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Original Research Article

Microscopic Approach versus Endoscopic Approach for Type 1 Tympanoplasty: Our Experience

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Abstract

Introduction: chronic otitis media is common entity for which tympanoplasty is done. The aid of a microscope or an endoscope is necessary to carry out the tympanoplasty. In the present work, we seek to compare endoscopic and microscopic approach for type-1 tympanoplasty for different aspects.

Material and Methods: This is an analytical study in which data was collected from 50 patients who underwent tympanoplasty in our department in our respective hospital July 2022 to May 2023. Patients above 15 years of age with inactive chronic otitis media tubotympanic type operated for type-1 tympanoplasty.

Result: Equivalent number of cases underwent microscopic and endoscopic type-1 tympanolasty. As far as graft taken up is concern both approaches had similar surgical outcome. Hearing gain was almost similar. Average hearing gain in microscopic tympanoplasty group is 11.0±3.14 dB and in endoscopic tympanoplasty group is 11.30±2.97 dB.

Conclusion: Both microscopic and endoscopic methods are outstanding for type-1 tympanoplasty with merits and demerits of each method. A meticulous selection of patient will be beneficial for endoscopic approach.

Keywords: endoscopic, microscopic, type 1 tympanoplasty

Introduction

Chronic otitis media (COM) is a very common pathology in ENT diseases, which may cause permanent changes in the tympanic membrane and/or in the various contents of the middle ear cleft. It is further classified as non-cholesteatomatous (tubotympanic) and cholesteatomatous (atticoantral). [**1]** Surgical procedures used for repair of the tympanic membrane and middle ear, respectively, are myringoplasty and tympanoplasty. Any operation involving reconstruction of the tympanic membrane with or without ossicular chain reconstruction is referred to as tympanoplasty. On the other hand, myringoplasty refers to repair of tympanic membrane only. [2] Type I tympanoplasty is the repair of the perforation of the tympanic membrane, and it was first performed by Berthold (1878), later popularized by Wullstein and Zollner (1950) [3].

In 1921 Carl Olof Nylen, a Swedish otologist used microscope in ear surgery. The monocular microscope was soon replaced by binocular microscope in 1922 by Gunner Holmgren. There was rapid progress of microscopic ear surgery when Littmann and Zeiss Co. introduced their version of microscope which has been modified with advancement over the years [4]. It had benefits of magnified vision, good depth perception, and utilization of two hand techniques. However, it has the shortcomings like difficulty to ‘‘view around corners’’ in deep recesses and require soft tissue and bony dissection to allow sufficient light to reach the surgical field.

With the introduction of the endoscope into various fields of surgery, there have been attempts at its utilization in otology. The first published description of imaging of the middle ear by endoscopy was by Mer et al. in 1967 [5]. The use of a rigid endoscope for tympanoplasty has a significant advantage as it is simple to use, not only for the examination, but also for the repair of the tympanic membrane perforation. This provides a magnified vision, and hence enables the surgeon to change rapidly from a close-up to a wide-angle view, just by going closer or by withdrawing the scope. Further, it provides a panaromic vision to the surgeon, who can rotate the angled endoscope to visualize the deep anterior canal wall, anterior recess, sinus tympani, facial recess, hypotympanum and the attic [6].

The decision to decide the approach for tympanoplasty depends upon multiple factors such as [7]

- Extent of disease,
- Size of external auditory canal
- Location of perforation
- Size of perforation,
- And surgeon’s own expertise and preference

It also helps to understand and examine the ventilatory pathway of middle ear and its correction, if needed. Endoscopically, the typical transcanal approach is possible by elevating a tympanomeatal flap10. This avoids other unnecessary incision and soft tissue dissections[7]. The objectives of this study were to compare the outcome of endoscopic and microscopic Type I tympanoplasty regarding graft uptake rate, Hearing improvement, Success in various age groups, Operative time, and Operative difficulties, to identify and compare the difficulties in surgery with microscopic and endoscopic approach, to compare Patient’s compliance and satisfaction via two approaches.

