

# Endoscopic Versus Microscopic Myringoplasty Through Endaural Approach

Original  
Article

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## ABSTRACT

**Introduction:** Different approaches were used for myringoplasty mainly the post-auricular, the endaural and trans-canal using either the endoscopic or the microscopic. This study aims to compare endoscopic myringoplasty with microscopic myringoplasty through end aural approach using temporalis fascia graft regarding operative technique, success rate and postoperative hearing improvement.

**Patients and Methods:** The work was performed at the ENT Department, Al-azhar University hospitals. The work involved 40 cases diagnosed to have chronic suppurative otitis media of tubotympanic type submitted to myringoplasty operation. They were classified into Class A: endoscopic myringoplasty and Class B: microscopic myringoplasty through endaural approach.

**Results:** The graft was taken after 3 months in 18 cases (90%) in class A and in 17 cases (85%) in class B. The mean of Preoperative airbone gab (ABG) was  $22.85 \pm 10.34$  db in group A and the mean postoperative ABG was  $5.5 \pm 2.15$  db while the mean Preoperative ABG was  $25.75 \pm 5.90$  db in class B and the mean postoperative ABG was  $7 \pm 3.25$  db with statistically significant difference between Preoperative and postoperative ABG ( $p$  value < 0.05), also in class A, the perforation circumference was definitely visible in whole cases (100%) without the necessity for external auditory canal drilling or curettage, whereas in class B, it was only partially visible in 7 cases (35%).

**Conclusion:** Regardless of the perforation's width, the external auditory canal's narrowness, or its protrusion, an endoscopic myringoplasty can be done. The best hope for ear surgery in the future is the endoscope.

**Key Words:** Endoscopic, microscopic, myringoplasty.

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## INTRODUCTION

The optimal treatment for non-suppurative chronic otitis media associated with tympanic membrane perforations is myringoplasty<sup>[1]</sup>. The main goal of this operation is the completely healing of the perforation in the tympanic membrane then, the enhancement of the hearing level<sup>[2]</sup>.

Perforations of tympanic membrane were healed using a variety of techniques, such as the postauricular, endaural, and transcanal implantation of harvested grafts. The temporalis fascia, perichondrium, cartilage, and fat plugs-especially for tiny perforations-are the most often employed graft materials<sup>[3]</sup>.

By enhancing the technique's accuracy, the insertion of the operated microscope has substantially improved the results of myringoplasty. The surgeon can't see the deep recesses of the middle ear in a singular operational field because the operational microscope only presents a magnified image in a continuous direction<sup>[4]</sup>.

The utilization of endoscope for myringoplasty operation has an important role in the examination and

the treatment the perforation of the tympanic membrane. With this technique, the surgeon can quickly switch from a narrow to a wide-angle show by moving in closer and pulling back the endoscope, which allows the surgeon to spin the endoscope to see the anterior recess, deep anterior canal wall, sinus tympani, anterior marginal perforations, fascial recess, the attic and hypotympanum<sup>[5]</sup>.

While the external auditory canal's narrowest part limits the vision during microscopic surgery, transcanal endoscopic surgery avoids this segment and offers a broader view, even when a 0° endoscope is utilized<sup>[6]</sup>.

This work aims to compare between microscopic and endoscopic myringoplasty through end aural approach using temporalis fascia graft regarding operative technique success rate and postoperative hearing improvement.

## PATIENTS AND METHODS

This work was performed from March 2020 to august 2021 at the ENT Department, Al-azhar University hospitals. This work involved 40 cases diagnosed to have uncomplicated chronic suppurative otitis media of

tubotympanic type and then submitted to myringoplasty. After approval of the ethical committee of Al-Azhar University, all participants introduced an informed consent. The age of whole cases was between 18 - 60 years old classified into two equal classes.

**Class A:** involved 20 cases submitted to endoscope myringoplasty through endaural approach.

**Class B:** involved 20 cases submitted to microscopic myringoplasty through endaural approach.

All cases were randomly distributed in both classes regardless of the perforation size either small, medium or large size perforation.

