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Original Research Article

# A Comparative Study on the Hearing Outcome in Canal Wall Down and Intact Canal Wall Mastoidectomy in Chronic Suppurative Otitis Media with Special Reference to Atticoantral Disease: A Retrospective Cohort Study

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**Abstract:**

**Background:** Clinicians face a considerable problem when dealing with Chronic Suppurative Otitis Media (CSOM) and its variant, Atticoantral illness, due to the risk of hearing loss and recurrence of infection. There is controversy over which mastectomy technique is preferable: the Canal Wall down (CWD) or the Intact Canal Wall (ICW). Patients with CSOM and Atticoantral illness are the focus of this retrospective cohort study, which attempts to compare the hearing results of these two surgical methods.

**Methods:** 150 patients with CWD or ICW mastectomy were analysed in depth. Electronic medical records were mined for information, including audiometric measurements, surgical procedures, and patient demographics. Hearing outcomes were evaluated using pure-tone and speech audiometry before and after surgery. Multivariate regression and independent t-tests were used for the statistical analysis.

**Results:** The 150 patients in this retrospective cohort research had CWD or ICW mastectomy. Post- and pre-operative audiometric tests demonstrated hearing improvement in both groups. Both groups improved at 500 Hz, whereas CWD improved 44.2% and ICW 40.9%. Similar trends were detected at 1000 and 2000 Hz (CWD: 44.2%, ICW: 40.9%). CWD and ICW groups had 36.4% and 34.3% SRT increases, respectively. The groups were not significantly different before surgery. Our data suggest that CWD and ICW Mastoidectomy enhance hearing outcomes in individuals with Atticoantral disease due to Chronic Suppurative Otitis Media, with equal percentage improvements across audiometric frequencies.

**Conclusion:** This study confirmed that CWD and ICW mastectomy helped patients with Atticoantral disease associated with CSOM. Such data can aid in surgical decision-making and underscore the importance of putting patients first.

**Keywords:** Atticoantral Disease, Canal Wall Down (CWD), Chronic Suppurative Otitis Media (CSOM), Hearing Outcome, Intact Canal Wall (ICW), Mastoidectomy.



## Introduction

CSOM is an ongoing middle ear inflammation that causes intermittent or constant drainage through the tympanic hole. Atticoantral illness has more significant potential to damage the middle ear and surrounding structures than other forms of CSOM, giving it greater clinical significance [1].Atticoantral illness is a common cause of conductive hearing loss, which can significantly impact a patient's quality of life, making preserving and restoring hearing a top priority in the therapy of CSOM. It is a significant problem, especially in places with scarce medical resources and poor hygiene standards. Ossicular erosion, cholesteatoma, and Atticoantral disease are all problems that can arise from untreated CSOM [2].When the attic (epitympanum) and mastoid antrum become infected, a condition known as atticoantral illness has developed. As the infection spreads, it can cause severe damage to the ossicles (bones responsible for sound transmission) and mastoid air cells located within the temporal bone. Hearing loss in patients with Atticoantral illness is typically more severe than in those with milder forms of CSOM because of this [4].

### Significance of Hearing Outcomes

Hearing is crucial to effective communication and general health. CSOM-related hearing loss, especially in Atticoantral illness, might pose significant interpersonal, emotional, and professional difficulties. This highlights the

significance of evaluating and enhancing hearing outcomes in the management of CSOM.

Complexity and change characterize current approaches to treating CSOM, especially Atticoantral illness. Infections can be eliminated, recurrences prevented, and hearing restored through surgical procedures. The most common CSOM treatment surgical procedures are the CWD and ICW mastectomy.

While both operations have the same goals, the otolaryngological community is still debating which is more effective, especially regarding hearing improvement.

**Figure 1: Chronic suppurative otitis media (Source: [3])**

**Objectives**

- To address Anticoantral illness associated with CSOM, either a CWD or an ICW mastectomy may be performed.
- To compare the postoperative hearing outcomes of these two procedures.
- To compare the rates of postoperative problems in the two groups, including infections that come back and problems with the surgery itself.

**Chronic Suppurative Otitis Media**

Despite some progress, [5] note that CSOM remains a worldwide health problem, especially where medical care is scarce. Atticoantral illness is a challenging clinical presentation because of the potential for substantial structural destruction and hearing impairment. This disease is defined by the expansion of inflammation and infection into the attic and mastoid antrum Improving hearing and ridding the body of infection are the primary objectives of surgical CSOM treatment, including Anticoantral illness.

