

# Assessment of Post-Operative Hearing Loss After Middle Ear Surgery: A Hospital Based Study

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## ABSTRACT

**Background:** Endoscopic ear surgery (EES) has remained controversial since its first description in the English literature in the late 1960s. Optimized and designed for sinus surgery, rigid zero degree and angled endoscopes are now the standard instrument for visualization of the paranasal sinuses. Hence; we planned the present study to evaluate occurrence of Post-Operative Hearing Loss in patients after Middle Ear Surgery.

**Materials & Methods:** The present study included evaluation of Post-Operative Hearing Loss in patients undergoing Middle Ear Surgeries. A total of 40 patients were included in the present study. Duration and frequency of otorrhoea, hearing loss and nature of previous treatment was recorded in all the patients. Otoscopic, otomicroscopic examination and tuning fork tests were carried out in all the patients. Middle ear surgeries were performed in all the patients. Patients were subjected to pure tone audiometry pre-operatively, tenth day postoperatively and one month postoperatively. All the results were analyzed by SPSS software.

**Results:** A total of 40 patients were included in the present study who were planned to undergo middle ear surgeries. In 15 patients, duration of symptoms was less than 2 years while in

14 and 11 patients, duration of symptoms was two to four years and more than four years respectively. Non-significant results were obtained while comparing the bone conduction audiometry preoperatively and postoperatively in patients undergoing middle ear surgeries.

**Conclusion:** No significant difference exists in between preoperative and postoperative bone conduction levels in patients undergoing middle ear surgeries.

**Key words:** Hearing, Loss, Middle Ear Surgery.

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## INTRODUCTION

Endoscopic ear surgery (EES) has remained controversial since its first description in the English literature in the late 1960s.<sup>1</sup> Advocates of endoscopic visualization of chronic ear disease espouse its wide-field view of the surgical field, high resolution, magnification, and the ability to "look around corners". Recognizing the potential advantage of this technology over standard operative microscopes, sinus and skull base surgeons incorporated the use of the endoscope in the 1980s and 1990s into sinus surgery.<sup>2-4</sup>

Optimized and designed for sinus surgery, rigid zero degree and angled endoscopes are now the standard instrument for visualization of the paranasal sinuses.<sup>5</sup>

Although tympanoplasty is typically a straightforward procedure with a high rate of successful tympanic membrane closure, the

rates reported in the literature vary greatly (35-98%) but are generally greater than 80%. Intraoperative complications, including injury to the cochlea with partial or total sensorineural hearing loss (SNHL), can occur.<sup>6-8</sup>

Hence; we planned the present study to evaluate occurrence of Post-Operative Hearing Loss in patients after Middle Ear Surgery.

## MATERIALS & METHODS

The present study was planned in the department of ENT of Government D.B. General Hospital, Churu, Rajasthan, and included evaluation of Post-Operative Hearing Loss in patients undergoing Middle Ear Surgeries.

## Sample Size

A total of 40 patients were included in the present study.

**Inclusion Criteria**

- Patients between the age group of 15 years to 50 years,
- Patients planned to undergo middle ear surgeries in the department of ENT

**Exclusion Criteria**

- Patients with history of familial hearing loss,
- Patients with history of prolonged exposure to noise, head trauma
- Patients with history of otosclerosis.

Through clinical examination was done in all the patients followed by complete history taking and noting the demographic details. Duration and frequency of otorrhoea, hearing loss and nature of previous treatment was recorded in all the patients. Otoscopic, otomicroscopic examination and tuning fork tests were carried out in all the patients. Middle ear surgeries were performed in all the patients. Patients were subjected to pure tone audiometry pre-operatively, tenth day postoperatively and one month postoperatively. The hearing threshold for pure tone audiometer was determined in a sound treated room at frequencies ranging from 125-8000 Hz for air conduction and 250- 4000 Hz for bone conduction. All the results were analyzed by SPSS software. Student t test was used for assessment of level of significance. P-value of less than 0.05 was taken as significant.

**RESULTS**

A total of 40 patients were included in the present study who were planned to undergo middle ear surgeries. Out of 40, 25 patients were males while the remaining were females. Mean age of the patients was 28.6 years. In 15 patients, duration of symptoms was less than 2 years while in 14 and 11 patients, duration of symptoms was two to four years and more than four years respectively. Non- significant results were obtained while comparing the bone conduction audiometry preoperatively and postoperatively in patients undergoing middle ear surgeries.