### ***Inclusion Criteria***

1. Individuals with minor, moderate, and large (subtotal) dry tympanic membrane perforations.
2. Perforation due to trauma.
3. Individuals with tubo-tympanic chronic suppurative otitis media.
4. The nose, paranasal sinuses, nasopharynx, and throat are free of infection.

### ***Exclusion criteria***

1. Individuals under the age of 18 or older than 60.
2. Individuals with chronic otitis media sequelae.
3. Individuals with attico-antral chronic suppurative otitis media (cholesteatoma).
4. Myringoplasty revision.
5. Ear infections.

### ***Preoperative assessment***

1. Detailed history is taken.
2. Complete ENT examination.
3. Hematological tests (platelet count, bleeding time)
4. Pure tone audiometry.

### ***Operative technique***

General Hypotensive anesthesia and local injection of xylocaine and 1/200,000 adrenaline at intercartilaginous area between the helical and the tragal cartilage and injection at bony cartilaginous junction of ear canal at 3, 6, 9, 12 o'clock were done for all cases.

A zero-degree endoscope (4.2 mm in diameter and 30cm in length) or microscope was connected to camera and video monitoring system for visualization steps of operation.

A No. 15 scalpel was used to make the inter cartilaginous incision between the helical and tragal cartilages, making continuous connection with the bony external ear canal. Reduced pressure was applied as the incision was raised in an upward, gently curved line parallel to the anterior part of the helix (Figure 1). This technique prevents bleeding and lowers risk to the superficial temporal vein.



**Fig. 1:** Shows external part of endaural incision at incisura of the auricle extended parallel to the anterior portion of the helix upwards

A second skin medial circumferential incision is placed in 4-5 mm medial position to the opening of the external ear between the 6 and 12 o'clock directions and is expanded to the inter cartilaginous incision. self-retaining retractor with acute margins raises the laterally based skin flap, the temporalis fascia graft was taken from fascia anterior to auricle through intercartilaginous incision (Figure 2).



**Fig. 2:** Shows temporalis fascia graft taken from fascia anterior to auricle

At this step, the endoscope or the microscope was utilized to visualize perforation of tympanic membrane and to refresh the margins of the perforation. In the endoscopic group, the endoscope was inserted into the tympanic cavity via the perforation if it was wide enough. A 0° or 30° endoscope was used to begin the endoscopy in order to visualize the middle ear cavity.

Refreshment of the borders of the perforation was made by utilizing straight sharp needle (Figure 3). Then we elevated the tympanomeatal flap (TMF) and reflected it anteriorly. Then exploration of middle ear cavity was done by endoscope to view Eustachian tube orifice, round window and ossicles (Figure 4) Then graft was positioned utilizing underlay mechanism below the annulus and the handle of malleus.



Fig. 3: Shows endoscopic view of refreshment the edge of perforation

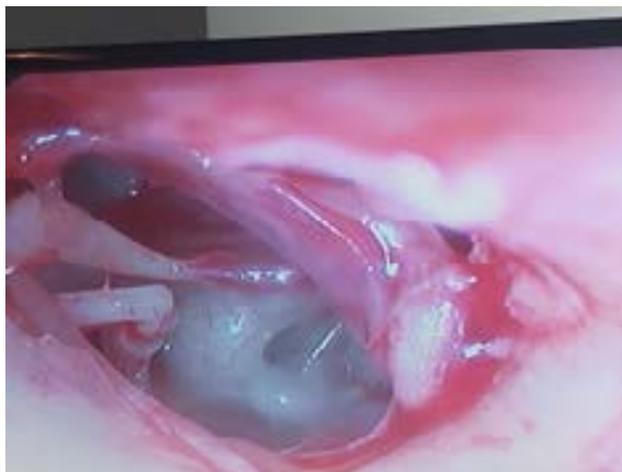


Fig. 4: Shows exploration of middle ear cavity by endoscope showing ossicles Eustachian tube orifice and round window

A gelfoam disc was used to hold the graft in place over the promontory, if needed. The tympanomeatal flap was returned and good apposition of the graft with the edge of the tympanic membrane perforation was checked and confirmed. Then gelfoam is positioned in external auditory canal to fix the graft. A gauze pack dipped in an antibiotic ointment was placed inside the meatus.

