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Endoscopic vs Microscopic Tympanoplasty in Management of Mucosal Chronic Otitis Media - A Comparative Study

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Abstract: ***Background**: Chronic Otitis Media (COM) of the mucosal type that primarily affects the anterior inferior region of the middle ear cleft, results in permanent central perforation and is more prevalent cause of conductive hearing loss in developing countries. Tympanoplasty, aimed at restoring the integrity of the tympanic membrane and improving hearing, can be performed using either a microscope or an endoscope. **Aim**: To evaluate the efficacy of endoscopic tympanoplasty and compare it with microscopic tympanoplasty in terms of need for canaloplasty, Intra-operative visualization of middle ear structures/areas, Operative time, Duration of hospital stay, Graft uptake rate, Post operative complications **Materials and Methods**: A prospective comparative study was conducted on patients with mucosal COM that were further divided into two groups undergoing either endoscopic or microscopic tympanoplasty. **Results**: However, both techniques showed comparable graft uptake rates and improvement of hearing but endoscopic tympanoplasty offered better visualization of hidden areas of the middle ear, required less operative time, fewer canaloplasty and resulted in reduced postoperative complications. Canaloplasty was required in 33.33% of patients in the microscopic group, whereas none of the endoscopic cases required it. 100% Intraoperative visualization of middle ear structures was achieved with endoscope compared to that of microscopic group particularly attic, sinus tympani, and round window. Most patients were from endoscopic group were operated within 60-90 minutes, 33% took less than 60 minutes, only 26.66% took more than 90 minutes compared to the microscopic group were significant number of patients i.e. 60% took more than 90 minutes. Similarly, the duration of hospital stay was shorter in the endoscopic group with 86.66% patients with 2 days of stay, versus maximum patients (73.33%) needed stay of 3 or more days in the microscopic group. Graft uptake rate was slightly higher in the endoscopic group at 93.33% compared to 90% in the microscopic group. Postoperative complications were also less in endoscopic group. **Conclusion**: Endoscopic tympanoplasty is a safe, effective, and cosmetically favorable minimally invasive alternative as compared to the conventional microscopic approach for managing mucosal COM.*

Keywords: Otitis media; Chronic otitis media; Mucosal COM; Endoscopic Tympanoplasty; Microscopic Tympanoplasty; Graft uptake; Canaloplasty; Minimal invasive surgery

1. Introduction

Chronic otitis media (COM), is a major contributor for hearing loss specially in developing countries like India, with a high prevalence rate reaching up to 7.8% [(1)]. It is a persistent infectious disease associated with inflammation of the middle ear and mastoid mucosa, which can lead to perforation or formation of a tympanostomy tube and ear discharge (otorrhea) [(2,3)]. The mucosal type COM also known as "Safe type" typically leads to central perforations without the risk of cholesteatoma.

Type I tympanoplasty is the favored and most frequently conducted procedures in chronic otitis media (COM) [(4)]. Tympanoplasty has conventionally been conducted with an operating microscope; nevertheless, the endoscopic technique has emerged due to ongoing technological improvements and endeavours to enhance results. Amongst both microscopic and endoscopic, the approach for tympanoplasty depends upon the factors [(5)] like Extent of disease, Size of the external auditory canal, Location of perforation, Size of perforation, and the surgeon's expertise and preference.

This study aims to evaluate the efficacy of endoscopic tympanoplasty in comparison to the conventional microscopic approach in the surgical management of inactive mucosal chronic otitis media. The primary objectives were to assess and compare graft uptake rates, hearing improvement, and the necessity of canaloplasty between the two techniques. Secondary objectives included evaluation of operative duration, intraoperative visualization of middle ear structures and the incidence of postoperative complications.

2. Material and Method

This is a prospective observational study that was conducted over two years at the Department of Otorhinolaryngology, JNUIMSRC, Jaipur, after obtaining institutional ethical approval. Sixty patients aged 18–50 years with inactive mucosal chronic otitis media, dry for at least one month, and having small to large central tympanic membrane perforations with mild to moderately severe conductive hearing loss were included. Patients with active/squamosal COM, mixed hearing loss, revision surgeries or uncontrolled systemic illnesses were excluded.