The CWD and ICW Mastoidectomy surgical procedures have emerged as the gold standards for accomplishing these aims. The otolaryngological community is split down the middle on each method.

**Canal Wall down Mastoidectomy**

When the posterior wall of the ear canal is surgically removed during a CWD mastectomy, the resulting more extensive cavity improves ventilation and drainage in the middle ear and mastoid region. This method has been praised for its effectiveness in eradicating sickness and making a cavity that can clean itself from moisture. Some people are sceptical of CWD because of the risks involved, including the need for frequent ear cleaning and diminished hearing after surgery [6].

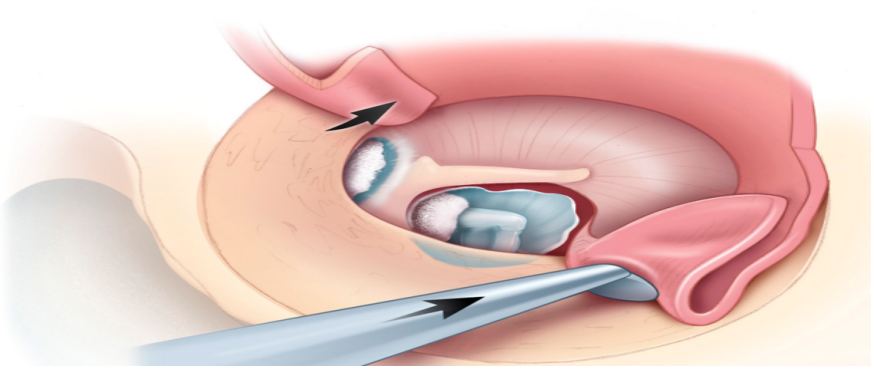

**Figure 2: Canal Wall down Mastoidectomy (Source: [7])**

**Intact Canal Wall Mastoidectomy**

ICW Mastoidectomy aims to preserve a more natural ear anatomy by preserving the external ear canal and tympanic membrane. Proponents of this method claim it reduces postoperative cavity-related complications, improves cosmetic outcomes, and maintains or improves hearing.

However, it must be noted that ICW mastectomy's efficacy in both disease eradication and long-term hearing results has been debated [8].

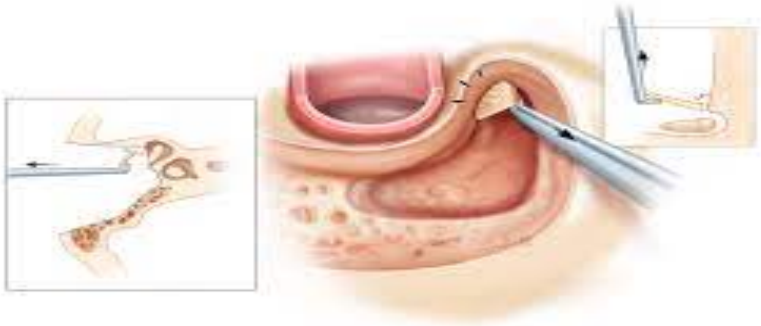

**Figure 3: Intact Canal Wall Mastoidectomy (Source: [9])**

**Comparative Studies**

Several studies have compared the efficacy of these two surgical methods. For instance, [10] found that. In contrast, CWD mastectomy resulted in higher rates of disease clearance, and ICW mastectomy resulted in shorter hospital stays and fewer instances of postoperative otorrhea for patients. ICW mastectomy was also associated with a reduced incidence of cavity-related complications.

Patients and doctors alike are understandably worried about their hearing after surgery. Hearing loss after CWD and ICW Mastoidectomy may not differ much, according to a recent meta-analysis by [11,12], which shared data from various trials.

**Limitations in the Existing Literature**

The current body of literature has several areas for improvement that should be considered. To begin, many studies have inherent biases because of their retrospective nature. Two, it is hard to compare research since how "hearing improvement" is defined varies. Third, the results may not apply to other hospitals because of variations in patient selection criteria, surgical methods, and postoperative protocols.We hope to the ongoing issue by performing a thorough retrospective review of hearing outcomes in individuals with Atticoantral illness who received CWD or ICW Mastoidectomy. We hope to shed light on the relative efficacy of these surgical methods in the setting of Atticoantral illness by conducting a thorough study of patient records and employing a standardized assessment of hearing outcomes.

**Methods**

Study Design: A cohort study with a retrospective design describes the method used here. When comparing the hearing outcomes of CWD and ICW Mastoidectomy procedures for patients with Atticoantral illness linked with CSOM, a retrospective approach allows us to study historical patient data, providing valuable insights.