In microscopic group, the perimeter of the perforation should not be completely imagined in 7 cases, 5 cases of whom had external canal hump that needed external auditory canal curettage for this hump and other 2 patients having narrow external canal needed microscopic

myringoplasty aided by endoscope, while in endoscopic class no such technique were required.

### Post operative assessment

Postoperative antibiotics were given to all participants for at least 7 days following surgery. Participants were warned to prevent from washing their ears, sneezing, constipation, and forceful nose blowing.

For at least two months, postoperative follow-up was conducted. After the first postoperative checkup, which took place a week later, the stitches and ear pack were removed, and antibiotic ear drops were then prescribed for use for a week. Participants were assessed for graft uptake, granulation tissue development, and canal recovery every week following surgery. Three months after surgery, an audiometric assessment was performed.

### Statistical Analysis

The mean value, standard deviation, and lowest and maximum frequency were all included in descriptive statistics. For quantitative analysis, the t-test was utilized. For the analysis of qualitative data, the Chi-square test was utilized. For statistical analysis, the SPSS 22.0 package was used. Consequently, the p-value was regarded as significant as follows: Probability (*P-value*): *P-value* 0.05 was regarded as insignificant.

## RESULTS

The research was performed from March 2020 to august 2021. Mean age of group A was  $33 \pm 15.2$  years old with arrange of 20-47 years old and mean age of group B was  $38.27 \pm 12.51$  years old with range of 18-55 years old. In the this study, in group A, male patients were 14 cases (70%) and females patients were 6 cases (30%) & in group B, male patients were 9 cases (45%) and females patients were 11 cases (55%). There was no significant difference between the two classes considering sex and age distribution (*p-value* >0.05).

In the current study there was not a significant difference in sizes and sides of perforation between both classes (*p-value* >0.05) (Table 1).

**Table 1:** Distribution of side and size of tympanic membrane perforations in both classes

Parameters \ Classes	Group A N=20	Group B N=20	<i>P-value</i>
Side of diseased ear			
Right	12 (60%)	9 (45%)	0.342
Left	8 (40%)	11 (55%)	0.230
Size of perforation			
Large	10 (50%)	12 (60%)	0.525
Medium	6 (30%)	4 (20%)	0.465
Small	4 (20%)	4 (20%)	1.000

Operative times in class A and B were 110±25 and 80±30 minutes, respectively, with no significant difference (*p-value* > 0.005). Additionally, in class (A), all cases (100%) with subtotal perforations and cases with small or projecting ear canals could see the perimeter of the perforation without the necessity for external auditory canal canaloplasty or curettage, whereas in class B, the

perimeter of the perforation couldn't be completely noticed in 7 cases (35%), 5 cases (25%) of whom had external canal hump that needed external auditory canal curettage for this hump and other 2 patients (10%) having narrow external canal needed microscopic myringoplasty aided by endoscope. The difference between the 2 classes was not significant (*p-value* >0.05) (Table 2).

**Table 2:** operative time and Visualization In both classes

visualization of the perforations' dges: n(%)	Group A N=20	Group B N=20	Chi-square test: $\chi^2$	<i>P-value</i>
Completely Visualized	20 (100%)	13 (65%)	$\chi^2 = 5.012$	0.642
Could not be Completely visualized	0 (0%)	7 (35%)	$\chi^2 = 2.769$	1.328
Added procedures				
External canal Curettage or drilling	0 (0%)	5 (25%)	$\chi^2 = 6.329$	0.732
Microscope assisted by endoscope	0 (0%)	2 (10%)	$\chi^2 = 3.475$	0.081
Operative time mean ±SD	110±25 minutes	80±30 minutes	$\chi^2 = 4.072$	1.459
Median (Min.- Max.)	120(145-95)	90(120-60)		

