ORIGINAL ARTICLE

EFFICACY OF UNDERLAY VERSUS OVERLAY TECHNIQUE FOR MYRINGOPLASTY IN TERMS OF HEARING IMPROVEMENT

Muhammad Arif, Muhammad Mudassar, Allah Noor, Asmatulllah Khan, Qaisar Khan, Saeed Khan

Department of ENT, Hayatabad Medical Complex, Peshawar - Pakistan.

ABSTRACT

Objectives: To compare the efficacy of the underlay and overlay techniques for myringoplasty among patients with perforated tympanic membrane in terms of improvement in the hearing.

Material and Methods: This study was performed in the department of ENT Hayatabad Medical Complex, Peshawar from January 2019 to December 2019. A total of 164 patients were randomly allocated into two groups. In group A patients (n=82), the underlay technique was performed while in group B patients (n=82) overlay technique was performed. Temporalis fascia was used for grafting in all cases. All procedures were performed under general anesthesia. All patients were followed at 3 months to determine the effectiveness in terms of improvement in the air-bone gap of at least 10db.

Results: As per efficacy in both groups, in Group A, 70 (85.36%) patients showed effectiveness while in Group B, only 52 (63.41%) patients showed effectiveness (P-Value < 0.001).

Conclusion: The underlay technique improved the air-bone gap by at least 10dB in a significantly (P < 0.001) higher number of patients as compared to the overlay technique.

Keywords: Myringoplasty, Overlay, Underlay, Tympanic Membrane.

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INTRODUCTION

Myringoplasty is a surgical procedure performed for the reconstruction of the eardrum[1]. Perforation closure with a dry stable grafted membrane and improvement in hearing level is the aim of this procedure[2]. The concept of myringoplasty was first introduced in 1878 by Berthhold who used full-thickness skin graft to repair tympanic membrane perforation. Since then many changes in technique and material have been made[3]. Persistent perforations occur either due to improper treatment of recurrent middle ear infections or infected traumatic perforation.

There are two classical techniques of myringoplasty- the overlay and underlay techniques. The overlay technique is commonly performed through the permeatal approach while the underlay technique is carried out via the endaural approach. As no such study on this topic has been done in our population, so this study will determine the latest and updated information about the efficacy of underlay and over techniques for myringoplasty among patients with the perforated tympanic membrane.

Correspondence
Dr. Muhammad Arif
Department of ENT, Hayatabad Medical Complex, Peshawar - Pakistan
Email: arif3660@gmail.com
Cell: +92-345-3987768
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MATERIAL AND METHODS

All patients were randomly allocated into two groups by lottery method. Patients in group A were subjected to underlay and patients in group B were subjected to overlay technique for myringoplasty. Patients with perforation in only one quadrant of the pars tensa were termed small perforations. Perforations involving two quadrants were termed medium size while those involving all quadrants of pars tensa were termed subtotal perforations. Temporalis fascia was used for grafting in all cases. All operations were done under general anesthesia. The overlay technique was performed through the permeatal approach. Margins of perforation were debrided, and squamous epithelium was elevated from the tympanic annulus and the tympanic membrane remnant. The graft was placed lateral to the annulus. The underlay technique was carried out via an endaural approach tympanomeatal flap based on superior vascular pedicle was elevated along with the annulus. The middle ear was packed with small pieces of spongeston. The graft was placed over the handle of the malleus, medial to the annulus. Small pieces of spongeston were placed over the graft to stabilize it. Gauze pack soaked in the antibiotic ointment was placed in the meatus for 1 week. The prophylactic antibiotic cover was given for five days. Those patients with a pre-op air-bone gap (ABG) of more than 40 dB were excluded from

the study. All patients were followed at 3 months intervals to determine the effectiveness in terms of improvement in the air-bone gap of at least 10dB. Post Op patients in which graft was not taken were excluded from the final analysis.

RESULTS

We have carried out this study on 164 patients (82 in each group) at the Department of ENT, MTI-HMC, Peshawar from January 2019 to December 2019. Table 1 shows the demographic details between the two groups. Table 2 shows the efficacy of the procedures between the two groups with significant difference.