Materials and Methods

This study was carried out in 50 patients who came to ENT OPD at respective tertiary care centre. Patients who presented with complaint of ear discharge and those who were willing for surgery with their informed and written consent were screened. Tuning fork test was done with 256-, 512-, and 1024-Hz frequency tuning forks, and pure tone audiometry was performed to evaluate the type and degree of hearing loss. Hearing loss was determined by taking the average of A-B gap at frequencies of 500, 1, and 2 kHz. This study data was collected from 50 patients who underwent tympanoplasty at our respective tertiary care centers from July 2022 to May 2023.

Inclusion Criteria: Patient having

- Age Above 15 Years Having Chronic Otitis Media (Tubotympanic).
- Having Dry Ear For At Least 10 Day
- Mild To Moderate Degree of Conductive Hearing Loss.

Exclusion Criteria: Patient with

- Squamous type of com (atticoantral).
- Active mucosal chronic otitis media.
- Sensorineural hearingloss.
- Extracranial and intracranial complication
- Revision cases of tympanoplasty
- Tympanosclerosis

- Age less than 16 year

A proforma was prepared for all the cases, findings were noted and treatment and follow up were charted. All surgeries were carried out under general anesthesia. As graft material, Temporalis Fascia was used in all cases for the purpose of uniformity. All grafts were kept by Inlay technique for ease of comparison.

Microscopic tympanoplasty was done conventionally by postaural route

- Incision is given 2mm away from postaural sulcus starting from 12o'clock position superiorly just up to mastoid tip inferiorly.
- It is made through skin and subcutaneous tissue preserving underlying fascia.
- Dissection carried out on upper part towards temporal bone and temporalis fascia is exposed and graft is harvested.
- Periosteal flap is elevated from bone. Posterior canal wall incision given from 12o'clock to 6o'clock position.
- Perforation margins were trimmed. Further steps of the procedure is carried in the similar manner as endaural approach.
- After tympanoplasty, post aural incision is closed with reposition of periosteal flap and closing the incision with interrupted suturing or subcuticular continous suturing.

Endoscopic tympanoplasty was done by Endaural / Permeatal route. A zero degree, 18 cm long, 2.7 and 4 mm wide Hopkin's rod endoscope was used. All surgeries were done by visualization using the monitor. All patients had a 3 cm incision in the hairline just above the helix to harvest the temporalis fascia graft. For freshening the margins of the perforation the endoscope was introduced through the external auditory canal and the edges of the perforation were freshened. Elevation of the tympanomeatal flap was done. An incision was taken 5 mm from the tympanic annulus from 12'clock to 6'clock position for left ear and 6'clock to 12'clock position for right ear. The tympanomeatal flap was elevated and placed anteriorly. Dried temporalis fascia was placed by underlay techniqu and the tympanomeatal flap was replaced. Gelfoam was placed to stabilize the graft. Postoperative care antibiotic, analgesics and oral decongestants are administered for 14 days. Mastoid dressing applied for 3 to 6 days. Antibiotic ear drops advised for 3 weeks for three times a day after 3weeks postoperatively.

Results

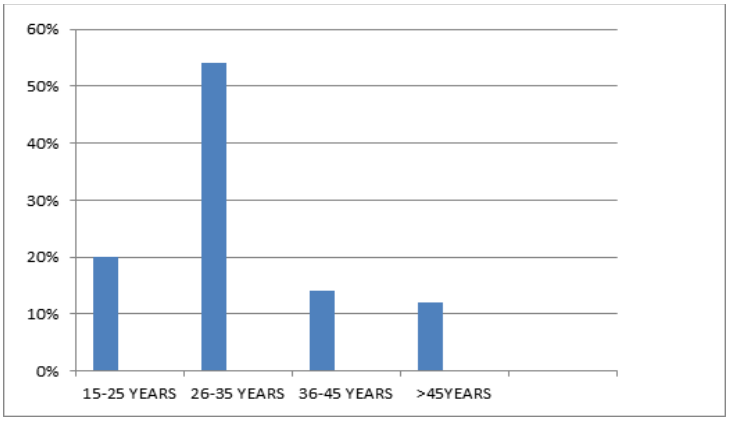

Figure 1: Age distribution age group of patient

In the present study, the maximum number of patients affected is in the age group of 26-35 years (54%). Since this age group leads a active life with work and other liabilities , patients are more aware of their deafness as it hampers the active life.