In class A, the mean Preoperative airborne gab (ABG) was 22.85±3.34db and the mean postoperative ABG was 5.5 ±2.15 db with hearing gaining which was 16 ±2.75 db with a statistically significant difference between Preoperative and postoperative airborne gab. (*p-value*<0.05) (Table 3). (*p-value*<0.05) while in class (B) the mean Preoperative

air bone gab (ABG) was 25.75±2.90 db and the mean postoperative ABG was 7 ±3.25 db with hearing gaining which was 15 ±5.75 db with a statistically significant difference between Preoperative and postoperative air bone gab (Table 3) (*p-value*<0.05).

**Table 3:** Air bone gab (ABG) In both classes

	Group A N=20	Group B N=20	Chi-square test: $\chi^2$	<i>P-value</i>
Preoperative ABG:				
mean ±SD	22.85 ± 3.34 db	25.75 ± 2.90	$\chi^2= 2.381$	0.0369
Median (Min. – Max.)	24.75 (20 – 30)	27.25 (20 – 35)		
Postoperative ABG:				
mean ±SD	5.5 ± 2.15 db	7 ±3.25 db	$\chi^2= 5.556$	0.014
Median (Min. – Max.)	2.25 (0-5)	7.50(5-10)		
ABG gain:				
mean ±SD	16 ± 2.75	15 ±5.75	$\chi^2= 2.038$	0.034
Median (Min. – Max.)	17.75 (15 – 20)	12.25 (10 – 15)		

The graft was removed from 18 cases (90%) in the endoscopic class (class A), but not from 2 cases (10%), whereas in the microscopic class (class B), the graft was removed from 17 cases (85%), but not from 2 cases (10%). The 2 failed cases of group A were large sized perforations with deficient rim, these patients developed postoperative infection not responding to medications while the 3 failed cases of group B were medium sized perforations which are located anteroinferior and also patients developing postoperative infection did not respond to medications. There was no significant difference between the both classes (*p-value*>0.05) (Table 4)

**Table 4:** Graft taking in both groups

Graft taking	Classes		<i>P-value</i>
	Group A N=20	Group B N=20	
After 1 month			
Taken	15(75%)	13(65%)	1.362
Not taken	5(25%)	7(35%)	0.677
After 3 month			
Taken	18(90%)	17(85%)	4.265
Not taken	2(10%)	3(15%)	3.53

Regarding complications, no complications were reported as SNHL or fascial nerve paralysis in both groups. only 2 cases in class A and 3 cases in class B have post-operative loss of taste sensation due to attraction on chorda tympani that improved 3 months after operation with no statistically significant difference considering sequelae between microscopic and endoscopic classes

## DISCUSSION

A variety of endoscopes have been employed in the practice of ear surgery in myringoplasty and general in particular, and endoscope-assisted tympanoplasty has a surgical success rate between 80 and 100%<sup>[7]</sup>.

In the current study, all patients (100%) in the endoscopic class (class A) had the perimeter of the perforation clearly visible without the need for external auditory canal curettage, whereas in class B, the perforation circumference should not be entirely observed in 7 cases (35%), 5 cases (25%) had an external canal hump that needed external auditory canal curettage, and the other 2 cases (10%) had a narrow external canal that required microsurgery with no statistically significant differences between the 2 classes ( $p$ -value >0.05).

In this research, middle ear perforation and good exposure by endoscope were more likely to findings of Lade *et al.* 2014, Also, Migirov and Wolf .2015, reported that the surgical success rate for the microscope-assisted endoscopic myringoplasty was 100%. They noted that individuals with anterior abnormalities, narrow external auditory canals, and bone overhang may benefit most from this procedure. Consequently, under a microscope, the perforation's borders are poorly apparent<sup>[8,9]</sup>.

This is similar to results of Furukawa *et al.* 2014, who noticed that the edges of the perforation should not be visualized with the microscope pre refreshment in 12.0% of patients. In contrast, the endoscope can show the whole of the margins of the perforation, especially in cases of even the external auditory canal is narrowing or protruding<sup>[10]</sup>.

