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## Study Of Effect Of Mastoid Drilling On Contralateral Ear During Tympanomastoidectomy.

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### ABSTRACT

Tympanomastoidectomy is a common procedure for treating chronic otitis media and other middle ear pathologies. This study aimed to evaluate the effect of mastoid drilling on the contralateral ear in patients undergoing this surgery. This observational prospective study was conducted at a tertiary care center from September 2018 to October 2020. Seventy-two patients aged 5-50 years, who met the inclusion criteria, were enrolled. Preoperative and postoperative auditory assessments were performed using distortion product otoacoustic emissions (DPOAE) and pure tone audiometry (PTA). Data on demographics, presenting complaints, ear diseases, mastoid pneumatization, and surgical procedures were collected and analyzed. The mean age of patients was  $29.12 \pm 10.88$  years, with 56.94% females. The most common presenting complaint was otorrhea (95.83%), followed by decreased hearing (20.83%) and facial palsy (6.94%). Chronic suppurative otitis media with granulations was the most common intraoperative finding (34.72%). Postoperatively, DPOAE pass rates decreased significantly at 6 hours (44.44%) and improved at 24 hours (61.11%). PTA results showed initial hearing loss, particularly at higher frequencies, with gradual recovery by postoperative day 7. Mastoid drilling during tympanomastoidectomy can cause transient hearing loss in the contralateral ear. Careful intraoperative monitoring and postoperative follow-up are essential to mitigate these effects.

**Keywords:** Tympanomastoidectomy, Mastoid Drilling, Contralateral Ear, Hearing Loss.

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## INTRODUCTION

Tympanomastoidectomy is a common surgical procedure performed to treat chronic otitis media, cholesteatoma, and other middle ear pathologies. This procedure involves drilling into the mastoid bone to access the middle ear and mastoid air cells [1]. While the primary focus is on the diseased ear, there is growing concern regarding the potential impact of mastoid drilling on the contralateral (opposite) ear [2, 3]. The vibrations and noise generated by the high-speed drill used during the surgery can transmit through the skull and potentially affect the inner ear structures of the contralateral ear [4].

Several studies have reported changes in auditory thresholds and transient hearing loss in the contralateral ear following tympanomastoidectomy. These findings raise important clinical questions about the safety and long-term effects of mastoid drilling. Understanding the mechanisms underlying these changes is crucial for developing strategies to minimize potential adverse effects. This study aims to evaluate the impact of mastoid drilling on the contralateral ear by assessing changes in auditory function before and after surgery. By investigating these effects, we aim to provide insights into the clinical significance of contralateral ear involvement and enhance surgical techniques to preserve overall auditory health in patients undergoing tympanomastoidectomy [5, 6].

## METHODOLOGY

This observational prospective study was conducted at a tertiary care centre from September 2018 to October 2020. A total of 72 patients, aged 5 to 50 years, who presented to the ENT outpatient department (OPD) and met the inclusion criteria, were enrolled in the study. Inclusion criteria consisted of patients undergoing mastoid drilling for conditions such as chronic suppurative otitis media (mucosal and squamosal types), osteoma, exostosis, canaloplasty, stapedectomy, and facial nerve palsy, with a normal contralateral ear both otoscopically and audiological. Patients were excluded if they presented with hearing loss in the contralateral ear, had a history of psychological disorders, suffered from bilateral ear disease, were unwilling to participate in the study, or were outside the age range of 5 to 50 years.

Ethical clearance was obtained from the Institutional Ethical Committee, and written informed consent was secured from the patients or their parents/guardians. Detailed histories were gathered from each patient, including the duration of complaints, previous ear surgeries, comorbidities, family history of hearing loss, and the use of any ototoxic medications. Thorough clinical examinations were conducted, encompassing pre-auricular, pinna, and post-auricular examinations, followed by otoscopic examinations of both tympanic membranes and tuning fork tests. Necessary investigations, such as x-rays of the mastoid, otomicroscopy, and high-resolution computed tomography (HRCT) of the temporal bone, were performed as needed to assess mastoid pneumatization.

Audiological examinations were conducted preoperatively using distortion product otoacoustic emissions (DPOAE) and pure tone audiometry (PTA). Bone conduction thresholds of the normal contralateral ear were categorized into low frequency (averaging decibel levels over 512 Hz, 1 kHz, and 2 kHz) and high frequency (averaging decibel levels over 4 kHz and 6 kHz). Patients underwent various ear surgeries involving mastoid drilling, and the duration of surgery and drilling, including the time spent using diamond and cutting burrs, was recorded. Postoperatively, DPOAE was conducted at 6 and 24 hours, and PTA was performed at 24, 48, and 72 hours, as well as on the seventh day postoperatively, with results noted as mentioned preoperatively.

## RESULTS

**Table 1: Distribution of Study Subjects Based on Age Group and Gender**

Age Group (Years)	Males	Females	Total
	No	%	No
Up to 10	1	3.2	0
11-20	8	25.8	9
21-30	7	22.5	16
31-40	9	29.03	6
41-50	6	19.35	10
Total	31	100	41

Mean	28.74		29.41
SD	10.67		11.16

**Table 2: Distribution of Study Subjects Based on Presenting Complaints in Diseased Ear**

Presenting Complaints	Laterality		Total	Percentage (%)
	Right	Left		
Otorrhea	33	36	69	
Decreased Hearing	8	7	15	
Facial Palsy	3	2	5	

**Table 3: Distribution of Patients Based on Ear Disease**

Disease	No. of Patients	Percentage (%)
Chronic Suppurative Otitis Media with Granulations	25	34.72
Chronic Suppurative Otitis Media with Cholesteatoma	23	31.94
Chronic Suppurative Otitis Media with Only Mucosal Edema	19	26.38
Chronic Suppurative Otitis Media with Complications	3	4.16
Fracture of Temporal Bone	2	2.7
Total	72	100