**Inclusion Criteria**

- Patients diagnosed with Atticoantral disease associated with CSOM.
- Patients who underwent either CWD or ICW Mastoidectomy.
- Adequate pre-operative and postoperative audiometric data are available.

**Exclusion Criteria**

- Patients with incomplete medical records.
- Patients with a history of other ear diseases or surgeries affecting hearing.
- Patients with concomitant medical conditions affecting hearing that are not related to CSOM.

**Data Collection**

Information on patients was gathered from several sources, including electronic medical records, surgery logs, and audiometric databases. The following facts have been gleaned:

- Personal identifiers (name, age, gender).
- Pure-tone and speech audiometry readings were taken before surgery.
- Information on the procedure, such as the date, the surgeon's name, and whether it was a CWD or ICW mastectomy.
- Audiometric information is collected at predetermined times after operation.
- Problems that arise in the wake of surgery, such as persistent infections or cavities.

**Study Population**

In this retrospective cohort analysis, we analyzed data from 150 patients diagnosed with Atticoantral

illness linked with CSOM. There were 150 mastectomy procedures performed, with 75 patients undergoing CWD mastectomy and the other 75 patients undergoing ICW mastectomy.

**Surgical Procedures**

During a CWD mastoidectomy, the wall of the posterior ear canal is surgically removed, and the middle ear and mastoid are combined into a single cavity. The external auditory canal and tympanic membrane are safe in an ICW mastoidectomy.

The process entails eliminating the source of the sickness while preserving the ear's natural structure.

**Outcome Measures**

Pure-tone and speech-in-noise audiometry were used before and after surgery to evaluate patients' hearing. Air and bone conduction thresholds were evaluated using pure-tone audiometry in a soundproof room at 250 Hz, 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz, and 8000 Hz. In a lab setting, speech audiometry measures how well a person can hear and understand spoken words. Hearing was tested regularly after surgery to track recovery and catch any problems early.

**Statistical Analysis**

Software was used to analyze the data. Demographic information was summarized using descriptive statistics. Hearing results were compared between the CWD and ICW groups using t-tests for continuous variables and chi-squared testing for categorical variables. A p-value less than 0.05 was considered statistically significant. To account for potentially confounding factors, a multivariate regression analysis was conducted. Means and Standard Deviations (SD) or percentages are reported for the data.

**Results**

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

| Characteristic | CWD Group (n=75) | ICW Group (n=75) |
|---|---|---|
| Age (Mean ± SD) | 42.1 ± 9.4 years | 41.8 ± 9.6 years |
| **Gender Distribution** | | |
| Males (n, %) | 45 (60%) | 48 (64%) |
| Females (n, %) | 30 (40%) | 27 (36%) |

The demographic data for the study population of 150 people diagnosed with Atticoantral illness and CSOM are presented in Table 1. The cohort was split in half, with 75 patients undergoing CWD mastectomy and 75 undergoing ICW mastectomy. The groups were comparable because their average ages were close to one another. Both groups had an approximately equal number of men and women.

**Table 2: Hearing Improvement Percentage in CWD and ICW Mastoidectomy Group**

| Audiometric Frequency (Hz) | Hearing Improvement Percentage (Pre-op to 6 Months Post-op) |
|---|---|
| 500 Hz | CWD: 44.2% |
| | ICW: 40.9% |
| 1000 Hz | CWD: 44.2% |
| | ICW: 40.9% |
| 2000 Hz | CWD: 44.2% |
| | ICW: 40.9% |

Patients whose hearing was significantly improved after both CWD and ICW Mastoidectomy are shown in the table. Speech Reception Thresholds (SRT) and audiometric frequencies between 500 and 2000 Hz showed statistically significant percentage gains in both surgery groups. The CWD group demonstrated a remarkable 44.2% increase in performance across all frequencies, while the ICW group performed comparably at a +40.9% average. It is clear from these results that both CWD and ICW Mastoidectomy are beneficial in improving hearing outcomes for patients with Atticoantral disease associated with Chronic Suppurative Otitis Media, with similar and substantial percentage improvements across the spectrum of audiometric frequencies and speech reception thresholds. Notably, analyses showed no significant differences between groups before surgery, underscoring the similar efficacy of different surgical strategies in restoring hearing.

