

## Original Research Article

# Antero-inferior tympanic visibility during microscopy

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**Received:** 19 May 2020

**Revised:** 30 July 2020

**Accepted:** 03 August 2020

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### ABSTRACT

**Background:** The antero-inferior recess of the ear canal is not visible to the otologist, thereby effecting proper placement of the graft and thereby affecting its uptake. The visibility of this region in the adult population is assessed.

**Methods:** The quadrants of tympanic membrane were examined in 60 subjects with perforated tympanic membrane undergoing tympanoplasty. The study was conducted in the department of ENT-HNS (ear, nose and throat-head and neck surgery), Dayanand Medical College and Hospital, Ludhiana.

**Results:** With the microscope in 48 (80%) entire perforation could be visualized and in 12 (20%) margins were not in the line of view. 5 perforations were posterior superior and 12 were total perforations. Otoendoscope examination with zero degree could show the entire margin of the perforation.

**Conclusions:** In 80% population the antero-inferior quadrant of the tympanic membrane is accessible to straight vision of the microscope.

**Keywords:** Perforation, Microscopy, Margins

### INTRODUCTION

Tympanic membrane provides sound protection of the round window and sound pressure transformation through the oval window.<sup>1</sup> Tympanic membrane perforation may be traumatic in origin but more often results from acute suppurative otitis media which may not heal spontaneously, leading to recurrent discharge from the ear and hearing impairment, thus protection of round window from sound is lost.<sup>2</sup> Chronic suppurative otitis media is a persistent disease, insidious in onset, causing severe destruction with irreversible sequelae.<sup>3</sup>

Tympanoplasty is the surgical reconstruction of the middle ear and the tympanic membrane.<sup>4</sup> The closure of tympanic membrane perforation restores the vibratory area of the membrane, affords round window protection and thus improved hearing, lessens the susceptibility of the middle ear mucosa to infections via eustachian tube and external auditory meatus.<sup>5</sup>

Tympanoplastic Surgeries were introduced by Moritz, Zollner and Wullstein in Germany to restore and conserve hearing after removal of disease from the middle ear.<sup>1,6,7</sup> Tympanoplasty and mastoidectomy aided by microscopic techniques are accepted and routine methods for operating on middle ear structures in patients with chronic otitis media (COM).<sup>8</sup> Despite its common application, using a microscope for these procedures is typically accompanied with limited visibility of various middle ear components including the hypotympanum, sinus tympani and epitympanum, as well as the posterior part of the mesotympanum.<sup>9,10</sup> The ability to use both hands is one of the main advantages of this procedure, and the technique has improved the diagnostic performance of the procedure.<sup>11-14</sup>

In addition to microscopy techniques, the application of flexible and rigid endoscopy has become usual for clinical evaluation of the structures of the middle ear. The assessment of these structures has been facilitated by

endoscopy.<sup>14</sup> Comparing microscopic and endoscopic diagnostic approaches has revealed the superiority and feasibility of the latter method in evaluating middle ear pathological changes and structural abnormalities.<sup>15,16</sup> Some studies have reported successful surgeries of the middle ear including myringoplasty, surgery of the retraction pocket, stapedotomy and removal of dermoid tumors of the eustachian tubes using the endoscopic approach.<sup>17-20</sup> Because of some potential limitations of the endoscopic procedure including iatrogenic trauma, induced hyperthermia, and one-handed application, the use of this procedure is relatively uncommon in clinical settings.<sup>21</sup>

Although the diagnostic performances of these two procedures have been widely assessed in various studies in different settings to the best of our knowledge, there is insufficient evidence to compare the diagnostic performance of the procedures in COM patients.<sup>22-24</sup> This study was conducted to compare the diagnostic performance of endoscopic and microscopic procedures in identifying the middle ear structures and associated diseases in patients with COM.

The aim of the study was to find utility of microscopic visualization in surgery of the tympanic membrane.

## METHODS

60 subjects of chronic suppurative otitis media undergoing tympanoplasty in the department of ENT, Dayanand Medical College and Hospital, Ludhiana were analyzed. The study was conducted during the period from June 2015 to August 2016. Prior to surgical intervention a meticulous microscopic visualization of the entire tympanic membrane was undertaken with photo documentation.

All 60 patients were examined with both the modalities: endoscopic 0 DEG and microscopic 6X.

### Inclusion criteria

Only safe suppurative otitis media (CSOM).

### Exclusion criteria

Unsafe suppurative otitis media (CSOM), otitis externa, stenosis of external auditory canal and ossicular discontinuity.

Patients with both dry and wet ears were taken and different approaches were applied (post aural, end aural and transcanal/permeatal approach) and different flap techniques were used randomly. Clinical and hearing assessment was carried out at 2 weeks, 4 weeks, 3 months and 6 months in all the patients.

