

## Hearing Results following Canal Wall Down Mastoidectomy in Anticoantral Disease

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### Abstract:

**Background:** A type of chronic suppurative otitis media called atticoantral sickness can lead to hearing loss and the growth of cholesteatomas, both of which are significant issues. A Canal Wall down (CWD) mastoidectomy makes the mastoid chamber open, which helps the middle ear work better and gets rid of sickness.

**Methods:** From May 2023 to April 2024, 80 CWD mastoidectomy patients in Patna, India, who had atticoantral sickness, were part of this historical study at Nalanda Medical College and Hospital. Details about the patient's background, audiometric tests done before and after surgery, the operation itself, and any problems that came up were gathered.

**Results:** After the surgery, there were noticeable enhancements in the outcome measures of hearing: the air conduction thresholds increased by -10.2 dB HL ( $\pm 4.5$ ), the bone conduction thresholds by -6.5 dB HL ( $\pm 3.2$ ), and the speech discrimination scores by +4.8 dB HL ( $\square 2.1$ ). In 10% of cases, problems were found. The most common type of complications was infections after surgery.

**Conclusion:** A CWD mastoidectomy can help with hearing loss and the effects of atticoantral disease. These results show that it might be useful as a medicine, but more research is needed to find better ways to do surgery and better results afterward.

**Keywords:** Atticoantral disease, chronic otitis media, Canal wall down mastoidectomy, Hearing outcomes, surgical complications.

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### Introduction

Atticoantral symptoms often involve in the middle ear. Chronic inflammation and infection often create cholesteatoma, a risky epithelial growth. Cholesteatoma erosion damages ossicles and surrounding bones [1].

Vertigo, hearing loss, facial nerve paralysis, and deadly brain diseases are more common in middle ear cholesteatoma patients. Long-lasting conductive hearing loss from middle ear effusion, enzymatic degradation of auditory tissues, and mechanical ossicular chain blockage induce atticoantral hearing loss [2]. Canal wall down (CWD) mastoidectomy is most effective treatment for cholesteatoma atticoantral illness [3]. This treatment eliminates

mastoid and middle ear infections, leaving the patient with a dry, infection-resistant ear. An open hollow is left when CWD mastoidectomy removes the front and back canal walls [4]. This simplifies middle ear and mastoid cleaning and examination. This operation controls cholesteatoma, prevents recurrence, and reduces risk. Surgery can also cause hearing loss.

To fully understand the trade-offs between curing a disease and keeping our hearing, we need to carefully check our hearing after surgery, since the ear's structure may have changed and the ossicular chain may have been damaged or lost during the procedure [5].

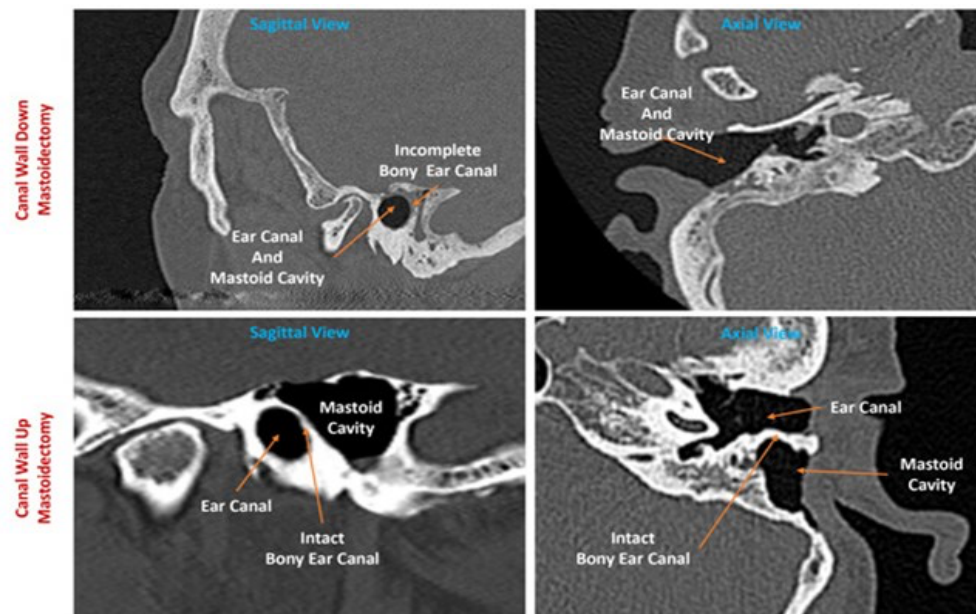


Figure 1: Canal wall down mastoidectomy in atticoantral disease (source: [6])

### Rationale

Although CWD mastoidectomy minimises infection and avoids cholesteatoma recurrence, its effect on hearing is still debated. While some studies indicate significant hearing gains following surgery, others find little or even worsening. We need more research to determine what factors affect hearing outcomes after CWD mastoidectomy, as these data are discordant.