In this study, in endoscopic class the graft was uptaken in 90% of cases (18 cases ) while in microscopic class, the graft was uptaken in 85% of cases (17 cases ) with no significant difference between the two classes.

This is similar to Harugop *et al.*, the graft-take ratio in microscopic was 86 % while in endoscopic was 82 %, <sup>[11]</sup>.

Yadav SPS. *et al.*<sup>[12]</sup> in their research of endoscopic myringoplasty 40 cases out of total 50 cases had an intact tympanic membrane in the 8th week postoperative representing an 80 % rate of success.

El-Guindy<sup>[13]</sup> has assessed the function of the hard endoscope in the treatment of 36 patients of dry central tympanic membrane perforation. The graft uptake rate was 91.7%. Raj *et al.*<sup>[14]</sup> the graft-take rate in microscopic was 85 %, while in endoscopic was 90 %.

Ghaffar S *et al.*<sup>[15]</sup> the graft take-rate in microscopic was 68.18 %, while in endoscopic was 68.18 %. Lakpathi *et al.*<sup>[16]</sup> the graft-take rate in microscopic was 90 %, while in endoscopic was 88 %.

In group A. the mean Preoperative air bone gab (ABG) was 22.85±3.34db and the mean postoperative ABG was 5.5 ±2.15 db with hearing gaining which was 17 ±2.75 db while in in group B, the mean Preoperative air bone gab (ABG) was 25.75±2.90 db and the mean postoperative ABG was 7 ±3.25 db with hearing gaining which was 15 ±5.75 db with a statistically significant difference between Preoperative and postoperative airborne gab. ( $p$ -value<0.05)

The current finding were similar to those of Özgür *et al.*2015, who notified a perforation healing ratio of 84.0% and the development in ABG was 10.3 dB in endoscopic myringoplasty<sup>[17]</sup>.

Also, the findings of this research are similar to the study of Ayache. 2013 who notified that the use of the endoscopic technique has less trauma to the normal tissues with minimally invasive surgery and the rate of success of the utilization of cartilage grafts in cases undergoing endoscopic tympanoplasty is 96%<sup>[18]</sup>.

This study identifies a one-handed approach as a limitation of endoscopic myringoplasty. The surgeon used one hand to hold the endoscope throughout the duration of the surgery, leaving the other hand free for operation. It is consistent with study of Mohindra S and Panda 2015, who indicated that the major limitation of endoscopic surgery was the need for a single hand and the difficulty in controlling any ear canal bleeding<sup>[19]</sup>.

In the present study, The tympanic membrane perforations, the drum fragment, the middle ear mucosa, the Eustachian tube aperture, and the ossicular chain can all be examined closely with the endoscope. Endoscopes were used to circumvent the anatomical differences (anterior meatal overhang, stenotic or tortuous ear canals, etc.) that prohibit visualization of the full tympanic membrane margin during otological surgery. Therefore, endoscope offers the most promise for ear surgery in the future<sup>[20]</sup>.

## CONCLUSION

In spite of the size of the perforation and the external auditory canal's narrowness or protrusion, the endoscopic myringoplasty revealed clear visualization of the deep recesses of the middle ear. Therefore, using the endoscopic approach, external auditory canal canalplasty and curettage must be averted.

Some of the disadvantages of endoscopy including one-handed procedure and loss of depth perception may be avoided with practice and the usage of an endoscopic holder.

Consequently, endoscopic myringoplasty may be a great option for microscopic myringoplasty. In terms of future ear surgery, the endoscope has the most potential.

#### CONFLICT OF INTERESTS

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There are no conflicts of interest.