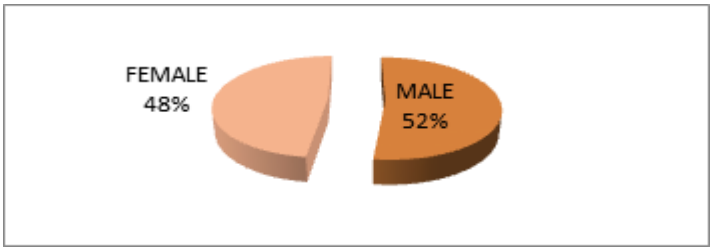

Figure 2: Sex distribution sex of patient

Patients were selected randomly in our study irrespective of their sex. There is no any predilection for sex in the prevalence of the disease.

Table 1: Ear pathology

Site of Pathology	No. of Patients (%)
Unilateral	28(56%)
Bilateral	22(44%)
Total	50(100%)

Maximum patients in our study were found to having unilateral pathology while 22 patients were found to having bilateral COM. In bilateral ear pathology dry and more affected ear was selected for surgery.

Table 2: Chief complaint in the study

Chief Complaints	No. of Patients	Percentage
Ear Discharge	50	100%
Decreased Hearing	44	88%
Earache	20	40%

Present study had All patients with complaint of ear discharge either on presentation or in past. All cases underwent surgery once ear was dry. Total 50 (100%) Ear discharge was having wide duration from less than 1 year to more than 5 year. It may be due to chronicity of disease, intermittent nature of disease and treatment with conservative medication. Majority of our patients (88%) had complaint of some degree of deafness. Many also presented with pain (40%) when discharge was active.

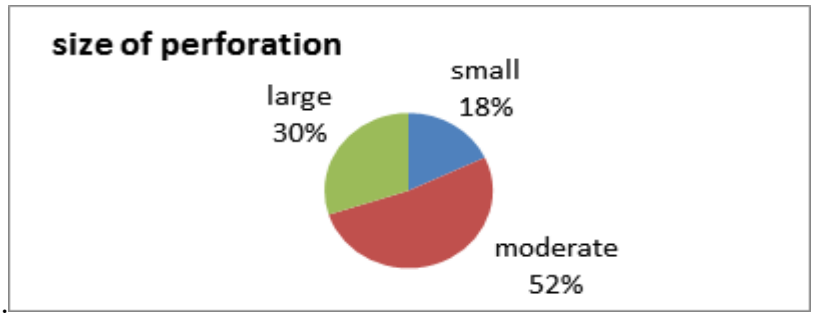

Figure 3: Size of perforation

Size of the perforation of tympanic membrane with middle ear space volume is an important determinant of the conductive hearing loss. We found a linear relationship between tympanic membrane perforation size and hearing loss i.e. large perforation results in larger hearing losses. Patients with small size perforation were found to be less in number- 9(18%). Cause that healed quickly with conservative Rx. Majority of patients had moderate (52%) to large (30%) perforation. This may be due to non-healing

nature of moderate and large perforation, which may have become permanent resulting in hearing loss which causes difficulty.

Table 3: Hearing loss : Pure tone audiometry results

Average conductive hearing loss (dB)	Microscopic tympanoplasty		Endoscopic tympanoplasty	
	Pre operative AB Gap	Post operative AB gap	Pre operative AB Gap	Post operative AB gap
10-20	2(8%)	6(24%)	3(12%)	9(36%)
21-40	12(48%)	14(56%)	15(60%)	13(52%)
41-50	10(40%)	5(20%)	6(24%)	3(12%)
>50	1(4%)	0(0%)	1(4%)	0(0%)

Since the patients were randomly selected for each approach, there was no significant difference in pre-operative AC hearing loss between two approaches. Overall hearing loss in our study range from 21- 40 dB. Average hearing loss was 38.78 dB. In our study, average preoperative hearing loss in microscopic tympanoplasty group was 32.53 dB while in endoscopic tympanoplasty group it was 30 dB. Postoperatively, average air–bone gap in microscopic tympanoplasty group was 22.03 dB, while in endoscopic tympanoplasty group it was 20.03 dB.