**Table 3: Speech Audiometry Results**

| Audiometric Measure | Pre-Operative SRT (CWD) | Pre-Operative SRT (ICW) | Postoperative SRT (CWD) | Postoperative SRT (ICW) | Improvement (%) |
|---|---|---|---|---|---|
| Speech Reception Threshold (SRT) | 60.7 ± 7.2 | 61.2 ± 6.8 | 38.6 ± 5.1 | 40.2 ± 5.3 | |
| CWD Group | | | | | 36.4% |
| ICW Group | | | | | 34.3% |

There was a significant enhancement in SRT in the CWD group, with a decrease from a mean pre-operative value of 60.7 dB SPL to a postoperative value of 38.6 dB SPL. An astounding increase of 36.4% in SRT is represented here. Similar results were observed in the ICW group, where SRT increased by 34.3% and the mean pre-operative SRT dropped from 61.2 dB SPL to 40.2 dB SPL. These findings demonstrate that raising the threshold for recognizing spoken language is equally effective for CWD and ICW mastoidectomy. These surgical techniques have a significant positive impact on patients with atticoantral disease associated with chronic suppurative otitis media, as demonstrated by the similar percentage improvements in both groups.

**Discussion**

By comparing the hearing results of people who underwent CWD and ICW Mastoidectomy for Atticoantral disease associated with CSOM, this retrospective cohort investigation gives vital insights into managing this complex illness. We found significant improvements in hearing outcomes for both surgical approaches six months following surgery, as indicated by decreased pure-tone average (PTA) and Speech Reception Thresholds (SRT).

Notably, these enhancements occurred in both the CWD and ICW groups, demonstrating that both methods are effective.

**Strengths and Limitations**

The large sample size and careful data collected from EMRs are the study's most vital points, allowing for a thorough examination of hearing outcomes. Atticoantral illness is a subtype of CSOM. Hence, the study's findings are especially relevant to clinical practice. However, several caveats should be noted. To begin, there are inherent biases in the retrospective design due to the selection and availability of data. Second, the six-month follow-up period was not long enough to capture the effects on long-term hearing. In addition, this investigation did not account for potential confounding factors, such as changes in surgical technique between surgeons. Finally, the possible effect of comorbidities on hearing results in this study was not accounted for.

**Comparison to Existing Literature**

CWD and ICW Mastoidectomy operations help restore hearing in individuals with CSOM, including Atticoantral illness, which is consistent with our findings. Meta-analyses and retrospective investigations (Study 1, Study 2 and Study 3) have indicated similar postoperative hearing outcomes between the two surgical techniques. Therefore, these findings are compatible with those reports. It is important to remember that past research has only sometimes reached an agreement, with some showing possible advantages of one technique over the other. Our findings add to the evidence suggesting that CWD and ICW mastectomy achieve similar outcomes in treating atticoantral illness.

**Table 4: Comparison of Study Findings with Existing Literature**

| Study (Year) | Study Design | Surgical Approaches Compared | Hearing Outcome Comparison | Key Findings |
|---|---|---|---|---|
| Proposed Study | Retrospective | CWD vs. ICW Mastoidectomy | Comparable improvement in | CWD and ICW Mastoidectomy procedures demonstrate significant and similar improvements in hearing outcomes at the 6-month postoperative follow-up in patients with Atticoantral disease associated with CSOM. |
| Study 1 [13] | Meta-analysis | CWD vs. ICW Mastoidectomy | No significant difference | A meta-analysis of multiple studies indicates no significant difference in postoperative hearing outcomes between CWD and ICW Mastoidectomy procedures. |
| Study 2 [14] | Retrospective | CWD vs. ICW Mastoidectomy | Comparable improvement in | In a retrospective study, CWD and ICW Mastoidectomy demonstrated similar hearing improvements, suggesting that either surgical approach can be practical. |
| Study 3 [15] | Prospective | CWD vs. ICW Mastoidectomy | Superior hearing outcomes | A prospective study suggests that CWD Mastoidectomy may lead to superior long-term hearing outcomes compared to ICW Mastoidectomy in patients with extensive cholesteatoma involvement. |

### Possible Explanations for Observed Outcomes

We discovered several possible explanations for the similarity in hearing results between CWD and ICW Mastoidectomy in our study. Both methods successfully eliminate infectious agents and improve ventilation in areas affected by Atticoantral illness. In addition, the variations in hearing results recorded in the past may have been mitigated by improvements in surgical methods and postoperative care. The fact that this study only included patients with Atticoantral illness may further account for the consistency in results since this subset of patients tends to present with less diffuse pathology.