Participants were randomly divided into:

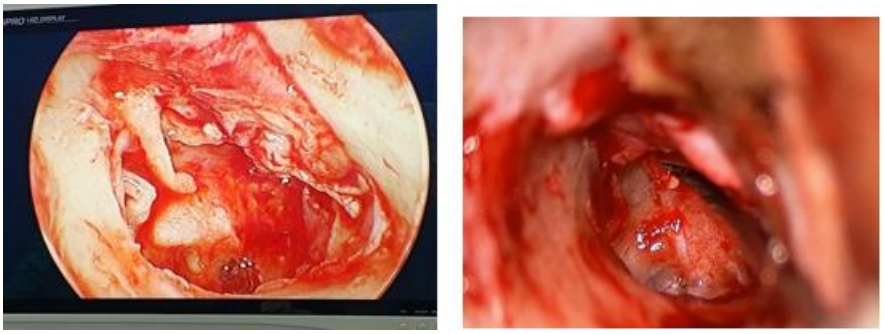
- Group A (n = 30): Underwent microscopic type I tympanoplasty (postauricular approach).
- Group B (n = 30): Underwent endoscopic type I tympanoplasty (transcanal approach).

All patients underwent preoperative evaluation including otoscopy and pure tone audiometry. Temporalis fascia grafting was performed using the underlay technique. Intraoperative findings, need for canaloplasty, and visualization of middle ear structures were noted. Postoperative assessment included graft uptake, hearing improvement, and post operative complications over three months.

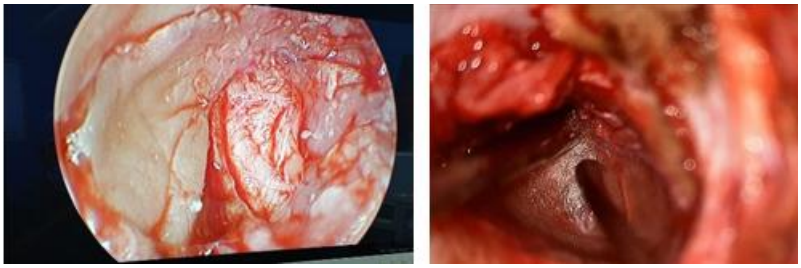
ENDOSCOPIC APPROACH MICROSCOPIC APPROACH

(OT setup for both the surgical approaches)

(Incision used for both the surgical approaches)



(visualization of middle ear structures by both the approaches)



(showing graft placement for both the approaches)

(showing surgical scars for both approaches)

3. Results

Table 1: Need for Canaloplasty

Canaloplasty	Group A (Microscopic)		Group B (Endoscopic)		p Value
	N = 30	%	N = 30	%	
Required	10	33.33%	0	0	**0.0018 (S)**
Not Required	20	66.66%	30	100%	
Total	30	100%	30	100%	
MEAN+/-SD	15.6+/- 2.83		15.4 +/-2.21		

Table 2: Intraoperative Visualisation of Middle Ear Areas

Visualisation	Group A (Microscopic)		Group B (Endoscopic)		p VALUE
	N = 30	%	N = 30	%	
Eustachian tube	30	100%	30	100%	1.0
Attic	**4**	**13.33%**	**30**	**100%**	**$7.84X10^{-13}$ (S)**
Sinus tympani	**13**	**43.33%**	**30**	**100%**	**$6.19X10^{-7}$ (S)**
Tympanic annulus	**22**	**73.33%**	**30**	**100%**	**0.0046 (S)**
Round window	**17**	**56.66%**	**30**	**100%**	**$4.64X10^{-5}$ (S)**
Ossicular chain	**23**	**76.66%**	**30**	**100%**	**0.0105 (S)**
MEAN +/- SD	**18.17+/-9.02**		**30+/-0.00**		

Table 3: Operative Time (in Minutes)

Time Required	Group A (Microscopic)		Group B (Endoscopic)		p Value
	N = 30	%	N = 30	%	
<60 Minutes	4	13.33%	10	33.33%	0.0271 (S)
60-90 Minutes	8	26.66%	12	40%	
>90 Minutes	18	60%	8	26.66%	
Total	30	100%	30	100%	
Mean +/- SD	87.0 +/- 25.81 Minutes		68.0 +/- 29.43 Minutes		

Table 4: Duration of Hospital Stay

Duration of Hospital Stay	Group A (Microscopic)		Group B (Endoscopic)		p Value
	N = 30	%	N = 30	%	
2 Days	8	26.66%	26	86.66%	0.00001 (S)
3 Days or More	22	73.33%	4	13.33%	
Total	30	100%	30	100%	

Table 5: Graft Uptake Rate

Graft Status	Group A (Microscopic)		Group B (Endoscopic)		P Value
	N (30)	%	N (30)	%	
Successful Graft Uptake	28	93.33%	27	90%	1.0 (NS)

