

A Comparative Study of Endoscopic Myringoplasty v/s Conventional Microscopic Myringoplasty- Our Experience

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Abstract: ***Objective:** To determine the advantages and disadvantages of the endoscopic myringoplasty as compared to the microscopic myringoplasty. **Methods:** This study was conducted between July 2017 and Jan 2018 in the department of Ent and Hns Govt Medical College Srinagar Kashmir (SMHS), total of 60 patients were included in this study. All 60 patients underwent myringoplasty, Group1, 30 patients were endoscope assisted and Group2, 30 patients were microscope assisted. Results of surgery were compared at the end of six months postoperatively. All patients undertaken for surgery had dry central type perforation. **Results:** In both groups, the postoperative air–bone gap (ABG) was significantly lower than the preoperative ABG. There were no significant differences between the preoperative and postoperative ABG values (in dB) in either group. The mean operative duration in Group 1 was significantly lower than that in Group 2. The difference between the perforation conditions (larger vs. smaller) was not significant in either group. **Conclusion:** The endoscopic approach for tympanoplasty offers superior visualization and shorter operative time than conventional surgery with less bleeding intra-operatively, in addition to equal hearing outcome and perforation rate. Furthermore observation of fewer tissue injuries, negligible bleeding and lesser perioperative nausea and vomiting^{5,6}, early healing of wound, suggest that the endoscopic myringoplasty is a better choice for surgery.*

Keywords: otoendoscope, myringoplasty, microscopy, ear

1. Introduction

Tympanoplasty is a surgical procedure used to eradicate the disease of middle ear and reconstruction of the ear drum. Various approaches of tympanoplasty have been given like post auricular(wildes), endaural, transcanal and endoscopic approach. The advent of operating microscope result of myringoplasty started showing dramatic improvement. The technique Myringoplasty is a surgical procedure performed to close tympanic membrane perforations.. Major disadvantage of operating microscope is that it provides a magnified image along a straight line which limit the visual field in deep recess of middle ear. Endoscopic² ear surgery is an emerging technique with recent literature highlighting advantage over traditional microscopic approach. It provide an excellent magnified image with good resolution. With minimal effort it can visualise corners of middle ear cavity. Magnification can be achieved by just getting the endoscope closer to surgical field. Middle ear cavity can be visualised easily using an endoscope. Even difficult areas to visualize by microscope like sinus tympani can easily be examined using an endoscope, also endoscopic axis is 360 degrees without tilting patients head as required some times under microscopic procedures. Therefore, middle ear surgery is increasingly being performed endoscopically^{1,13,14}.

In this study, we compared the result of hearing improvement ,operation duration ,bleeding during procedure, residual perforation cases after 6month follow up period for patients who recieved endoscopic and

microscopic myringoplasty . We then evaluated the endoscopic approach over conventional surgery.

2. Material & Method

Inclusion criteria

- 1) Patients in the age group of 15 -60 were included in the study.
- 2) All these patients had dry central perforation of ear drum.
- 3) Patients with demonstrable degree of conductive deafness was chosen (at least ≥ 30 dB pure tone average).
- 4) All patients who gave informed consent for operation.

Exclusion Criteria

- 1) CSOM with Cholestatoma.
- 2) SNHL type hearing loss.
- 3) Patients with active discharge.
- 4) Patients who had ossicular reconstruction or underwent type 2 or more advanced type of tympanoplasty.

The patients were divided into two groups according to the surgical procedure they received. Group 1 underwent conventional microscopic myringoplasty and Group 2 underwent endoscopic myringoplasty. We took proper history, did all necessary investigations, analysed the demographic data, preoperative and postoperative pure tone audiometry, surgical approach (endoscopic or microscopic), intra-operative bleeding and operative duration. Postoperative follow-up evaluations were performed after 1, 3, and 6 months; they included pure tone audiometry, endoscopic or microscopic evaluation of the status of the graft. Hearing thresholds, including air

conduction threshold and bone conduction threshold, were evaluated by the averages at 0.5, 1.0, and 2.0 kHz. The air-bone gap (ABG) was also calculated in each examination. All these procedures were performed under general anaesthesia after proper consent.