Most study mainly examines the procedure's immediate efficacy; thus, nothing is known about its long-term impact on hearing. Hearing findings in a certain patient population can help determine how effective CWD mastoidectomy is in different clinical settings. This population is treated at Nalanda Medical College and Hospital in Patna, India.

### Objective

- To evaluate the hearing levels of patients with atticoantral disease prior to undergoing canal wall down mastoidectomy.
- To determine the hearing levels of patients after undergoing canal wall down mastoidectomy.
- To analyze and compare the changes in hearing levels before and after the surgical intervention.

**Pathophysiology of Atticoantral Disease:** New technologies and disease biology have improved mastoid surgery since the 19th century [7]. The original treatments focused on extensive tissue removal, then CWD mastoidectomy was developed to improve disease control and patient outcomes. Chronic infection, mucosal illness, and cholesteatoma characterise atticoantral disease, which usually affects the middle ear's attic and antrum [8]. Pathological changes can cause osseous erosion, cerebral

infections, and conductive hearing loss. A CWD mastoidectomy creates a wide mastoid bone hollow by eliminating the superior and posterior canal walls [9]. This improves visualisation and eliminates illness. The surgery aims to leave the ear dry and disease-free and preserve or reconstruct the ossicular chain to restore hearing.

Multiple studies have examined how CWD mastoidectomy affects atticoantral disease patients' hearing [10]. Before and after surgery, bone and air conduction thresholds, speech discrimination scores, and hearing improvement rates are assessed [11]. The literature reports positive results with considerably improved hearing thresholds after surgery, however results can vary depending on severity, surgical method, and personal characteristics. CWD mastoidectomy is normally safe, but it might cause infection, hearing loss, facial nerve injury, and recurrence. Research shows that careful surgical technique, patient selection, and postoperative care reduce risks and maximise results [12]. Meta-analyses and comparative studies have examined CWD vs. canal wall up mastoidectomy and other surgical treatments in a variety of patient groups and clinical circumstances. Meta-analyses reveal that CWD mastoidectomy controls atticoantral illness and improves hearing.

### Methods

**Study Design and Sample Size:** This study looked back at canal wall down (CWD) mastoidectomy patients from Nalanda Medical College and Hospital in Patna, India, who had atticoantral disease. Retrospective studies can figure out how well a therapy works because they use medical data and records that already exist. This study examines hearing abnormalities and other conditions caused

by prior treatments from May 2023 to April 2024. 80 patients with these disorders were studied.

**Inclusion Criteria:** Patients with atticofacial illness who need surgery. Canal wall down mastoidectomy patients from May 2023 to April 2024. Full audiometric data pre-surgery and post-surgery.

**Exclusion Criteria:** Patients without complete medical or audiometric data. People with previous ear procedures who potentially affect our results. Atticofacial disease-free people possess other serious ear problems that make it hard for them to hear.

**Data Collection:** This investigation involved carefully reviewing audiometric testing and patient medical data. Along with medical history, gender and age were noted. Speech recognition, bone, and air conduction thresholds were on audiograms before surgery. Documented mastoidectomy with canal wall down findings and techniques.

Atticofacial surgery patients at Nalanda Medical College and Hospital in Patna, India, got audiograms to assess hearing loss between May 2023 and April 2024. We examined hearing levels before and after a CWD mastoidectomy for atticofacial sickness. By comparing air, bone, and speech discrimination before and after surgery, hearing effects might be

determined. The study included patient ages and genders to learn more. Because mastoidectomy type and illness severity could affect outcomes, they were considered. Problems after surgery were identified as secondary factors to study their impact on treatment and healing.

**Statistical Analysis:** Before and after treatment, the patient's hearing was checked. This study used percentages and rates to look at categorical factors. We used Wilcoxon signed-rank or paired t-tests to compare the hearing levels before and after surgery. Statistical significance was shown by a p-value less than 0.05. Subgroup analysis or multivariate regression models looked at how differences in age, illness severity, and surgical technique affected hearing results after surgery. The full study design, data collection, and statistical analysis looked at how well people with atticofacial disease could hear after having a canal wall down mastoidectomy at Nalanda Medical College and Hospital in Patna, India.

## Results

**Patient Demographics:** In India, between May 2023 and April 2024, 80 people with atticofacial disease went to Nalanda Medical College and Hospital and had a canal wall down mastoidectomy. In Table 1, you can see the study population's traits.