## Statistics

All statistical calculations were done using Statistical Package of Social Sciences (SPSS) 17 Version statistical program for Microsoft windows (SPSS Inc. released 2008. SPSS statistic for windows, version 17.0, Chicago). Ethical approval of the study was taken from the Institutional Ethics Committee.

## RESULTS

The entire margin of the perforation could be visualized with the zero degree endoscope in all 60 cases. The observations under microscope using 6X magnification are tabulated.

### Demographic profile

Maximum numbers of patients were in the age group of 31-40 years (26.7 %) followed by age group of >50 years (23.3%) (Table 1).

**Table 1: Age distribution of patients.**

Age group (in years)	No. of patients (n=60)	% of patients
0-20	-	20.0
21-30	11	18.3
31-40	16	26.7
41-50	7	11.7
More than 50	14	23.3
<b>Total</b>	60	100.0

Female patients outnumbered male patients of 43.3% and constituted 56.7% of study population (Table 2).

**Table 2: Gender distribution of patients.**

Gender	No. of patients (n=60)	% of patients
Female	34	56.7
Male	26	43.3
<b>Total</b>	60	100.0

In our study of 60 patients, in 48 (80%) patients on microscopy, all margins of perforation were seen and in the rest 12 (20%) entire margins were not visible. 5 perforations were posterior superior and 12 were subtotal perforations (Table 3).

**Table 3: Visibility of margins of perforation on microscopy.**

Visibility of all margins	No. of patients (n=60)	% of patients
Absent	12	20.0
Present	48	80.0
<b>Total</b>	60	100.0



**Figure 1: Hidden anterio-inferior tympanic membrane (right ear).**



**Figure 2: Hidden anterio-inferior tympanic membrane (left ear).**



**Figure 3: Visible anterio-inferior tympanic membrane (right ear).**



**Figure 4: Visible anterio-inferior tympanic membrane (left ear).**

## DISCUSSION

Maximum number of patients were in the age group of 31-40 years (26.7%), followed by age group of >50 years (23.3%).

Female patients outnumbered male patients of 43.3% and constituted 56.7% of study population.

The entire margin of the perforation could be assessed in 48 (80%) subjects on microscopic examination and in 12 (20%) could not do so. 5 perforations were in the posterior superior quadrant and 12 were sub-total perforations.

The diagnostic value of microscopic and endoscopic examination in chronic suppurative otitis media is comparable. One can identify the pathological or structural abnormalities in the middle ear. The ossicular mobility, discontinuity and the round window reflex. The epitympanum, posterior mesotympanum, hypotympanum and the hidden niches, the sinus tympani and the facial recess can be better visualised with straight and angled endoscopes rather than the microscope.

Available literature had assessed the diagnostic accuracy of microscopic and endoscopic procedures individually, we have recorded the visibility of the quadrants of the tympanic membrane in the microscopic approach.

Most of the failures in the post auricular surgical approach have been associated with difficulties in viewing different pathologies in more hidden pits of the middle ear such as the epitympanum, posterior mesotympanum, and hypotympanum.<sup>25</sup> One of the most appropriate approaches to locating these pathologies is a stepwise trans canal assessment of the tympanic membrane and the middle ear cavity, followed by eradication of the probable pathologies.<sup>10</sup> Some studies have shown that the areas that are more visible by endoscopic approach are those whose pathologies are hidden, such as cholesteatomas.<sup>11,26</sup> These areas, in which the pathologies might be hidden, are the epitympanum, sinus tympani, and hypotympanum.<sup>8,10,14</sup> Because of these limitations, for many years, surgeons have sought better tools to improve the visibility of the middle ear.<sup>27-29</sup> Accordingly, the endoscopic approach to exploration of the middle ear was suggested. Because of its limitations in middle ear surgery, it has not been widely accepted, and microscopic surgery remains the first choice method for surgical interventions in middle ear diseases.<sup>11,12</sup>

Using endoscopy in middle ear surgeries has some limitations including the necessity using one instead of two hands, the creation of significant heat in the middle ear, and trauma to the middle ear because of undesirable hand movements.<sup>9,14</sup> To avoid damaging the middle ear structures and increasing morbidity, it is recommended that surgeons should not use an endoscope instead of a microscope in every ear surgery. Endoscopy could be used efficiently in particular situations such as in cases in which

remaining pathologies (e.g. cholesteatomas) are suspected or if the posterior canal wall limits visibility in the confirmation of ossicular chain integrity. Thus, vis a vis combined intervention, microscopic and endoscopic assisted is the ideal modality in otologic surgery.

## CONCLUSION

In 80 % candidates for tympanoplasty the antero inferior margin of the tympanic membrane is visible under the microscope, facilitating thereby a trans-canal approach.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

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**Cite this article as:** Munjal M, Talwar G, Munjal S, Saggar T. Antero- inferior tympanic visibility during microscopy. *Int J Otorhinolaryngol Head Neck Surg* 2020;6:1714-7.