**Table 4: Distribution of Patients According to Mastoid Pneumatization in Diseased Ear Radiologically**

Mastoid Pneumatization	No. of Patients	Percentage (%)
Sclerotic	49	68.05
Pneumatic	20	27.77
Diploic	3	4.1
Total	72	100

**Table 5: Distribution of Patients According to Procedure Performed in Diseased Ear**

Procedure Done	No. of Patients	Percentage (%)
Canal Wall Down Mastoidectomy	39	54.16
Canal Wall Up Mastoidectomy	28	38.88
Canal Wall Down Mastoidectomy with Facial Nerve Decompression	5	6.94
Total	72	100

### DISCUSSION [7-10]

The present study entitled “Effect of Mastoid Drilling on Contralateral Ear During Tympanomastoidectomy” was conducted at a tertiary care center from September 2018 to October 2020. This observational prospective study aimed to investigate the impact of mastoid drilling on the contralateral ear by examining changes in auditory function before and after surgery in a sample of 72 patients.

#### Demographic Distribution

The demographic distribution of patients in the study revealed a mean age of 29.12 ± 10.88 years, with the majority of patients falling within the age group of 21-30 years (31.94%), followed by those in the 11-20 years (23.61%) and 41-50 years (22.2%) age groups. This distribution suggests that tympanomastoidectomy is more commonly performed in young to middle-aged adults. The gender distribution showed a higher prevalence of females (56.94%) compared to males (43.06%). The slight predominance of females undergoing this procedure could be reflective of healthcare-seeking behavior differences or a higher incidence of chronic ear conditions among females.

## Presenting Complaints

The most common presenting complaint among the study subjects was otorrhea, observed in 95.83% of the patients. This high prevalence is consistent with the typical symptoms of chronic suppurative otitis media, which often necessitates surgical intervention. Decreased hearing was the second most common complaint, affecting 20.83% of patients, followed by facial palsy in 6.94% of patients. The distribution of these complaints highlights the varied clinical presentations that can lead to the need for tympanomastoidectomy, emphasizing the importance of thorough preoperative evaluation to address all potential issues effectively.

## Ear Diseases

The intraoperative findings revealed that the most common condition was chronic suppurative otitis media with granulations, present in 34.72% of patients. Chronic suppurative otitis media with cholesteatoma was observed in 31.94% of cases, while mucosal edema was seen in 26.38% of patients. These findings underline the chronic nature of the diseases requiring mastoid drilling, with granulations and cholesteatoma being significant contributors to persistent infection and complications. The presence of cholesteatoma, a destructive and expanding growth of keratinizing squamous epithelium, further underscores the necessity for timely surgical intervention to prevent serious complications such as intracranial infections or facial nerve palsy.

## Mastoid Pneumatization

Radiological examination of mastoid pneumatization in diseased ears showed that 68.05% of patients had sclerotic mastoid air cells, indicating chronic inflammation and reduced air cell development. Pneumatic mastoid air cells were found in 27.77% of patients, while diploic air cells were observed in 4.1% of cases. The high prevalence of sclerotic mastoids in this cohort is consistent with the chronicity and severity of the underlying conditions. Reduced pneumatization is often a response to long-standing infection and inflammation, leading to bone thickening and sclerosis.

## Surgical Procedures

The most commonly performed procedure was canal wall down mastoidectomy, accounting for 54.16% of cases. Canal wall up mastoidectomy was performed in 38.88% of patients, while 6.94% of cases required canal wall down mastoidectomy with facial nerve decompression. The preference for canal wall down mastoidectomy reflects its effectiveness in managing extensive disease and providing better access for disease clearance. However, it also comes with the potential for greater postoperative hearing loss due to the more extensive removal of structures compared to canal wall up procedures.

## Impact on Contralateral Ear

The study meticulously monitored auditory changes in the contralateral ear using DPOAE and pure tone audiometry. Preoperatively, 87.5% of patients had normal DPOAE results (Pass), while 12.5% had results categorized as Refer. Postoperatively, there was a noticeable decline in DPOAE pass rates at 6 hours (44.44%) and 24 hours (61.11%), indicating an initial impact of mastoid drilling on contralateral ear function. However, the improvement in pass rates at 24 hours suggests a degree of recovery, albeit incomplete within the immediate postoperative period.

Pure tone audiometry results further supported these findings, with postoperative bone conduction thresholds showing transient increases, particularly at higher frequencies. On postoperative day 1, a significant number of patients exhibited hearing loss in the 8-10 dB range for speech frequencies and 6-8 dB range for high frequencies. By postoperative day 7, these values had improved, though not entirely returning to preoperative levels. This pattern of initial deterioration followed by gradual recovery aligns with the hypothesis that the noise and vibrations from drilling can cause temporary threshold shifts in the contralateral ear.

### **Correlation with Burr Usage**

The study also investigated the relationship between the type and duration of burr usage and hearing loss. It was found that longer durations of diamond burr usage were associated with greater hearing loss at low frequencies, while cutting burrs had a less pronounced effect. This highlights the importance of surgical technique and the potential benefits of minimizing drilling time and using techniques that reduce noise and vibration exposure to the contralateral ear.

### **CONCLUSION**

In conclusion, our study demonstrates that mastoid drilling during tympanomastoidectomy can have a transient impact on the contralateral ear, with most patients experiencing some degree of temporary hearing loss. The findings underscore the need for careful intraoperative monitoring and postoperative follow-up to mitigate and manage these effects. Future research should focus on refining surgical techniques and exploring protective strategies to preserve auditory function in the contralateral ear.

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