A Comparative Study Of Endoscopic And Microscopic Type-1 Tympanoplasty

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Abstract: Background: Chronic suppurative otitis media tubotympanic type is a common pathology for which tympanoplasty is done. The decision to decide the approach for tympanoplasty depends upon multiple factors like extent of disease, site and size of perforation, size of external auditory canal and surgeon's own expertise and preference. This study was undertaken to compare endoscopic and microscopic approach for type-1 tympanoplasty. Material And Methods: This study data was collected from 50 patients who underwent tympanoplasty in our department in our hospital from July – 2017 to November 2019.Patients above 15 years of age with inactive chronic otitis media tubotympanic type operated for type-1 tympanoplasty. Pre-operative, intra-operative and post-operative data collected as per performa and evaluated. Result: Equal (25) number of cases underwent microscopic and endoscopic type-1 tympanolasty. As far as graft taken up is concern both approaches have good and comparable result. Hearing gain is almost similar in both approaches - Endoscopic approach- 10.80 dB; microscopic approach- 11.23 dB. Both methods do not have any major complications. Endoscopic approach has advantage of depth and angled vision. Endoscopic approach (57.2 min.) also saves surgical time than microscopic approach (89.4 min.) and comparatively good cosmetic result. Microscopic approach has upper hand over endoscopic approach in having two handed surgery with magnified surgical view. Patient compliance and satisfaction is more with endoscopic approach. Conclusion: Both microscopic and endoscopic methods are excellent for type-1 tympanoplasty with advantage and limitation of each method. A careful selection of patient is necessary for endoscopic approach. [Patel K Natl J Integr Res Med, 2022; 13(1): 54-60, Published on 26/01/2022]

Key Words: Endoscopic, Microscopic, Type-1 Tympanoplasty

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Introduction: Wide variety of ear pathologies can cause hearing impairment, which can ruin the quality of life. Chronic otitis media is one of the major causes of deafness and is an important public health problem too. To make the patient's ear free of discharge and restoration of hearing by correction of conductive hearing loss are the basic goals to perform middle ear surgeries. I.e.- tympanoplasty [2].

Tympanoplasty is a procedure to eradicate disease in the middle ear and to reconstruct the hearing mechanism, with or without tympanic membrane grafting[1]. There are various techniques and approaches for tympanoplasty.

The decision to decide the approach for tympanoplasty depends upon multiple factors like extent of disease, site and size of perforation, size of external auditory canal and surgeon's own expertise and preference[10, 13]. Tympanoplasty is done under microscopic vision. Conventional microscopic tympanoplasty with a post-auricular incision remains the most effective procedure for patients with chronic otitis media[1]. In ENT, endoscopes are being used for nasal surgeries since many years. With advancement in the technology, now otoendoscopes are also being used for ear surgery, which makes surgery minimally invasive with excellent results. Because it gives wider field of vision and detailed view of middle ear as compared to microscope[10]. It increases the surgeon's reach of the disease and its extension in hidden area of middle ear[10].

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 flap[10].This avoids other unnecessary incision and soft tissue dissections[10].

However, endoscopic surgery has several disadvantages. Only one handed surgery is

feasible with the endoscopic technique, which is the endoscopic view could be stained by blood and continuing the procedure could be difficult[10,18]. Furthermore, endoscopic instrument could make direct injury and thermal damage by light source[10,18]. We conducted the study to compare microscopic and endoscopic approach in Type-1 tympanoplasty in relation to- Graft uptake, 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.

Material & Methods: We conducted the study to compare microscopic and endoscopic approach in Type-1 tympanoplasty. This study data was collected from 50 patients who underwent tympanoplasty in our department in our hospital from July – 2017 to November 2019.

Inclusion Criteria: Patient above age of 15 years having chronic otitis media (tubotympanic). Patient having dry ear for at least 10 days. Patient with mild to moderate degree of conductive hearing loss.

Exclusion Criteria: Patient with squamous type of com (atticoantral). Patient with active mucosal chronic otitis media. Patient with sensorineural hearingloss. Patient with extracranial and intracranial complications.

less efficient; in a situation of massive bleeding, 50 patients were randomly selected who fulfilled above criteria. A performa was prepared for all the cases-findings were noted, treatment and follow up were charted. After clinical examination was over, all patients underwent pure tone audiometry (PTA) and X-Ray B/L mastoid with necessary pre-operative investigations.

All surgeries were carried out under local or general anesthesia, depending upon patient's cooperation. We used 0 degree nasal endoscope of 4 mm thickness, 18 cm length for endoscopic surgery, Without endoscopic coupler with one hand method.