Table- 4 Hearing gain in air-bone gap with different approach

Gain in A-B gap(db) ((Mean± Standard Deviation)	
Microscopic tympanoplasty	Endoscopic tympanoplasty
11.0±3.14 dB	11.30±2.97 dB

Average hearing gain in microscopic tympanoplasty group is 11.0±3.14 dB and in endoscopic tympanoplasty group is 11.30±2.97 dB. There is no significant difference between two approaches. This suggested that hearing improvement achieved by both microscopic and endoscopic approach was same.

Table-5 Incidence of canaloplasty with different approach

Incidence Of Canal Wall Hump Removal (%)	
Endoscopic	Microscopic
0(0%)	6(24%)

In our study 6/25 patients of microscopic group require canaloplasty while none of the patient in endoscopic group requires canaloplasty. Since ossicular visibility that is hampered by posterior canal hump can be managed with depth and angled vision in endoscopic approach.

Table-6a: Operative time in different approaches

Time (minutes)	Microscopic tympanoplasty	Endoscopic tympanoplasty
60–80	9	14
81–100	11	8
101–120	3	2
121–140	2	1

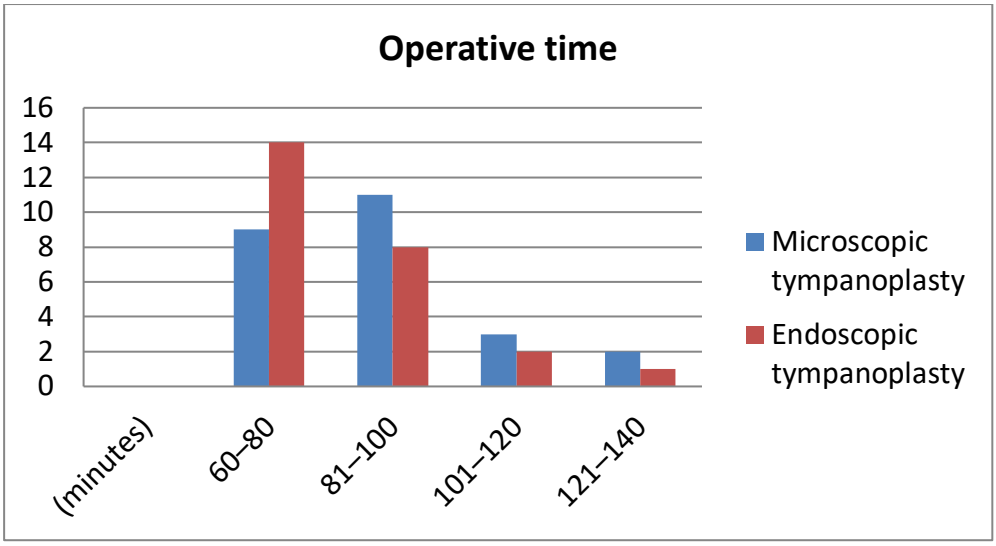

Table 6b: Operative time in different approaches

Average time taken in Microscopic tympanoplasty was 95 ±6.34 minutes range (60–120 minutes) while time taken in endoscopic group of tympanoplasty was 65.2 ±5.78 minutes range (60–140 minutes).

Table 10: Post-Operative Status Of Graft uptake At 3 Months

Approach	Three months		Six months	
	No. of patients	%	No. of patients	%
Microscopic Approach	22	88%	24	96%
Endoscopic Approach	24	96%	24	96%

As per above table it is clearly seen that our study showed excellent and equivalent result by both approaches in view of graft uptake.