In group 1 microscopic approach was used with post-auricular approach. The temporal muscle fascia was harvested at the beginning of the operation, and the "underlay" graft was placed medial to the malleus.

In Group 2, an endoscopic approach was used and rigid otoendoscopes (2.7 mm and 4.0 mm) were used for this approach. After freshening the margins of the tympanic membrane perforation, an incision was made laterally in the posterior and inferior parts of the external auditory canal (about 5 to 10 mm from the tympanic membrane). A tympanomeatal flap was elevated, and the middle ear cavity was visualized. A piece of temporalis fascia graft was harvested by separate small incision given in scalp after shaving small area of scalp.

3. Result

The demographic characteristics and clinical findings of Groups 1 and 2 are shown in Table 1. In total, 30 ears (16 men and 14 women) were subjected to the microscopic approach, and 30 ears (13 men and 17 women) were subjected to the endoscopic approach. The mean age of the patients was 49.9 ± 15.0 years in Group 1 and 54.2 ± 15.6 years in Group 2, there were no significant differences in the age of the patients between Groups 1 and 2 ($p=0.1687$).

Preoperatively, the air conduction levels of the pathological ears in Group 1 and Group 2 were 44.0 ± 21.9 dB and 44.4 ± 20.6 dB respectively. There were no significant differences between the two groups ($p=0.9253$). The bone conduction levels of the pathological ears in Group 1 and Group 2 were 22.6 ± 17.0 dB and 22.8 ± 15.2 dB respectively.

There were no significant differences between the two groups ($p=0.9507$). The ABGs were 21.4 ± 10.6 and 21.6 ± 11.2 respectively. There were no significant differences between the two groups ($p=0.9270$).

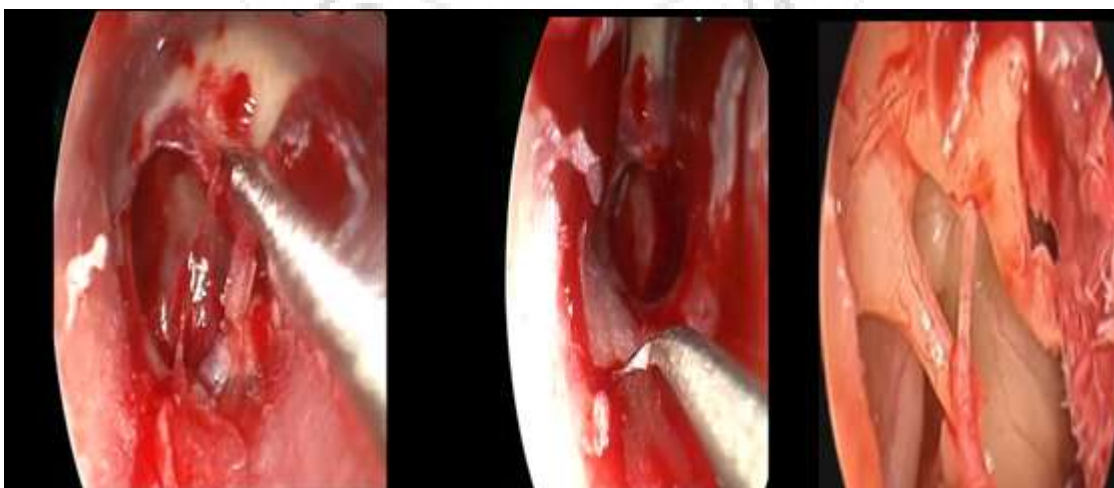
Postoperatively, the improvements in the air conduction level of the pathological ears in Group 1 and Group 2 were 9.5 ± 8.6 dB and 9.5 ± 8.6 dB. There were no significant differences between the two groups ($p=1.0000$). The improvements in the bone conduction level of the pathological ears in Group 1 and Group 2 were 1.2 ± 7.8 dB and 0.6 ± 7.0 dB. There were no significant differences between the two groups ($p=0.6865$). The improvements in ABG were 8.3 ± 10.0 dB and 8.9 ± 10.0 dB respectively. There were no significant differences between the two groups ($p=0.7641$).