Temporalis fascia was the graft material of choice in all cases for purpose of uniformity. For microscopic approach we kept wilde's incision, while in endoscopic approach we kept a small postauricular incision around 5 mm away from post-auricular sulcus in its upper part, around 2 to 2.5 cm in length for harvesting temporalis fascia. All grafts were kept by inlay method for ease of comparison.

Post-operatively patient was given broad-spectrum antibiotics for 3 weeks with other supportive treatment and advised for ear care. Post-operative follow-up was taken on following days-

Table 1: Post Operative Follow up

Post-Operative Day	Treatment
07 Days – Week 1	Suture Removal , Wick Removal
15 Days – Week 2	Examination Of Wound And Canal Wall Incision, Topical Antibiotic Ear Drops
42 Days – Week 6	Examination Of Graft Uptake
90 Days – 3 Months	Hearing Evaluation With Pta

Figure 1: A Microscopic And B Endoscopic Post-Aural Wound

Results: Results are as follows.

Table 2: Age Distribution

Age Group Of Patient	Present Study
15-25 years	15(30%)
26-35 years	22(44%)
36-45 years	12(24%)
>45 years	1(2%)
Total	50(100%)

In the present study, the maximum number of patients affected is in the age group of 26-35 years (44%). In this age group patients are more aware of their deafness as it interferes with active life.

Table 3: Sex Distribution

Sex Of Patient	Number Of Patients
	Present Study No. (%)
Male	24(48%)
Female	26(52%)

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 4: Ear Pathology

Site Of Pathology	Present Study No. (%)
Unilateral	36(72%)
Bilateral	14(28%)
Total	50(100%)

No specific criterion for patient selection according to side of ear was taken. Maximum patients in our study were found to having unilateral pathology while 14 patients were found to having bilateral COM. In bilateral ear pathology dry and more affected ear was selected for surgery.

Table 5: Chief Complaint In The Study

Chief Complaints	Our Study	
	No. Of Patients	%
Ear Discharge	50	100%
Decreased Hearing	42	84%
Earache	16	32%

In our study, All patients had complaint of ear discharge either at presentation or in past. All patients underwent surgery after ear was dry. Majority of our patients (84%) were having complaint of some degree of deafness. Small no. of patients (32%) complained regarding pain.

Table 6: Duration Of Active Disease (Ear Discharge)

Years	Our Study No.(%)
< 1 Year	6(12%)
1-3 Years	7(14%)
3-5 Years	9(18%)
>5 Years	28(56%)
Total	50 (100%)

Ear discharge was having wide duration from less than 1 year to more than 5 year. Majority of patient was having ear discharge for > 3 years.

Reason may be due to chronicity of disease, intermittent nature of disease and treatment with conservative medication.

Table 7: Size Of Perforation

Size Of Perforation	Our Study No. (%)	
Small	9	18%
Moderate	26	52%
Large	15	30%

In our study, 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 8: Pre-Op AC Hearing Level As Per PTA

Pre-Op Ac Hearing Loss In DB	No. Of Patients	(%)
10-20	0	0
21-40	31	62%
41-50	18	36%
>50	1	2%

Overall hearing loss in our study range from 21-40 dB. Average hearing loss was 38.78 dB.

Table 9: Type 8: Hearing Level (Air-Conductive) According To Size Of Perforation (As PTA)

Size Of Perforation	Mean Hearing Loss
Small	34.04 Db
Moderate	38.2 Db
Large	43.1 Db

It is found that hearing loss is proportional to size of perforation i.e. with increase in size of perforation, hearing loss is also higher.

Table 10: Pre-Operative Air-Conductive Hearing Level Between Different Approaches

Endoscopic Approach	Microscopic Approach	P-Value
38.2±6.9 Db	39.8±5.91 Db	0.326

As patients were randomly selected for each approach, there was no significant difference in pre-operative AC hearing loss between two approaches.

Table 11: Incidence Of Canal Wall Hump Removal With Different Approach

Present Study	Incidence Of Canal Wall Hump Removal (%)	
	Endoscopic	Microscopic
	0	7(28%)

In our study, 7 (28%) patients underwent canal hump removal via microscopic approach, and no patients with endoscopic surgery need it.

Because ossicular visibility is hampered by hump can be managed with depth and angled vision in endoscopic approach.