Table 1: Demographic details of the patients included in the study

	Group A	Group B
Mean (±SD) age at presentation	**31±8.37 years**	**32±6.36**
Mean (±SD) duration of disease	8±1.17	8±1.13
Number of patients with age 18-30 years	40 (48.78%)	40 (48.78%)
Number of patients with age 31-40 years	26 (31.7%)	30 (36.6%)
Number of patients with age 41-50 years	12 (14.63%)	09 (10.98%)
Number of patients with age 51-60 years	04 (4.88%)	03 (3.66%)
Male patients	48 (58.53%)	44 (53.65%)
Female patients	34 (41.46%)	38 (46.34%)
Male to Female ratio	1.41: 1	1.16:1
Small Perforation	12 (14.63%)	13 (18.85%)
Medium Perforation	35 (42.68%)	34 (41.46%)
Subtotal Perforation	35 (42.68%)	35 (42.68%)

Table 2: frequency of efficacy in the two groups (n=164)

Efficacy	GROUP A (n=82)	GROUP B (n=82)	P VALUE
Yes	70 (85.36%)	52 (63.41%)	0.001
No	12 (14.63%)	30 (36.58%)	
Total	82 (100%)	82 (100%)	

DISCUSSION

In this study, we evaluated the role of myringoplasty in the surgical management of patients presented with the perforated tympanic membrane. The demographic data of these patients were recorded, summarized, and examined to characterize any possible trends. Comparison of pre-and post-surgical audiometry (i.e., at three months follow-up) patient's hearing improvement after myringoplasty was assessed. The treatment was considered successful for hearing improvement of ≥ 10 dB.

Patients undergoing each type of myringoplasty (i.e., underlay and overlay techniques) showed improvement in hearing. However, a significantly higher number of patients (85% versus 63%: $p < 0.001$) in Group A (underlay technique) showed hearing improvement as compared to the patients in Group B (overlay technique). The high success rate of both underlay and overlay techniques may be attributed to the patient selection criteria used herein. Specifically, we excluded patients presenting with severe disease, such as signs of mastoid or ossicular pathology. Moreover, the relatively higher success rate achieved with the underlay technique seems to be contributed by many factors. In particular, the underlay technique requires reduced surgical manipulation of the middle ear structures, which ultimately leads to faster healing. Also, the underlay technique is technically easy, less time-consuming, time-consuming assessment of ossicular chain integrity/mobility, and typically has fewer minor complications.

The results of this study are consistent with that of previous studies- both reported locally and internationally. For example, a success rate of 92% (n=23/25) has been reported for the underlay technique in the Indian population[4]. Likewise, a graft uptake rate of 89.18% and a mean hearing improvement of 11.72 dB after myringoplasty (i.e., overlay technique) has been described[5]. Moreover, underlay myringoplasty was performed in 52 patients; the follow-up showed that the procedure was anatomically unsuccessful in five cases. Also, a comparison of underlay and overlay techniques demonstrated better air bone gap improvement and hearing gain in the underlay group[6]. A success rate of 91.5% in a group of 46 patients was achieved with the overlay technique, without observing lateralization of the graft in any case, and a mean air-bone gap improvement of 16.55 dB[7]. Furthermore, the graft take rate was 85% for the underlay technique at the last follow-up visit, while an air-bone gap closure was 9.3 ± 3.2 dB[8]. The underlay technique was used in 554 patients (259 males, 295 females) and resulted in an 88.8% (489 cases) success rate[9].

Overall all these studies illustrate that myringoplasty is an effective treatment for perforated tympanic membrane. The slight differences in the results of different studies may be contributed by several factors. For example, the size of the perforation has been reported as a major factor in the success of Myringoplasty[10,11]. Hyaluronic acid fat graft myringoplasty (HAFGM) has been suggested for large perforations in the tympanic membrane[12,13]. The site of the perforation is also very critical. To exemplify, anterior perforations are relatively difficult to access[14,15]. The effectiveness of the procedure is commonly reduced by the lateralization and detachment of the graft during the healing process[7].