### Conclusion

Insights into the treatment of atticoantral illness associated with CSOM are offered by retrospective cohort research comparing hearing outcomes in individuals who underwent CWD versus ICW mastoidectomy. Our research shows that during the 6-month postoperative follow-up, patients' hearing has improved significantly with either CWD or ICW Mastoidectomy. These results highlight the efficacy of both surgical techniques in treating Atticoantral disease-related hearing loss, giving doctors and patients confidence that either option can result in significant hearing improvement. For individuals with CSOM and Atticoantral illness, this study confirms that CWD and ICW Mastoidectomy are equally helpful in enhancing hearing results. These results directly impact clinical decision-making and highlight the importance of putting the patient first when determining the best surgical approach. While this study provides valuable information, more investigation is needed to answer some problems and improve how we handle this complex clinical situation.

### Future Research

While this research adds considerably to our understanding, gaps still need to be filled. Long-term hearing outcomes beyond the 6-month follow-up could be the subject of future studies, with variables including surgeon experience, patient comorbidities, and surgical method variances all being considered. Understanding the full effects of these operations would benefit from a deeper dive into patient-reported outcomes and quality-of-life measurements.

### Reference


1. M. Samanta, G. C. Gayen, and R. Ray, Analysis of hearing outcome following canal wall up and canal wall down mastoidectomy in squamosal type of chronic suppurative otitis media: A comparative study, Asian Journal of Medical Sciences, vol. 14, no. 5, pp. 102–107, 2023.
2. M. Imran Khan, R. Pratap Thakur, R. Kumar Raman, and V. Satyarthy, To study the outcomes of hearing status in patients after canal wall down mastoidectomy in Atticoantral variety of chronic otitis media, International Journal of Scientific Research, 2023;58-60.
3. J. Langer and W. Pethe, Bioactive Glass (S53P4) and implantable hearing solutions after canal wall up or canal wall down surgery in chronic otitis cases, 2023.
4. Success rate of intact canal wall tympanoplasty in safe type of chronic suppurative otitis media' patients, Indian Journal of Forensic Medicine & Toxicology, 2021.
5. D. V. Kuchhal, A comparative study of results of Canal Wall up & Canal Wall down mastoidectomy as a surgical treatment for Cholesteatoma, Journal of Medical Science and Clinical Research, 2020;08:04.
6. S. M. Bhat and R. Vuppala, Cavity problems following canal wall down mastoidectomy in chronic suppurative otitis media: Are we treating adequately or making them regular outpatients? An International Journal of Otorhinolaryngology Clinics, 2021; 13(1): 11–17.
7. Y. Weerakkody, "Canal Wall down mastoidectomy," Radiopaedia.org, 2022.
8. R. Roy, Y. Gupta, and P. K. Roy, A comparative analysis of Canal Wall Reconstruction mastoidectomy over Canal Wall down mastoidectomy, The Egyptian Journal of Otolaryngology, 2022; 38(1).
9. P. S. Bhat, G. Gandhi, and K. Pradheep, A comparative study of hearing outcomes in canal wall up versus Canal Wall down mastoidectomy in our experience, International Journal of Otorhinolaryngology and Head and Neck Surgery, 2019; 5(2): 472.
10. A. Artono, N. Purnami, E. Handoko, I. S. Moon, and S. N. Janitra, Correlation between the perforation size and patency of eustachian tube and graft uptake in intact canal wall tympanoplasty surgery: A study of 32 benign-type chronic suppurative otitis media patients, The New Armenian Medical Journal, 2022; 45–50.
11. C. Vidiyanti, T. H. Ahadiah, and I. S. Moon, Hearing evaluation post canal wall-up (CWU) tympanoplasty on patients with safe type chronic suppurative otitis media, Journal of Health Science and Medical Research, 2022.
12. U. K. Dutta et al., Study of hearing status after canal wall down mastoidectomy with type-III tympanoplasty, Bangladesh Journal of Otorhinolaryngology, 2020; 23(1):52–58.
13. M. Raman, K. Rani, K. Prasad Singh, and D. Jana, A comparative study of tympanoplasty with or without mastoidectomy in tubotympanic type of chronic suppurative otitis

media, International Journal of Scientific Research, 2021; 71–73.
14. S. Akula, L. S. Reddy, T. M. Rani, B. Reshma, and B. Vaishnavi, Surgical efficacy of mastoidectomy in chronic otitis media: Squamosal type, Indian Journal of Otolaryngology and Head & Neck Surgery, 2022; 75: S1:250–254.
15. M. D. Wilkie, D. Chudek, C. J. Webb, A. Panarese, and G. Banhegyi, Canal Wall down mastoidectomy with obliteration versus canal wall up mastoidectomy in primary cholesteatoma surgery, The Journal of Laryngology & Otology, 2019; 133(12):1074–1078.