Table 12: Operative Time In Different Approaches

Study Name	Time In Min. (Mean± Standard Deviation)		P Value
	Endoscopic	Microscopic	
Present Study	57.2±5.78min	89.4±6.34 Min	<0.0001

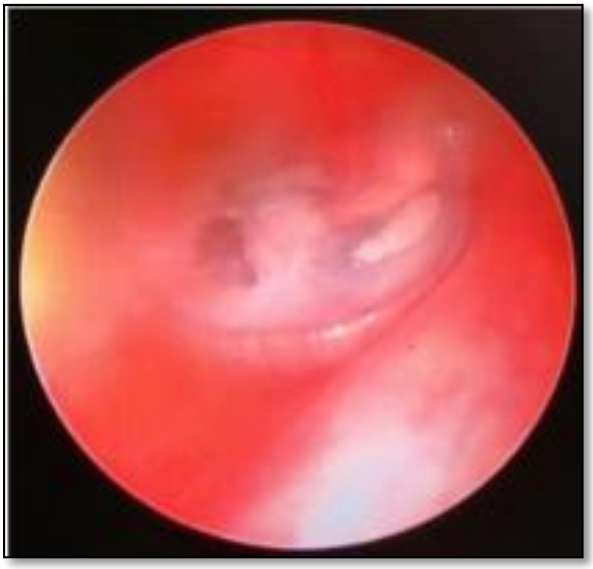
Time duration in our study was counted after temporalis fascia graft was taken up to end of dressing.

Mean operative time of microscopic approach (89.4±6.34 min) was significantly longer, the reason may be due to drilling work , more exposure in post-aural approach, suturing and mastoid bandage.

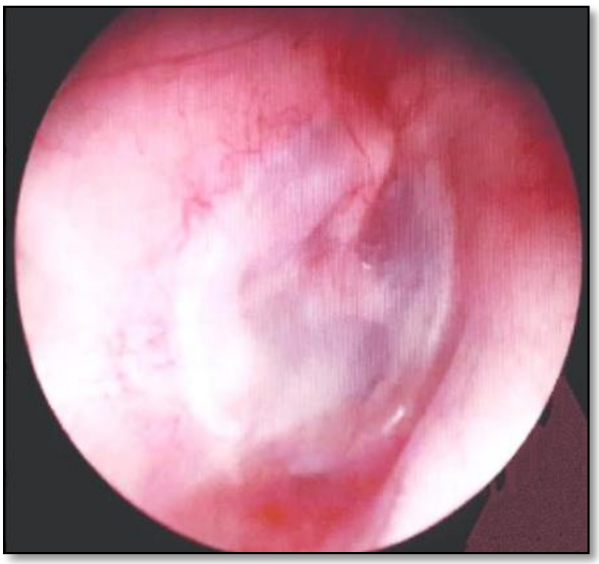
Table 13: Post-Operative Status Of Graft At 3 Months

Our Study	Graft Taken Up Status At Post-Operative 3 Months	
	Endoscopic Approach	Microscopic Approach
	24(96%)	24(96%)

Figure 2: A Microscopic And B Endoscopic Approach Graft Taken Up



A: Microscopic Graph



B: Endoscopic Graph

As per above table it is clearly seen that our study showed excellent and similar result by both approach as graft uptake is concerned.

Table 14: Comparison Of Pre Operative And Post Operative A-B Gap At 3 Months With Different Approach In Our Study

Pre Operative A-B Gap (Db)	Post Operative A-B Gap (Db)
Endoscopic Approach	
25.40±5.43	14.60±3.26
Microscopic Approach	
26.22±5.20	14.89±3.71

In endoscopic approach patients, the pre- and post-operative air-bone gap was 25.56±5.6 dB and 16.34±3.28 dB respectively, which was a significant improvement.

Table 15: Comparison Of Gain In Air-Bone Gap With Different Approach

Our Study	Gain In A-B Gap Mean (Db)	
	Endoscopic	Microscopic
	10.80	11.23

In our study gain in air-bone gap was 10.80±4.14 and 11.23±3.97 for endoscopic and microscopic approach respectively, which was not significantly different between two approaches (P value-1). It indicates that hearing improvement achieved by both microscopic and endoscopic approach was same.

Table 16: Post-Operative Complications With Different Approach

Complication	Endoscopic Approach	Microscopic Approach
Wound Gap (Percentage)	0	1(4%)
Graft Rejection	1(4%)	1(4%)

As per above table, there was no significant difference in post-operative complications with both approaches. Post-aural wound gap was noted only in 1 microscopic case is significant, which was managed conservatively. Graft rejection was seen in 2 cases, the reason may be due to upper respiratory tract infection, which was advised revision surgery.

Patient Satisfaction: As per subjective assessment patient had less pain with endoscopic approach as compare to microscopic approach. The reason may be endoscopic approach have wide and clean surgical view with minimal canal incision which could result in 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 2 cm) scar formed is relatively smaller in size and hence, cosmetically better.

Since patients operated with endoscopic approach were given only a small post aural dressing, they could resume their daily activities without any social taboo, hence patient satisfaction was found to be higher in endoscopic approach as compared to microscopic approach in which mastoid bandage was given.