**Table 1: Demographic details of the patients**

Parameter	Value
Mean age (years)	28.6
Males	25
Females	15

**Table 2: Distribution according to symptom duration**

Parameter	No. of patients
Less than 2 years	15
2 to 4 years	14
More than 4 years	11

**Table 3: Hearing Loss After Middle Ear Surgery**

Frequency (kHz)	Mean Preoperative BCA	Mean Postoperative BCA at 10 <sup>th</sup> day	Mean Postoperative BCA at one month	P- value
0.5	14.8	14.9	14.9	0.87
1	14.4	14.5	14.5	
2	14.4	14.6	14.4	
4	13.6	14.3	14.6	

BCA: Bone Conduction Audiometry

**DISCUSSION**

In the present study, we didn't observe any while comparing the bone conduction audiometry preoperatively and postoperatively in patients undergoing middle ear surgeries. Mazhar MS et al conducted a study to evaluate the occurrence of postoperative sensorineural hearing loss after middle ear surgeries. All patients undergoing middle ear surgeries are subjected to pure tone audiometry pre-operatively and tenth day, one month and three months postoperatively. Hearing assessment done with pure tone audiometer. The hearing threshold for pure tone audiometer was determined in a sound treated room at frequencies ranging from 125- 8000 Hz for air conduction and 250-4000 Hz for bone conduction. Results: Sensorineural hearing loss was not found in any of the patients postoperatively on 10th day 1st month and 3rd month. Conclusions: There was no significant variation between preoperative and postoperative bone conduction levels. Therefore middle ear surgeries have not resulted in any SNHL. Duration of ear discharge, duration of surgery, type of surgery had no bearing on postoperative sensory neural hearing levels.<sup>9</sup>

Kozin ED et al provided a systematic review of endoscope applications in middle ear surgery with an emphasis on outcomes. A literature review was performed using the Preferred Reporting Items for Systematic Reviews and Meta - Analysis

recommendations. Articles were categorized based on study design, indication, and use of an endoscope either as an adjunct to or as a replacement for a microscope. Quantitative and descriptive analyses were performed. Ninety-one articles published between 1967 and 2014 met inclusion and exclusion criteria. The main indication for the use of an endoscope was cholesteatoma or myringoplasty. Of the identified articles, 40 provided a discrete discussion of outcomes. In cholesteatoma surgery, the endoscope has been mainly employed as an adjunct to the microscope, and although outcomes assessments vary across studies, the endoscope identified residual cholesteatoma in up to 50% of cases. Endoscopes have been predominately used as an observational adjunct to the microscope to improve visualization of the tympanic cavity.<sup>10</sup> Al Anazy FH et al assessed the prevalence of hearing loss and to identify the risk factors for Sensorineural hearing loss (SNHL) after type 1 tympanoplasties. In this prospective cohort study, a total of 312 patients with tubotympanic chronic suppurative otitis media and pure conductive hearing loss were included. The patients were evaluated using case histories, clinical examinations, preoperative and postoperative (3, 6, and 12 months) audiograms, and laboratory investigations. All patients underwent type 1

tyimpanoplasties, the surgical details were noted, and the prevalence of SNHL as a consequence of the surgical procedure was recorded. Sixteen patients (5.1%) developed SNHL. Fifteen operations were performed by residents, and one was performed by a consultant. They concluded that the most important factor in the development of SNHL after a type 1 tympanoplasty is the surgeon's experience.<sup>11</sup> Kazikdas KC et al conducted a retrospective study to identify the effects of ossicular manipulation and mastoid drilling on high-frequency SNHL. Our study population was made up of 51 patients-20 males and 31 females, aged 10 to 59 years (mean: 28.5). Of this group, 26 patients had undergone a unilateral over-under tympanoplasty only (tympanoplasty group) and 25 had undergone a unilateral tympanoplasty plus additional mastoid surgery (mastoidectomy group). Bone-conduction audiograms were obtained pre- and postoperatively; the latter were obtained within 24 hours after surgery and again at 6 months of follow-up. In the tympanoplasty group, a significant SNHL, primarily at 2 kHz, was seen in 6 patients (23%) at 24 hours, but at 6 months there was no depression of bone-conduction thresholds. In the mastoidectomy group, a significant SNHL, primarily at 2 and 4 kHz, occurred in 12 patients (48%) at 24 hours, and bone-conduction deterioration was still present in 4 patients (16%) 6 months after surgery. The difference between the preoperative audiograms and the 6-month audiograms in both groups was statistically significant ( $p = 0.034$ ). They conclude that (1) over-under tympanoplasty, which requires significant manipulation of the ossicles, can cause temporary SNHL after surgery, and (2) prolonged exposure to the noise generated by mastoid drilling can result in permanent SNHL.<sup>12</sup>

## CONCLUSION

From the above results, the authors concluded that no significant difference exists in between preoperative and postoperative bone conduction levels in patients undergoing middle ear surgeries. However; future studies are recommended.

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