The average operation time in Group 1 was 78.5 ± 20.4 minutes, compared to 47.4 ± 13.4 minutes in Group 2. The operation time in Group 2 was significantly shorter than that in Group 1 based on an independent samples t-test ($p < 0.0001$).

In Group 1, there was significant amount of bleeding started from post auricular incision till closure. Bleeding was calculated depending upon number of small cotton pledgets of equal size which got soaked due to bleeding during the procedure. Similar procedure was followed in endoscopic group. On an average 8 to 10 cotton pledgets were used in microscopic group, on the other hand 3 to 5 pledgets were used in endoscopic group.

Below pictures showing endoscopic steps used in tympanoplasty:

Endoscopic freshening of margins of perforations followed by elevation of tympanomeatal flap and lastly showing ossicular chain along with chorda tympani and elevated tympanomeatal flap.





Otoendoscope used in Endoscopic tympanoplasty



Picture showing post-auricular incision used in Tympanoplasty

Table 1: Demographic characteristics and outcomes of Groups 1 and 2

Number of patients	Microscopic (Group 1)(30 ears)		Endoscopic (Group 2) (30 ears)		P Value
	30 (16 men, 14 women)		30 (13 men, 17 women)		
Left /Right	20LEFT/10 RIGHT		25LEFT/5RIGHT		0.4177
Age (mean±SD)	49.9±15.0		54.2±15.6		0.1687
Preoperative (pathological ear)					
Air conduction (mean±SD)	44.0±21.9		44.4±20.6		0.9253
Bone conduction	22.6±17.0		22.8±15.2		0.9507
Air-bone gap [n (SD)]	21.4±10.6		21.6±11.2		0.927
Tympanogram [n (%)]	A/C	B	A/C	B	0.2945
	2	28	3	27	
Postoperative (>6 months) (pathological ear)					
Air conduction improvement (mean±SD)	9.5±8.6		9.5±8.6		1
Bone conduction improvement	1.2±7.8		0.6±7.0		0.6865
Air-bone gap improvement (mean±SD)	8.3±10.0		8.9±10.0		0.7641
Tympanogram (mean±SD)	A/C	B	A/C	B	0.1475
26	26	4	25	5	
Operation duration (minutes) (mean±SD)	75.5±20.4		50.4±13.4		<.0001
Graft condition					
Perforated case [n (%)]	1 (2)		1 (2)		1

4. Discussion

The main objective of CSOM is to achieve symptomatic relief, dry ear, hearing improvement and minimize complication. Many ENT surgeons perform tympanoplasty under an operating microscope. The main advantages of the microscopic approach are stereo-vision and bimanual handling. However, despite providing direct exposure, microscopes require frequent adjustment and may still not be sufficient when encountering protruding structures, particularly the anterior wall. Hidden areas that cannot be seen under microscope can be better observed via thin rigid endoscope³ with different angles, bony overhangs of external canal wall can also be negotiated without drilling or curettage. Endoscopes also allow functional reconstruction during surgery and thus performance of minimally invasive procedure and conservative surgeries with protection of the anatomy¹².

The advantages of the endoscopic³ approach also include a decrease in the operative time, which results in a decrease of the duration of anesthesia and related side effects, and a lower effect on the surgeons concentration. Endoscopic

procedures having less wear and tear so less bleeding also. In a study by Ghaffar et al⁶ the mean operative time was 62.85 minutes among 34 patients who underwent endoscopic tympanoplasty. In our study, the mean operative time among the 30 ears that received the endoscopic approach was 50.4 minutes, compared to 75.5 minutes for the microscopic approach; this shows a significant difference.

The endoscopic approach gives results equal to those of the microscopic approach in terms of the hearing outcome and need of revision surgeries. However, this procedure has several disadvantages, including a lack of sufficient microscopic magnification and focus, less operative time, better visualization of hidden areas, better magnification and less bleeding also less tissue wear and tear.