Discussion: The study data was collected from 50 patients who underwent tympanoplasty in E.N.T department in our hospital from july – 2017 to November 2019 according to our inclusion criteria. 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 mean age in our study was 30.6 years, which is comparable to other studies –Lade et al (2014) – 28.30 years, Ismail guler et al study (2019)[15] – 35.1 years, Kaya et al (2017)[18] – 36.7 years.

In our study as per shown in table-2, 48 % male and 52 % female were affected. Which is comparable to other studies, Nayeon choi et al study (2017)[13] male -48%, female- 52% ,Ying chieh hsu et al study[14] male -41.5%, female-58.5%.

The chief complaints were ear discharge (100%) and hearing impairment 84%, earache 16%. Overall hearing loss in our study range from 21-40 dB. Average hearing loss was 38.78 dB. Hearing loss is corresponding to size of perforation.

Table 17: Graft Taken Up Status At Post-Operative 3 Months

Study	Graft Taken Up Status At Post-Operative 3 Months	
	Endoscopic Approach	Microscopic Approach
Plodpai and Paje et, al study[17]	96.7%	91.2%
Nayeon choi. et al study(2017)[13]	100%	95.8%
Ismail guler et al study(2019)[15]	91%	89%

As shown in Table-13, graft taken up at post operative 3 months are similar in both approach. Which is also comparable to other studies as shown in above Table - 17. As per shown in table-10, incidence of canal wall hump removal with microscopic approche was 28% in our study, which is similar to other studies Nayeon choi. et al study(2017)[13] 33% and Plodpai and Paje et. Al study (2017)[17] – 4%, while with endoscopic approach no incidence was noted which is

comparable to other studies Nayeon choi. et al study(2017)[13] and Plodpai and Paje et. Al study (2017)[17].

Table 18: Time Taken In Endoscopic And Microscopic Approach

Study Name	Time In Min. (Mean±Standard Deviation)		P Value
	Endoscopic	Microscopic	
Nayeon choi. et al study (2017)[13]	68.2±22.1 min	88±28.5 min	<0.002
Tzu-yen huang. et al atudy (2016)[14]	50.4±13.4 min	75.5±20.4 min	<0.0001
Ismail guler et al study(2019)[15]	57.8±9.6 min	78.6±17.7 min	<0.001

Endoscopic approach (57.2 min.) also saves surgical time than microscopic approach (89.4 min.) and comparatively good cosmetic result. As per above table 18 time taken with microscopic approach is longer than endoscopic approach in other studies also.

Table 19: Significant Air Bone Gap In Both Approaches

Study	Endoscopic Approach	
	Pre Operative A-B Gap (Db)	Post Operative A-B Gap (Db)
Our study	25.40±5.43	14.60±3.26
Huang et al study(2016)[18]	21.6±11.2	12.7±8.8
Nayeon choi. et al study(2017)[13]	18.9±1.6	9.2±1.4
Kuo and /Nu et.al(2017)[18]	22.48	11.79
Kumar et al study (2015)[18]	30	15

Study	Microscopic Approach	
	Pre Operative A-B Gap (Db)	Post Operative A-B Gap (Db)
Our study	26.22±5.20	14.89±3.71
Huang et al study(2016)[18]	21.4±10.6	13.1±9.4
Nayeon choi. et al study(2017)[13]	18.6±1.0	12.5±1.3
Kuo and /Nu et.al(2017)[18]	26.7	18.7
Kumar et al study (2015)[18]	31.53	16.03

Other studies in above table 19 also showed significant improvement in post-operative air-bone gap in both approaches, which is comparable to our study.

Table 20: Hearing Gain In Both Approaches

Study	Gain In A-B Gap Mean (Db)	
	Endoscopic	Microscopic
Our study	10.80	11.23
Huang et al study(2016)[18]	8.9	8.3
Nayeon choi. et al study(2017)[13]	9.7	6.1
Kuo and /Nu et.al(2017)[18]	10.69	8
Kumar et al study (2015)[18]	15.03	13.96

Hearing gain is almost similar in both approaches which is comparable to other studies also as shown in table 20. No significant statistically difference found between two approaches regarding surgical outcome and hearing restoration [8].

Both methods do not have any major complications. Endoscopic approach has advantage of depth and angled vision which avoids the necessity of canal drilling and humps removal in many cases [10]. Microscopic approach has upper hand over endoscopic approach in having two handed surgery with magnified surgical view[10,13].

Narrow canal wall, bloody operative field and requirement of extensive middle ear work are the reason where endoscopic method may have to be converted in microscopic method. Patient compliance and satisfaction is more with endoscopic approach [13, 18].

Conclusion: Both microscopic and endoscopic methods are excellent for type-1 tympanoplasty with advantage and limitation of each method. A careful selection of patient is necessary for endoscopic approach. There is no significant difference between two approaches regarding surgical outcome and hearing restoration.

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