

Gel foam was inserted in the middle ear and on the lateral surface of the TM in the EAC. Two packs were left in the EAC. Pressure dressing was left over both ears (Fig. 2).

Patients were administered systemic antibiotics for 1 week, after which antibiotic ear drops were prescribed for 2 weeks after removal of the outer ear pack. Patients were discharged on the same day as the surgery. Patients were instructed not to blow their nose for 1 month after surgery, to prevent water entry into their ear after the pressure dressing is removed, and to avoid catching a cold by staying away from crowded places for 10 days. They were also instructed to avoid excessive activity or heavy lifting for 10–15 days and to avoid aircraft travel for 4 weeks.

Pressure dressing, the outer EAC pack, and stitches were removed 1 week after surgery, and the inner EAC pack was removed 2 weeks after surgery.

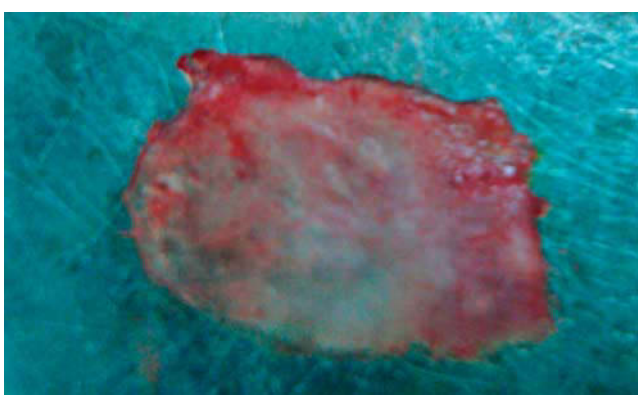
Our patients were followed up by otoscopic and/or microscopic examination at 3 and 6 weeks, at 3 and 6 months, and at 1 year, whereas a hearing test (pure tone audiometry) was performed at a mean of 6 and 12 months after surgery.

Successful closure of the perforation was defined as an intact eardrum at 6 months postoperatively. Success in terms of hearing was defined as an improvement by 10 dB or greater in two consecutive frequencies compared with the preoperative air conduction thresholds [12]. Preoperative and postoperative thresholds were measured at 500, 1000, 2000, and 4000 Hz [5]. Tolerance to the bilateral pressure dressing and complications were monitored.

Results

In total, 30 patients fulfilled the selection criteria and were included in the study. They included 18 male patients (60%) and 12 female patients (40%). The age of the patients ranged from 17 to 51 years (mean age 34 years).

Figure 1



Grafting material sufficient for bilateral myringoplasty was obtained from one side.

Figure 2

Pressure dressing over both ears.

Table 1 Size of tympanic membrane perforations

Size of TM perforation	*N* (%)
Small	12 (20%)
Medium	34 (56.7%)
Large	14 (23.3%)

TM, tympanic membrane.

Table 2 Preoperative and postoperative hearing thresholds

Mean preoperative hearing threshold	26.73 dB
Mean postoperative hearing threshold	16.58 dB
Mean hearing gain	10.15 dB

The size of the TM perforation was small in 12 ears (20%), moderate in 14 ears (23.3%), and large in 34 ears (56.7%; Table 1). The actual surgical time ranged from 52 to 73 min.

Of the 60 ears operated upon, perforation closure was successful in 56 (93.3%) ears, whereas the remaining four ears had a residual perforation: three ears with a large TM perforation and one with a moderate TM perforation preoperatively.

Hearing loss, preoperatively, ranged between 15 and 38.75 dB (the mean hearing threshold was 26.75 dB). Postoperatively, the mean hearing gain for all operated ears was 10.15 dB (Table 2), whereas the mean hearing gain for the successfully operated ears was 11.27 dB. Fifty-one (85%) ears gained hearing, whereas in the remaining nine ears no hearing was gained, including four ears with residual perforations, four ears with small perforations and a hearing loss of 15 dB, and one ear with a moderate-sized perforation and hearing loss of 23.75 dB. No worsening of hearing occurred in any operated ear in this study. Surprisingly, it was found that all patients included in this study underwent TM perforation closure at least in one ear. All patients, except one (1.7%; this patient also had residual perforation in one ear), gained hearing at least in one ear .

It was very encouraging that 56 (93.3%) patients were not annoyed by the bilateral pressure dressing and the bilateral ear canal gauze packing. The remaining four patients (6.7%) were not tolerant to the bilateral pressure dressing in the early postoperative period, as immediate postoperative hearing was compromised by the packing material.

