

Endoscopic versus microscopic myringoplasty: A comparative study

Naik Muhammad, Sameeah Hanif, Sowebea Hanif

Abstract:

Tympanic membrane perforation is a common problem that otolaryngologist encounter in day to day practice requiring tympanoplasty or myringoplasty. The cause of tympanic membrane perforation is either trauma, infection, or iatrogenic. The incidence of tympanic perforation in United States is 1 to 3% in lifetime.

Objective: To compare endoscopic versus microscopic myringoplasty in terms of graft success, operative time, pre and post operative Air bone gap.

Material and Methods: To compare the results of myringoplasty using operating microscope (post aural) with endoscopic approach (permeatal). This retrospective comparative study was conducted in department of ENT in DHQ Abbottabad after approval from ethical committee for a period of three years from January 2019 till December 2021. A total of 80 patients age group from 18 till 70 with tympanic membrane perforation were included in study.

Results: 80 patients were included in study. 40 patients in each group. The mean age in group A was 44.63 ± 13.83 years while in group B it was 46.20 ± 12.09 years. Graft success rate was 95 percent in endoscopic approach while 92.5% percent in microscopic group with a p value of 0.64. The pre-operative mean air bone gap was 24.15 db and 23.08 db, improved to 10.23db in endoscopic group and 9.2 db in microscopic group ($p > 0.05$).

Conclusion: In our study graft success was comparable in both groups. The surgical success rates were 95% in Group A and 92.5% in Group B. No differences in the mean decrease in the air–bone gap between two groups. Significant postoperative hearing improvements were evident in both groups. The mean operative time was lesser in case of endoscopic approach.

Keywords: Tympanoplasty, endoscopic, microscopic, graft uptake, hearing improvement

Introduction:

Tympanic membrane perforation is a common problem that otolaryngologist encounter in day to day practice requiring tympanoplasty or myringoplasty. The cause of tympanic membrane perforation is either trauma, infection, or iatrogenic. The incidence of tympanic perforation in United States is 1 to 3% in lifetime. Some perforation cause chronic ear discharge and hearing impairment. Chronic perforations if left as such can lead to formation of reservoir for infections, cholesteatoma, labyrinthitis, seventh nerve palsy; subperiosteal abscess.¹ Tympanoplasty is mostly performed for perforations

secondary to chronic otitis media in the absence of cholesteatoma in order to improve hearing. In order to close the tympanic membrane perforation perichondrium and temporalis fascia remain the mostly widely used materials.² Since the introduction of tympanoplasty various graft material and type of surgical technique have been developed, in those microscopic technique remained stereotype conventional approach involving post auricular approach for tympanoplasty. It required a bigger scar and straight line vision was major drawback of this approach impeding middle ear view through canal.³ In 1921 Swedish otolaryngologist Carl Olof Nylen used

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DHQ, Abbottabad

N Muhammad

S Hanif

S Hanif

Correspondence:

Dr. Sameeah Hanif

Department of Surgery

DHQ, Abbottabad.

Cell No: +92 321-9960321

email: dr.sameeahhanif@

gmail.com

monocular microscope for the first time. Subsequently in 1922 Gunner Holmgren used binocular microscope. Those microscopes had much drawback poor light quality, unstable illumination, near focal distance and small visual field. In 1951 Littman and Zeiss Company replaced previous models. New microscopes have advantage of binocular vision, good surgical vision and depth perception, and both hands are free to use however straight vision is the main drawback.⁴ Also microscope has a workspace which is upside down leading to more tissue resection with or without drilling of the bone to obtain sufficient illumination.⁵ With the development of endoscope the field of surgery was revolutionized. With endoscope middle ear was accessed with ease along with that middle ear ventilatory path could easily be understood.⁶ With the development of high quality endoscope with narrow diameter middle ear surgery has revolutionize along with cameras and screen of ultra high quality and cold light source. Because of cone shape source of illumination of endoscope optimal visualization is ensured and wider surgical view of surgical area. Endoscope allow wide angle view in whole external ear canal, it magnifies structures in middle ear and hidden areas can be visualized directly including sinus tympani, epitympanum, hypotympanus and posterior part of mesotympanum.⁷

Material and Methods:

This retrospective comparative study was conducted in department of ENT in DHQ Abbottabad after approval from ethical committee for a period of three years from January 2019 till December 2021. A total of 80 patients age group from 18 till 70 with tympanic membrane perforation were included in study. Causes of tympanic membrane perforation were either traumatic or chronic otitis media. Exclusion criteria were patient with a prior ear surgery, non tragal cartilage tympanic membrane graft, patients requiring additional surgical procedure. 40 patients were included in endoscopic group and 40 in microscopic group. Average time taken, graft uptake, pre and post-operative Airbone gap were recorded for each group. The surgical

success rate for hearing was taken as air-bone gap ≤ 20 dB.