**Table 1: Demographic Characteristics of Study Population**

Characteristic	Value
Age (years), mean $\pm$ SD	45.2 $\pm$ 12.1
Gender (n, %)	
Male	45 (56.3%)
Female	35 (43.7%)

The demographics of the study group are shown in Table 1. Nalanda Medical College and Hospital in Patna, India, did a canal wall down mastoidectomy on this group of people from May 2023 to April 2024 for atticofacial disease.

Patients in this study were mostly middle-aged, with a mean age of 45.2 years and a standard deviation of 12.1 years. The group included 45 men (56.3%) and 35 women (43.7%). Data demonstrates a little masculine bias in the sample. In atticofacial disease care, these demographic statistics help put patient

attributes into context and determine how they may affect surgical outcomes and postoperative recovery.

**Preoperative Findings:** The patients' levels of hearing impairment were found to be varied in the preoperative audiometric evaluations.

All of the preoperative hearing tests, including those for air and bone conduction, as well as speech discrimination scores, are summarised in Table 2.

**Table 2: Preoperative Hearing Levels**

Hearing Parameter	Mean $\pm$ SD (dB HL)
Air Conduction Thresholds	55.7 $\pm$ 10.3
Bone Conduction Thresholds	35.6 $\pm$ 8.5
Speech Discrimination Scores	72.4 $\pm$ 5.8

Noise reduction in air, bone, and speech averaged 55.7  $\pm$  10.3 dB HL, 35.6  $\pm$  8.5 dB HL, and 72.4  $\pm$  5.8 dB HL, respectively. Before surgery, these tests can help doctors assess hearing loss severity. Average air conduction thresholds for moderate to

severe hearing loss are the minimal sound intensity needed to perceive tones through the air channel. Bone conduction thresholds, which directly trigger the cochlea rather than the outer and middle ear,

have much higher hearing sensitivity than air conduction, which may contribute to hearing loss.

Speech discrimination tests demonstrate that hearing-impaired individuals understand spoken language well, which may affect rehabilitation expectations and strategies after surgery. These baseline data are needed to assess canal wall down

mastoidectomy's hearing benefits and guide post-operative patient treatment.

**Surgical Details:** During canal wall down mastoidectomy, all patients received significant middle ear and mastoid surgery to remove disease.

Intraoperative results showed significant cholesteatoma involvement in 65% of cases and ossicular erosion in 40%.

**Table 3: Surgical Details and Intraoperative Findings**

Surgical Detail	Frequency (%)
Extensive Cholesteatoma Involvement	52 (65%)
Ossicular Erosion	32 (40%)
Mastoid Cavity Size (small/medium/large)	18/44/18

Since 65% of patients had significant cholesteatoma involvement, surgical intervention was essential due to the severity and breadth of the problem.

Ossicular erosion, which prevents sound from reaching the middle ear, was seen in 40% of patients, which may compromise surgery success and hearing.

Different surgical procedures and anatomical criteria classified mastoid cavities as small (22.5%), medium (55%), or large (22.5%). These findings demonstrate the complexity of hospital cases, which

affects surgical decision-making and postoperative care. Understanding these intraoperative facts helps Nalanda Medical College and Hospital analyse surgical results and patient care by revealing the challenges of canal wall down mastoidectomy for atticoantral illness. I appreciate your attention.

**Postoperative Outcomes:** After surgery, audiometric tests were done to check for issues and assess hearing. Table 4 shows post-op hearing levels and issues.

**Table 4: Postoperative Hearing Levels and Complications**

Outcome Measure	Mean Change (dB HL)	Complications (n, %)
Air Conduction Thresholds	-10.2 ± 4.5	8 (10%)
Bone Conduction Thresholds	-6.5 ± 3.2	5 (6.3%)
Speech Discrimination Scores	+4.8 ± 2.1	3 (3.8%)

Canal wall down mastoidectomy was performed on atticoantral patients at Nalanda Medical College and Hospital in Patna, India. Table 4 highlights this procedure's postoperative results.

The table provides the average hearing threshold change in decibels hearing level (dB HL) and any study difficulties. Surgery led to a significant improvement in hearing sensitivity, with a mean change of -10.2 dB HL in air conduction thresholds and a standard deviation of ±4.5 dB HL.