#### REFERENCES

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1. Tawab A, Gharib F, ElSharkawy L and Algarf T. Myringoplasty with and without cortical mastoidectomy in treatment of non-cholesteatomatous chronic otitis media: a comparative study. *Clin Med Insights Ear Nose Throat*. 2014;7:19-23.
2. Hong P, Bance M and Gratzner PF. Repair of tympanic membrane perforation using novel adjuvant therapies: a contemporary review of experimental and tissue engineering studies. *Int J Pediatr Otorhinolaryngol.*, 2002, 77:3-12.
3. Rizer FM. Overlay Versus Underlay Tympanoplasty Part I: Historical Review of the Literature. *Laryngoscope*; 1997, 107:1-25.
4. Dennis SP. Endoscopic assisted middle ear surgery. In: Glasscock ME III, Gulya AJ, eds. *Surgery of the Ear*. 5th ed. Hamilton: Elsevier, 2003: 325-34
5. Patel J, Aiyer RG, Gajjar Y, Gupta R, Raval J and Suthar PP: Endoscopic tympanoplasty vs microscopic tympanoplasty intubotympanic CSOM: a comparative study of 44 cases. *Int J ResMed Sci*. 2015, 3(8):1953–1957.
6. Tarabichi M, Ayache S, Nogueira JF, Al Qahtani M and Pothier DD. Endoscopic management of chronic otitis media and tympanoplasty. *Otolaryngol Clin North Am.*, 2011, 46:155–163
7. DüNDAR R, Kulduk E, Soy FK, Aslan M, Hanci D and Muluk NB: Endoscopic versus microscopic approach to type 1 tympanoplasty in children. *Int J Pediatr Otorhinolaryngol.*, 2014, 78: 1084–1089.
8. Lade H, Choudhary SR and Vashishth A.: Endoscopic vs microscopic myringoplasty: a different perspective. *Eur Arch Otorhinolaryngol.*, 2019, 271: 1897-1902.
9. Migirov L and Wolf M (): Transcanal microscope-assisted endoscopic myringoplasty in children. *BMC Pediatrics* 2005,15:32-35.
10. Furukawa T, Watanabe T, Ito T, Kubota T and Kakehata S: Feasibility and advantages of transcanal endoscopic myringoplasty. *Otol Neurotol*. 2010, 35: e140-5.
11. Harugop A.S, Mudhol R. S., Godhi R. A. A comparative study of endoscope assisted myringoplasty and microscope assisted myringoplasty. *Indian J. Otolaryngology head & Neck Surgery* 2008, 60:29-302.
12. Yadav SPS, Aggarwal N, Julaha M, Goel A.. Endoscope assisted myringoplasty. *Singapore Med J* 2009;50(5):510).
13. El-Guindy A. Endoscopic transcanal myringoplasty. *J Laryngol Otol* , 1993,106:493–495.
14. Raj A, Meher R .Endoscopic transcanal myringoplasty—a study. *Indian J Otolaryngol head neck surg* 2001, 53(1):47–49.
15. Ghaffar S, Ikram M, Zia S, Raza A. Incorporating the endoscope into middle ear surgery. *Ear Nose Throat J*. 2006;85(9):593-596.
16. Lakpathi G, Reddy LS .Comparative study of endoscope assisted myringoplasty and microscopic myringoplasty. *Indian J Otolaryngol Head Neck Surg* 2016, 68:185.
17. Özgür, A., Dursun, E., Erdivanli, Ö. Ç., Coşkun, Z. Ö., Terzi, S., Emiroğlu, G. Ö. K. H. A. N. and Demirci, M.: Endoscopic cartilage tympanoplasty in chronic otitis media. *The Journal of Laryngology & Otology*. 2019, 129(11): 1073-1077.
18. Ayache S : cartilaginous myringoplasty: the endoscopic trans- scanal procedure. *Eur Arch Otorhinolaryngol*. 2013, 270: 853--60
19. Mohindra S and Panda NK : Ear surgery without microscope; is it possible. *Indian J Otolaryngol Head Neck Surg*. 2008,62(2):138–141.
20. Lakpathi G and Reddy LS: Comparative study of endoscope assisted myringoplasty and microscopic myringoplasty. *Indian J Otolaryngol Head Neck Surg*. 2016, 68:185-191.