Follow up was conducted using endoscopic examination and pure tone audiometry after period of 3 month post operatively. Data was recorded in Microsoft excel later SPSS was used for analysis. Continuous variable were expressed as mean \pm SD. Categorical variable were expressed in percentages. Student t test and chi square tests were used where required. A p-value of <0.05 was considered significant.

Results:

In our study 80 patients were there. Group A endoscopic and group B microscopic. Each group consisted of 40 patients.

The mean age in Group A was 44.63 ± 13.83 years while in Group B it was 46.20 ± 12.09 years. Pre-operative Airbone gap in Group A was 24.15 ± 1.02 db in Group B 23.08 ± 0.76 db. In Group A post operative Airbone gap was 10.23 ± 0.73 db while group B had 9.20 ± 0.88 db with a ($p > 0.05$). Mean operative time in Group A was 64.50 ± 7.7 minutes while in Group B it was 83.85 ± 8.13 minutes with a p-value of ($p < 0.001$). In Group A only 2 (5%) graft failure while in group B there were 3 rejection (7.5%) with a p-value of 0.64. Graft success rate was therefore 95% in endoscopic approach while 92.5% percent in microscopic group.

Discussion:

Myringoplasty is an operative procedure in which perforation in tympanic membrane is repaired and it is commonly performed in otolaryngology. The purpose of this study was to compare the advantages and disadvantages of microscopic myringoplasty with that of endoscopic myringoplasty in terms of operative time, cosmesis, audiological improvement and graft uptake. In endoscopic approach the margins of perforation can be visualized easily after refreshing edges in huge and subtotal perforation along with orifice of Eustachian tube, IS joint around the round window is better visualized with endoscope and it is easily negotiated through curved EAC. In microscopic procedure the mi-

croscope requires frequent adjustment. In endoscopic procedure canaloplasty and curettage is not required in contrast to microscopic procedure it's often difficult to see ossicular chain in case it overhangs.⁸ In our study the operative time taken in microscopic myringoplasty was 83.85 ± 8.13 min while 64.50 ± 7.7 min in endoscopic group with a ($p < 0.001$). In contrast to our study an author found that time taken during microscopic myringoplasty was 90 minutes (60–120 minutes) and 102 minutes (60–140 minutes) in endoscopic group.⁹ Another study quoted that the mean operation time of the Microscopic group of 52.63 ± 8.68 minutes was longer than that of the Endoscopic group 48.20 ± 10.37 minutes. More operative time required in conventional surgery, similar to our finding.¹⁰ In endoscopic group the success rate of graft was in 95% cases while in microscopic group graft was successful in 92.5% with a p value of 0.64. In a study the graft success rate was 91.42% after 12 weeks in both group with a p value of 1.00.¹¹ Also another author reported that in endoscopic group the graft uptake was 91.67% while in microscopic group it was 93.3%.¹² A study quoted that rate of graft healing in Endoscopic and Microscopic group after follow-up of 6 months was 88% (22 out of 25) and 72% (18 out of 25) respectively and difference between two groups was not significant ($p=0.157$).¹³ Pre-op ABG in group A was 24.15 ± 1.02 db and 23.08 ± 0.76 db in Group B. In Group A post-operative ABG was 10.23 ± 0.73 db while Group B had 9.20 ± 0.88 db. A study by an author found that after follow-up of 3 months in the endoscopic group 45.45% of the patients had postoperative Airbone gap between 0 to 10 dB while 50% of the patients had a postop Air–Bone gap between 11–20 dB. While in the microscopic group, 45.45% of the patients had a postoperative Airbone gap between 0–10 dB while 36.36% of the patients had a postoperative Airbone gap between 11–20 dB.¹⁴ Another study also found that the average Airbone gap in the microscopic group post-operatively was 16.05 dB and in the endoscopic group it was 15 dB. Apart from that, the mean post-operative gain in the endoscopic group and microscopic group was 15.03 dB and 13.96 db respectively.¹⁵

An Author found no difference in post operative Airbone gap between two groups.¹⁶ Many studies have not shown this finding they showed difference in hearing between two groups.^{17,18}

Conclusion:

The endoscopic approach is as effective as microscopic approach. For tympanic microscopic approach the advantages are good depth perception and both hands are free to use. While endoscopic approach allows better visualization, less incidence of trauma/ damage. Endoscope is portable so easy for surgeon where there is non availability of microscope. In our study graft success was comparable in both groups. The surgical success rates were 95% in Group I and 92.5% in Group II. No between-group differences in the mean decrease in the airborne gap. Significant post-operative hearing improvements were evident in both groups. The mean operative time was shorter when the endoscopic approach was chosen.

Conflict of interest: None

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Role and contribution of authors:

Naik Muhammad, collected the data, references and did the initial write-up.

Sameeah Hanif, collected the data, references and helped in discussion and introduction writing.

Soweiba Hanif, typically review the article, helped in tabulation and made the final changes.

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