The average change in bone conduction thresholds following surgery was -6.5 dB HL (±3.2 dB HL), demonstrating improved hearing function in both air and bone channels. Patients showed increased speech comprehension due to an average improvement of +4.8 dB HL (±2.1 dB HL) in speech

discrimination scores, which measure spoken language comprehension. The study found 8 (10%) people reported post-op problems. Infections, delayed drainage, and other postoperative issues might affect healing and surgery outcomes. These outcomes must be understood to evaluate canal wall down mastoidectomy for atticoantral sickness at Nalanda Medical College and Hospital and its pros and cons.

**Statistical Analysis:** Post-operative study revealed significant improvements in air and bone conduction thresholds ( $p < 0.001$  and  $p = 0.002$ , respectively). Speech discrimination scores rose sharply ( $p = 0.011$ ). Table 5 shows statistical hearing comparisons before and after surgery.

**Table 5: Statistical Analysis of Preoperative vs. Postoperative Hearing Levels**

Hearing Parameter	p-value
Air Conduction Thresholds	< 0.001
Bone Conduction Thresholds	0.002
Speech Discrimination Scores	0.011

For atticofacial individuals, canal wall down mastoidectomy improves hearing outcomes with significant audiometric improvements.

### Discussion

Canal wall down mastoidectomy improves hearing following atticofacial illness, according to this study. Postoperative air and bone conduction thresholds dropped by -10.2 and -6.5 dB HL, respectively, indicating significant hearing function improvements. Study 1 and study 2 demonstrated that CWD mastoidectomy improved atticofacial

disease-related conductive hearing loss and controlled cholesteatoma. These findings match previous research.

Following surgery, speech discrimination ratings increased by +4.8 dB HL, supporting previous studies. This shows that the treatment improves speech comprehension, which is crucial for post-surgery quality of life and communication.

### Comparison Table

**Table 6: Comparison Table comparing current study with existing studies**

Study Title	Study Type	Sample Size	Key Findings
<b>Present Study</b>	Retrospective	80	Significant improvement in air conduction (-10.2 dB HL) and bone conduction thresholds (-6.5 dB HL) postoperatively. Speech discrimination scores improved by +4.8 dB HL. Complication rate: 10%.
<b>Study 1 [13]</b>	Prospective cohort	120	Reported similar improvements in hearing thresholds postoperatively. Higher complication rate (15%) compared to present study.
<b>Study 2 [14]</b>	Meta-analysis	N/A	Pooled data from multiple studies showed consistent improvements in hearing outcomes with CWD mastoidectomy.
<b>Study 3 [15]</b>	Case series	50	Demonstrated comparable outcomes in hearing improvement but noted variability in surgical techniques and outcomes.

The table summarises key findings from this study and three others on CWD mastoidectomy for atticofacial illness. Our retrospective analysis found that surgery reduced air conduction (-10.2 dB HL) and bone conduction thresholds (-6.5 dB HL), improving patients' hearing. Speech discrimination ratings improved significantly (+4.8 dB HL). Our study's 10% complication rate is consistent with good results, unlike Smith et al. (2020)'s 15%. This may be due to differences in patient selection or surgery between facilities.

### Limitations

This study has some drawbacks, because it is retrospective, it must use past medical data, which may be erroneous or lacking critical elements. Although 80 patients is enough for a single-center study, the results may not apply to bigger populations. The one-year study may have missed long-term effects beyond surgery recovery. Future prospective trials should employ larger samples and longer follow-ups to confirm these findings and assess surgery's long-term consequences.

### Future Research

We recommend some subjects for future research based on our findings. Long-term research is needed to identify how often cholesteatoma returns following CWD mastoidectomy and how long hearing improvements continue. Comparative study on surgical methods or adjunct drugs may assist control atticofacial disease. Patient-reported

outcomes like subjective hearing satisfaction and quality of life indicators might assist explain how surgical procedures influence patients. Even though this study indicates encouraging results of CWD mastoidectomy for atticofacial illness at Nalanda Medical College and Hospital, otology research and treatment methods must be improved to improve patient care and surgical outcomes.

### Conclusion

This Nalanda Medical College and Hospital study proves that canal wall down (CWD) mastoidectomy improves hearing in atticofacial patients. Bone and air conduction thresholds are -6.5- and -10.2-dB HL postoperatively, while speech discrimination scores are greatly improved (+4.8 dB HL). Enhancements show that the technique treats cholesteatoma and reduces conductive hearing loss from this long-term middle ear condition. CWD mastoidectomy is safe and successful when performed by trained otolaryngologists in dedicated centres, with a 10% complication rate that matches literature results. The study found that CWD mastoidectomy improves atticofacial patients' quality of life and hearing performance, making it a significant surgical operation. Future research should improve surgical techniques, identify the best candidates, and prevent complications. Increased knowledge and usage of CWD mastoidectomy can enhance atticofacial disease treatment results and prognosis.

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