Table 6: Post-Operative Complications

Complications	Group A		Group B		p Value
	N (30)	%	N (30)	%	
1. Pain	6	20%	1	3.33%	**0.038**
2. Surgical Site Infection	4	13.33%	1	3.33%	**0.048**
3. Post Op Dizziness	2	6.66%	1	3.33%	0.500
4. Tm Retraction	1	3.33%	0	0	0.317
5. Canal Edema and Granulation Tissue Formation	3	10%	4	13.33%	**0.021**
6. Residual Perforation	2	6.66%	3	10%	0.648

4. Discussion

This study demonstrates that both endoscopic and microscopic tympanoplasty are effective and safe in managing inactive mucosal chronic otitis media (COM). However, the endoscopic approach offered several advantages.

Canaloplasty was required in 33.33% of patients in the microscopic group, whereas none in the endoscopic group needed it. Similar findings were reported by Rathod et al.[6], where 16% required canaloplasty and 8% required canal wall curettage in the microscopic group and by Manish Kumar et al [7]., where 16.66% underwent canaloplasty and 13.33% canal curettage. These differences are due to the endoscope's wider field of view and better visualization of the anterior tympanic membrane and ossicular chain, which minimizes the need for canal widening.

Regarding middle ear visualization, the endoscopic approach allowed 100% visualization of structures like the tympanic annulus, round window, ossicular chain, attic, and sinus tympani. In contrast, the microscopic group showed visualization in 73.33% (tympanic annulus), 56.66% (round window), 76.66% (ossicular chain), 13.33% (attic), and 43.33% (sinus tympani). These findings align with studies by

Deshmukh et al.[8] and Artham et al. [9] , supporting the endoscope's advantage in accessing deeper anatomical areas.

Operative time was also shorter in the endoscopic group, with 33.33% completed in under 60 minutes and 40% within 60–90 minutes. In the microscopic group, only 13.33% were under 60 minutes and 26.66% between 60- 90 minutes. The mean operative time was 68.0 ± 29.43 minutes for endoscopic and 87.0 ± 25.81 minutes for microscopic surgeries, which was statistically significant. Studies by B. Singh et al.[10] and Abdul Salam RT et al.[11] showed similar findings.

Postoperative recovery was faster in the endoscopic group, with 86.66% discharged within 2 days, compared to 73.33% discharged after 3 days in the microscopic group. This is likely due to the minimally invasive nature of the endoscopic technique, avoiding large incisions and reducing soft tissue dissection.

The graft uptake rate was 93.33% in the microscopic group and 90% in the endoscopic group, with no statistically significant difference observed. This suggests that both techniques are equally reliable in terms of anatomical success. Our findings are in line with previous studies such as those by Bishnoi et al.[12] , who reported uptake rates of 94.3% for endoscopic and 91.4% for microscopic tympanoplasty, and by Mohanty et al.[13] and Rehman et al.[14], who also found comparable results. These consistent outcomes reinforce that the success of tympanoplasty in terms of graft uptake depends more on surgical principles than the approach used.

Postoperative complications were fewer in the endoscopic group: pain occurred in 3.33% (vs. 20% in microscopic), surgical site infection in 3.33% (vs. 13.33%), and dizziness in 3.33% (vs. 6.66%). Tympanic membrane retraction occurred in only one microscopic case (3.33%). Granulation tissue formation and canal edema were seen in 13.33% (endoscopic) and 10% (microscopic). Residual perforations occurred in 10% of endoscopic and 6.66% of microscopic cases, mostly involving large perforations. These results align with findings by Khalid Mahmud et al.[15] Abdul Salam RT et al.[11], and Elnahal et al.[16], emphasizing less pain, reduced infection and better healing in endoscopic surgery.

5. Conclusion

This study demonstrates that both endoscopic and microscopic tympanoplasty is safe and effective in the management of inactive mucosal chronic otitis media. While graft uptake rate and hearing outcomes were almost comparable between both groups, the endoscopic technique offered significant advantages, including superior visualization of middle ear structures, reduced operative time, elimination of the need for canaloplasty, and shorter hospital stay. These findings support the use of endoscopic tympanoplasty as a minimally invasive and patient-friendly surgical option, especially in cases where enhanced intraoperative access and cosmesis are desirable.

Compliance with ethical standards

- No conflicts of interest
- Research involving humans only
- Informed consent was taken

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