Figure 4: Microscopic And Endoscopic incision

Table 7: Post-operative complications with different approach

Complication	Microscopic Approach	Endoscopic Approach
Wound Gap	2(8%)	0(0%)
Graft Rejection	1(4%)	1(4%)
Postauricular pain	2(8%)	0(0%)
Asymmetry of pinna	0(0%)	0(0%)

There was no significant difference in post-operative complications with both approaches. Patients present with postoperative complication like postaural wound gap in 2/25 (8%) in microscopic group while none in endoscopic group. Graft rejection was seen in 2 cases, the reason may be due to upper respiratory tract infection, which was advised revision surgery.

Patient Satisfaction: patients had less pain with endoscopic approach in comparison to microscopic approach on subjective assessment. This can be due to endoscopic approach have panaromic surgical view with minimal canal incision that leads to minimal manipulation of soft tissue and bony drilling. In our study, with microscopic approach since post aural incision is kept, it is always followed by post aural scar formation while in endoscopic approach since a small incision is kept (around 3 cm) scar formed is relatively smaller in size and hence, cosmetically better. Also patients with endoscopic tympanoplasty were given only a smaller dressing, due to which they could resume their routine activities without any social taboo, hence patient satisfaction was higher in endoscopic approach as compared to microscopic approach in which mastoid bandage was given.

Discussion

In our study of 50 cases, data was collected from patients who underwent tympanoplasty in E.N.T department in our respective hospital from July 2022 to May 2023 according to our inclusion criteria. The main aim of this study was to analyse and compare the advantage of using endoscopes in ear surgeries over conventional methods of ear surgeries.Cases were randomly divided into two groups. Equal (25) number of cases underwent microscopic and endoscopic type-1 tympanolasty. Maximum numbers of patients were seen in age group 26-35 years. The age of patient varied between 18 and 50 years. The take up rate of graft for different age group was almost similar, indicating that age group has no role in take up rate. Harugop [8] in their study found that average time taken during microscopic myringoplasty is 106 minutes (80–135 minutes) and in endoscopic group it takes on average 128 minutes (90–180 minutes). In our study, average time taken in conventional group of tympanoplasty was 95 minutes range (60–120 minutes) while time taken in endoscopic group of tympanoplasty was 65 minutes range (60–140 minutes). Out of microscopic group, 4/25 patients required canaloplasty due to canal overhangs and 2/25 required canal wall curettage for ossicular assessment, whereas none of the patients in the endoscopy group required. This is because the endoscope brings the surgeon's eye to the tip of the scope and provide a wide , clean surgical field. In endoscopic surgeries, precise canal incision is given. Therefore, manipulation of soft tissue is minimal. As view is magnified and wide bone drilling or canaloplasty is not required, bleeding is less, which subsequently increased effectiveness of this method of surgery as well as reduced postoperative pain and complication, such as infection, delayed wound healing, and scar dehiscence. External incisions, soft tissue dissections, and mastoidectomies can be avoided by using endoscopes in selected cases. Microscopes give limited visualization of deep and hidden spaces

involving sinus tympani, epitympanum facial recess, and the attic area. [9] In our study, percentage of successful graft uptake in conventional group is 96% while in endoscopic group 96% which is consistent with above literature. Yadav 10 in his study of endoscopic myringoplasty 40 out of the 50 patients had an intact tympanic membrane in the 8th postoperative week, accounting for an 80% success rate.Yadav [10] in his study of 50 patients none of the patients had an air-bone gap < 10 dB and 13 were in the range of 11 to 20 dB. Preoperatively, 35 patients had an air-bone gap in the range of 21 to 30 dB, whereas the same level was found in three cases postoperatively. In the 8th week, 47 patients had an air-bone gap their cosmetic result as poor, 25 (50%) patients rated the cosmetic result as satisfactory and 15 (30%) patients rated their cosmetic result as excellent. Objective analysis of cosmesis was done after 6 months and it revealed that in the endoscope group, none (0%) of the patients had a visible scar, whereas in the microscope group, 75% patients had a visible scar and in 25% patients the scar was not visible. In present study we assessed the patient after 6 months postoperatively for visible scar and found 13.3% patients with visible scar in conventional group and none in endoscopic group. Hearing gain is almost similar in both approaches which is comparable to other studies also as shown in Table 12.