Karhuketo et al⁷, emphasized that the use of endoscopic methods in ear surgery fulfills the requirements of minimally invasive surgery, and the least trauma to the normal tissues can be achieved in this way. Lade et al⁸ compared 60 patients undergoing myringoplasty (type 1 tympanoplasty) using either a microscopic or endoscopic procedure. Among

the 30 patients who underwent the microscopic method, canaloplasty was performed to evaluate the ossicular system in 5 and external auditory canal curettage was performed in 4 patients. However, none of the 30 patients who underwent the endoscopic procedure required such interventions, and the ossicular system could be assessed easily. They concluded that the results of endoscopic tympanoplasty are similar to those of microscopic tympanoplasty and that endoscopic tympanoplasty is more tolerable in terms of the cosmetic appearance. Thus, this technique was considered a potential alternative to microscopic tympanoplasty. In the present study, we obtained results similar to those of Lade et al.⁸. In our microscopic procedure, curettage of the chordal crest was performed to assess the ossicular system, and in one patient, canaloplasty was performed due to the prominence of the anterior wall. However, patients who underwent the endoscopic transcanal^{9,10} procedure required no extra interventions involving the external auditory canal.

Ayache¹⁰ reported a graft success rate of 96% in patients undergoing transcanal endoscopic cartilage tympanoplasty, and this procedure was reportedly a minimally invasive, safe and effective treatment method. The graft success rate in the endoscopic tympanoplasty procedure of the present study was 87.5%. Gasline et al. performed the classical microscopic approach for cartilage grafting in 42 patients 3–16 years of age and reported a graft success rate of 83.3%. In a study by Albirmawy, the cartilage graft success rate was 95% in 82 children. Nevoux et al. reported that their cartilage tympanoplasty success rate was 87.3% in 268 patients. In our study, the graft success rate was 87.5% in 32 patients who underwent the endoscopic procedure and 94.3% in those who underwent the microscopic procedure. Postoperative hearing gain is an important indicator of treatment success in patients who have undergone tympanoplasty. Especially hearing gain is important in terms of the future quality of life. Many studies have reported successful results regarding postoperative hearing gain in such patients. Friedman et al. performed type 1 tympanoplasty in 119 pediatric patients, using cartilage grafts, the preoperative and postoperative ABGs were calculated to be 20.7 and 8.5, dB respectively. In a study by Yilmaz et al., the ABGs were 30.6 dB preoperatively and 17.8 dB postoperatively in 45 pediatric patients who underwent type 1 cartilage tympanoplasty. In our study, the preoperative and postoperative ABGs were 20.40 and 8.12 dB, respectively in the endoscopic tympanoplasty group and 21.34 and 8.13 dB, respectively in the microscopic tympanoplasty group. Dr dharmidar kumar et al¹³ and manish kumar et al¹⁴ did similar study and found endoscopic method superior and better in most of the prospectives of surgical outcome and quality of life both intra operatively as well early and late post operative period. The duration of the operation is an important parameter in terms of the duration of anesthesia, the surgeon's concentration, and the increased risk of iatrogenic complications. In a study by Ghaffar et al the mean operation duration was 62.85 min among 34 patients who underwent endoscopic tympanoplasty. In 24 of these patients, the operation duration was less than 60 min. In our study, the operation duration among the 30 patients, the average operation time in Group 1 was 78.5±20.4 minutes, compared to 47.4±13.4 minutes in Group 2 which also included 30 patients. The reason for these differences may

be related to the fact that neither suturing nor extra time to view hidden areas is needed during endoscopic procedures and less bleeding intra operatively also adds to lessen time duration.

5. Conclusion

The endoscopic approach for tympanoplasty^{3,4} offers superior visualization and shorter operative times than conventional surgery, in addition to equal hearing outcomes and perforation rates. Other advantages of this surgical technique include a lower rate of tissue injury, better cosmetic outcomes, and lower rates of perioperative nausea and vomiting^{5,6}, less bleeding intra operatively, no requirement of canaloplasty, it can also negotiate canal prominences (bony overhang).

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