No graft lateralized or displaced into the middle ear and no retraction pocket was observed during the follow-up period. Operative blood loss was minimal and post-operative pain was tolerable in all patients.

Discussion

TM is not only responsible for the conduction of sound waves across the middle ear but also protects the middle ear cleft and shields the round window from direct sound waves, which is referred to as 'round window baffle'. This shield is necessary to create a phase differential so that the sound wave does not impact the oval and round windows simultaneously. This would disrupt the uni-lateral flow of sound energy from the oval window through the perilymph [11].

It has been found that the different ratio of the surface area of the TM and that of the oval window increases the sound pressure by about 27 dB, whereas the lever action of ossicles contributes only about 3 dB [13].

TM perforation is quite common among patients seen at the Otorhinolaryngology clinic. Bilateral perforations of the TM is a common finding as it represents about 39.4% of perforated TM, and CSOM was found to be the most common cause of TM in more than 90% of patients [14]. In a national survey to estimate the prevalence and causes of hearing impairment in Egypt, CSOM was seen to cause hearing impairment in 13.2% of patients, and bilateral CSOM was found to be much more frequent than unilateral CSOM [281/423 (66.4%)] [15].

TM perforation reduces the surface area of the membrane available for sound pressure transmission and allows sound to pass directly into the middle ear [11]. The objectives of tympanoplasty are obtaining an intact TM and a dry middle ear and audiometric improvement [3].

Medium-sized perforations were the most common type of perforations in this study (56.7%), which is similar to the results of the study by Omran [16]. However, in the study by Shrestha and Sinha [17], large perforations were the most common.

Perforations of the TM in patients of this study caused a conductive hearing loss ranging from 15 to 38.75 dB, which is consistent with the results of the study by Shrestha and Sinha [15], who reported hearing loss within 50 dB.

The total success rate in terms of graft uptake at 6 months postoperatively was 93.3%, similar to the success rate reported by Yu and Yoon [6], Gersdorff *et al.* [18], and Karela *et al.* [19] and higher than that reported by Omran [16] and Dornhoffer [20]. However, our success rate was lower than that reported by Yung *et al.* [21],

taking into consideration that their study was on unilateral TM perforations.

In this study on simultaneous bilateral myringoplasty, the graft take rate was within the average reported success rate of previous studies [3,7] on myringoplasty in unilateral perforations, but the results were discordant with the findings of Caylan *et al.* [22], who reported that the outcome of myringoplasty in unilateral perforations was better than that in bilateral perforations (96.9 and 55%, respectively).

The failure rate of perforation repair in this study was 7.7%. In total, 75% of the ears with failed repairs showed large perforations preoperatively, supporting the suggestion that as the size of the perforation increases, the success rate decreases as reported in the study by Sitnikov *et al.* [1]. This is not in accordance with the findings of Omran [16], who, however, used an endoscopic approach and achieved a lower total success rate.

In terms of success rate, it is interesting to note that TM perforation closure, at least in one ear, was achieved in all patients included in this study, and 26 of 30 patients (83.3%) achieved bilateral graft uptake. All patients except one gained hearing at least in one ear.

No worsening of bone conduction threshold was detected in any ear included in our study, which is concordant with the findings of Karkanevatos *et al.* [8], Caye-Thomasen *et al.* [7], and Saliba and Woods [9]. However, this is against the suggested theoretical risk of iatrogenic sensorineural hearing loss during myringoplasty [23].

The ABG closure ratio, or a change in the postoperative ABG, improved significantly as the mean hearing gain for all operated ears was 10.15 dB, which is similar to the results of Cruz *et al.* [24]. The mean hearing gain of 7.09 dB, which is more than that reported by Omran [16], was statistically significant.

The actual surgical time ranged from 52 to 73 min, which is less than double the actual surgical time range of unilateral myringoplasty (29–45 min, Omran [16]) because the grafting material was obtained from one ear only.

Thus, bilateral myringoplasty is a safe procedure, reduces costs, obviates the need for a second surgery, decreases the frequency of exposure to anesthesia, and increases the take rate of the graft in each patient as he/she will have two chances of success with both ears being operated upon simultaneously. Grafting material obtained from one ear was used for bilateral myringoplasty, avoiding the use of grafting material from the other ear. Simultaneous bilateral myringoplasty allowed single hospital admission, reduced the number of days of absence from work, and also reduced the burden on the healthcare system.

Conclusion

Simultaneous bilateral myringoplasty is safe and effective as a single-stage operation with a high success rate and single exposure to anesthesia, reducing cost and obviating the need for a second surgery.