This study only focused on the effectiveness of Myringoplasty for the treatment of perforated tympan-

ic membrane. However, the post-surgical complications (e.g., lateralization of the tympanic membrane, anterior blunting, external ear canal stenosis, delayed healing, epithelial pearls, etc.) were not included, which may be considered a limitation of this study. Another important point is that the graft thickness was not measured in our study.

CONCLUSION

The effectiveness of the underlay technique was observed in a significantly higher number of patients as compared to the overlay technique. Overall, these results support the postulate that the underlay technique may be preferred for the treatment of perforated tympanic membrane.

REFERENCES

1. Berglund M, Florentzson R, Fransson M, Hultcrantz M, Eriksson PO, Englund E, et al. Myringoplasty outcomes from the Swedish National Quality Registry. Laryngoscope. 2017;127(10):2389–95.
2. Shekharappa MK, Siddappa SM. Cartilage myringoplasty: an ideal grafting technique for complex perforations. J Clin Diagnostic Res. 2017;11(7):10–2.
3. Kulkarni S, Kulkarni V, Burse K, Sancheti V, Roy G. Cartilage support for fascia graft in type I tympanoplasty. Indian J Otolaryngol Head Neck Surg. 2014;66(3):291–6.
4. Prakash MD, Viswanatha B, Kaur J, Sanyal S. Comparative study of the underlay and over-underlay techniques of tympanoplasty in perforations of the tympanic membrane. Res Otolaryngol. 2014;3(5):65–9.
5. Kalsotra P, Gupta R, Gupta N, Kotwal S, Suri A, Kanotra S. Overlay versus underlay myringoplasty: A comparative study. Indian J Otol. 2014;20(4):183–8.
6. Sergi B, Galli J, Corso E De, Parrilla C, Paludetti G. Overlay versus underlay myringoplasty: report of outcomes considering the closure of perforation and hearing function. Acta Otorhinolaryngol Ital. 2011;31:366–71.
7. Yigit O, Alkan S, Topuz E, Uslu B, Unsal O, Dadas B. Short-term evaluation of over-under myringoplasty technique. Eur Arch Oto-Rhino-Laryngology. 2005;262:400–3.
8. Wang W, Lin Y. Minimally invasive inlay and underlay tympanoplasty. Am J Otolaryngol. 2008;29:363–6.
9. Rizer FM. Overlay versus underlay tympanoplasty. Part II: The study. Laryngoscope. 1997;107:26–36.
10. Karabulut B, Mutlu F, Sahin S, Adnan A. Anatomical and functional long-term results of endoscopic butterfly inlay myringoplasty. Eur Arch Oto-Rhino-Laryngology. 2018;275(11):2653–8.
11. Das A, Sen B, Ghosh D, Sengupta A. Myringoplasty: Impact of size and site of perforation on the success rate. Indian J Otolaryngol Head Neck Surg. 2015;67(2):185–9.
12. Gün T, Boztepe OF, Atan D, İkincioğulları A, Dere H. Comparison of hyaluronic acid fat graft myringoplasty, fat graft myringoplasty and temporal fascia techniques for the closure of different sizes and sites of tympanic membrane perforations. J Int Adv Otol. 2016;12(2):137–41.
13. Alhabib SF, Saliba I. Hyaluronic acid fat graft myringoplasty versus autologous platelet rich plasma. J Clin Med Res. 2017;9(1):30–4.
14. Ozturk A, Benzer M, Kaya I, Gode S, Bilgen C, Kirazli T. Comparison of anterior and posterior tympanomeatal flap elevations in endoscopic transcanal tympanoplasty. Acta Otolaryngol. 2019;139(8):692–6.
15. Dursun E, Demir E, Terzi S, Erdivanlı ÖÇ, Coşkun ZÖ, Balaban GA, et al. Endoscopic type 1 cartilage tympanoplasty in children. Int J Pediatr Otorhinolaryngol. 2020;131:109854.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

Arif M:	Topic Selection, article writing
Mudassar M:	material and methods
Noor A:	Proof Reading, Discussion
Khan A:	Data Analysis
Khan Q:	Data collection, Referencing
Khan S:	Data collection

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.