No significant statistically difference found between two approaches regarding surgical outcome and hearing restoration [11-13]

Various studies	Gain in A-b gap mean	
	Endoscopic approach	**Microscopic aproach**
Present study	11.30	11.0
Huang et al study (2016)[12]	8.9	8.3
Kuo and /Nu et. al. (2017)[12]	10.69	8
Nayeon choi. et al study (2017) [13]	9.7	6.1

Endoscopic ear surgery has several disadvantages over conventional microscopic technique, such as the endoscopic instrument can cause direct injury and thermal damage to the external canal and middle ear [14]. Due to heat generation from light source of the endoscope, Kozin et al. [14] recommended using sub-maximal light intensity and frequent repositioning of the endoscope. No such complications were seen in this study group.

Conclusion

The microscopic and endoscopic approaches are excellent for type-1 tympanoplasty with merits and limitation of each method. It requires careful selection of patient for endoscopic approach. However there is no significant difference between two approaches regarding surgical outcome and hearing improvement but cosmesis and postoperative recovery is better in endoscopic approach.

References

1. Fukuchi I, Cerchiari DP, Garcia E, Rezende CE, Rapoport PB. Tympanoplasty: surgical results and a comparison of the factors that may interfere in their success. Rev Bras Otorrinolaringol (Engl Ed). 2006;72 (02):267-271.
2. Patel J, Aiyer RG, Gajjar Y, et al. Endoscopic tympanoplasty vs microscopic tympanoplasty in tubotympanic csom: a comparative study of 44 cases. 2015; 3(8): 195 3–00201957.
3. Dornhoffer JL. Surgical management of the atelectatic ear. Am J Otol. 2000; 21(03):315-321.

4. Mudry A. The history of microscope for use in ear surgery. American Journal of Otolaryngology.2000; 21(6): 877-886.
5. Koen N, Remenschneider A, Lee DJ, Kozin ED. Georg von Békésy and Bruce Mer: Early Pioneers of Endoscopic Ear Surgery. Otolaryng ology–Head and Neck Surgery. 2021;164(5):1065-1067.
6. Patil RN. Endoscopic tympanoplasty —definitely advantageous (preliminary 0020 reports). Asian J Ear Nose Throat 2003; 25:9-13.
7 Endoscopic ear surgery, principals, indications and techniques; Livio pressuti, Daniele Marchioni; thieme publication, 2015; 15:263- 292.
8 Harugop A, Mudhol R, Godhi R. A comparative study of endoscope assisted myringoplasty and micrsoscope assisted myringoplasty. Ind J Otolaryngol Hea. 2008;60(4):298-302.
9 Kozin ED, Gulati S, Lehmann A, et al. Systematic review of endoscopic middle ear surgery outcomes. Laryngoscope. 2015; 125(5): 1205–1214.
10 Yadav SPS, Aggarwal N, Julaha M, Goel A. Endoscope-assisted myringoplasty. 0020. Singapore Med J. 2009; 50(5): 0020:0020510.
11 Hsu, YC., Kuo, CL. & Huang, TC. A retrospective comparative study of endoscopic and microscopic Tympanoplasty. J of Otolaryngol - Head & Neck Surg. 2018; 47: 44.
12 Sang-Yeon lee et al, endoscopic tympanoplasty be a good alternative to microscopic tympanoplasty, clinical and experimental otolaryngology 2019; 12(2): 145- 155.
13 Nayeon Choi et al, Comparison of endoscopic tympanoplasty to microscopic tympanoplasty, clinical and experimental otolaryngology, 2017 March; 002010(1):44-49.
14 Kozin ED, Lehmann A, Carter M, et al. Thermal effects of endoscopy in a human temporal bone model: Implications for endoscopic ear surgery. Laryngoscope. 2014;124(8): E30020300202–E339.