Acknowledgements

Conflicts of interest

There are no conflicts of interest.

References

1 Sitnikov V, Zavarzin B, Chernushevich I, Kuzovkov V. Modern concepts in myringoplasty. Balkan Journal of Otology & Neuro-Otology 2004; 4:93–95.

2 Tarasov DI. Disease of the middle ear. M Medicine 1988; 66:1076–1095.

3 Kumar N, Madkikar NN, Kishve S, Chilke D, Shinde KJ. Using middle ear risk index and et function as parameters for predicting the outcome of tympanoplasty. Indian J Otolaryngol Head Neck Surg 2012; 64:13–16.

4 Rourke T, Snelling JD, Aldren C. Cartilage graft butterfly myringoplasty: how we do it. Clin Otolaryngol 2010; 35:135–138.

5 Al-Khtoum N, Hiari MA. Myringoplasty in children: retrospective analysis of 35 cases. Braz J Otorhinolaryngol 2009; 75:371–374.

6 Yu MS, Yoon TH. Bilateral same-day surgery for bilateral perforated chronic otitis media: inlay butterfly cartilage myringoplasty. Otolaryngol Head Neck Surg 2010; 143:669–672.

7 Caye-Thomasen P, Nielsen TR, Tos M. Bilateral myringoplasty in chronic otitis media. Laryngoscope 2007; 117:903–906.

8 Karkanevatos A, De S, Srinivasan VR, Roland NJ, Lesser THJ. Day-case myringoplasty: five years' experience. J Laryngol Otol 2003; 117:763–765.

9 Saliba I, Woods O. Hyaluronic acid fat graft myringoplasty: a minimally invasive technique. Laryngoscope 2011; 121:375–380.

10 Iranfar K, Iranfar S. Does surgery of chronic otitis media cause sensori neural hearing loss? Pak J Med Sci 2009; 25:972–975.

11 Maharjan M, Kafle P, Bista M, Shrestha S, Toran KC. Observation of hearing loss in patients with chronic suppurative otitis media tubotympanic type. Kathmandu Univ Med J 2009; 7:397–401.

12 Salisu AD. Otology practice in a Nigerian tertiary health institution: a 10-year review. Ann Afr Med 2010; 9:218–221.

13 Voss SE, Rosowski JJ, Merchant SN, Peake WT. Non-ossicular signal transmission in human middle ears: experimental assessment of the 'acoustic route' with perforated tympanic membranes. J Acoust Soc Am 2007; 122:2135–2153.

14 Olowookere SA, Ibekwe TS, Adeosun AA. Pattern of tympanic membrane perforation in Ibadan: a prospective study. Ann Ibadan Postgrad Med 2008; 6:843–853.

15 Abdel-Hamid O, Khatib OMN, Aly A, Morad M, Kamel S. Prevalence and patterns of hearing impairment in Egypt: a national household survey. East Mediterr Health J 2007; 13:1170–1180.

16 Omran AA. Endoscopic bivalve inlay cartilage myringoplasty for central perforations: preliminary report. Egypt J Ear Nose Throat Allied Sci 2012; 13:37–42.

17 Shrestha S, Sinha BK. Hearing results after myringoplasty. Kathmandu Univ Med J 2006; 4:455–459.

18 Gersdorff M, Garin P, Decat M, Juantegui M. Myringoplasty: long-term results in adults and children. Am J Otol 1995; 16:532–535.

19 Karela M, Berry S, Watkins A, Phillipps JJ. Myringoplasty: surgical outcomes and hearing improvement: is it worth performing to improve hearing? Eur Arch Otrhinolaryngol 2008; 265:1039–1042.

20 Dornhoffer JL. Hearing results with cartilage tympanoplasty. Laryngoscope 1997; 107:1094–1099.

21 Yung M, Neumann C, Vowler SL. A longitudinal study on pediatric myringoplasty. Otol Neurotol 2007; 28:353–355.

22 Caylan R, Titiz A, Falcioni M, De Donato G, Russo A, Taibah A, Sanna M. Myringoplasty in children: factors influencing surgical outcome. Otolaryngol Head Neck Surg 1998; 118:709–713.

23 Palva T, Karja J, Palva A. High tone sensorineural losses following chronic ear surgery. Arch Otolaryngol 1973; 98:176–178.

24 Cruz OLM, Costa SS, Kluwe LH, Smith MM. Timpanoplastias. In: Cruz OLM, Costa SS, editors. *Otologia Clínica e Cirúrgica*. Rio de Janeiro: Revinter; 2000. pp. 245–270.