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REVISION MASTOIDECTOMY – AN INSTITUTIONAL STUDY

Otorhinolaryngology

Asmita Mishra Junior Resident, Department Of Otorhinolaryngology, B.R.D. Medical College, Gorakhpur, U.P., India

Ramanand Yadav Professor And Head, Department Of Otorhinolaryngology, B.R.D. Medical College, Gorakhpur, U.P., India

Aditya Kumar Pathak Associate Professor, Department Of Otorhinolaryngology, B.R.D. Medical College, Gorakhpur, U.P., India

P.N Singh Associate Professor, Department Of Otorhinolaryngology, B.R.D. Medical College, Gorakhpur, U.P., India

ABSTRACT

Background: Chronic otitis media (COM) often necessitates mastoidectomy for disease control and hearing restoration. Despite advances, surgical failures persist due to residual disease or recurrence, requiring technically demanding revision mastoidectomy. **Objectives:** To evaluate the common indications, intraoperative challenges, and outcomes of revision mastoidectomy in patients with failed primary ear surgeries. **Methods:** This cross-sectional study was conducted over 12 months at a tertiary care center on 31 patients with persistent symptoms following intact canal wall (ICW) or canal wall down (CWD) mastoidectomy. Patients underwent preoperative HRCT, audiological evaluation, and microbiological assessment. Intraoperative findings and postoperative outcomes were documented and analyzed descriptively. **Results:** The most common clinical feature was persistent otorrhea (100%). Tympanoplasty (35.5%) and CWU (32.25%) were the most frequent prior procedures. Residual cholesteatoma was observed in 19.35% of cases. Common causes of surgical failure included incomplete exenteration and poor cavity design. All patients achieved a dry ear postoperatively, and 58.07% showed hearing improvement. **Conclusion:** Revision mastoidectomy is effective in managing recurrent COM when guided by precise imaging, thorough intraoperative evaluation, and individualized surgical planning.

KEYWORDS

Chronic otitis media; Revision mastoidectomy; Cholesteatoma; Tympanoplasty; Canal wall up; Postoperative outcomes.

INTRODUCTION

Chronic otitis media (COM) is a long-standing inflammation of the middle ear and mastoid cavity that often requires surgical intervention. [1] Mastoidectomy is the key procedure to eliminate disease and restore hearing. Despite surgical advancements, many patients still experience persistent or recurrent disease, necessitating revision surgery. [2] Revision mastoidectomy represents a critical yet complex domain in otologic surgery, undertaken when initial mastoid procedures fail to achieve disease eradication or auditory restoration. Common causes of failure include residual or recurrent cholesteatoma, persistent otorrhea, and unresolved conductive hearing loss. These revision cases are particularly challenging due to altered anatomy, extensive fibrosis, and obscured surgical landmarks, which heighten the risk of intraoperative complications. [3,4] Managing such cases requires thorough preoperative assessment, precise identification of the underlying causes of failure, and careful selection of surgical technique. [5] The debate between canal wall up and canal wall down approaches remains central, each with its own benefits and limitations in revision scenarios. Additionally, modern techniques such as mastoid cavity obliteration and the use of high-resolution imaging have enhanced surgical planning and outcomes. [6-8] Despite advancements, revision mastoidectomy continues to pose technical and clinical hurdles.

The purpose of the study was to assess the indications, intraoperative challenges, and surgical approaches in revision mastoidectomy to improve outcomes and reduce recurrence.

MATERIALS AND METHODS

This cross-sectional study was conducted over a period of 12 months, from January 1, 2024, to January 1, 2025, in the Department of Otorhinolaryngology at B.R.D. Medical College, Gorakhpur, in collaboration with other allied departments. Prior approval was obtained from the Institutional Ethics Committee, and informed written consent was secured from all participating patients.

A total of 31 patients who had previously undergone either intact canal wall (ICW) or canal wall down (CWD) mastoidectomy and presented with persistent or recurrent symptoms were included in the study using a convenience sampling technique. The inclusion criteria encompassed patients of any age and sex who were medically fit and consented for revision surgery. Patients who declined consent or were medically unfit for surgery were excluded.

Each patient underwent a thorough preoperative evaluation. A detailed history was taken, with special attention to associated conditions such as rhinitis, chronic tonsillitis, or allergy. Radiological evaluation included high-resolution computed tomography (HRCT) of the temporal bone using a GENERAL ELECTRIC OPTIMA 64-slice CT scanner. Parameters included a section thickness of 0.6–1.0 mm, 0.3 mm spacing with overlap, 120 kV, 250 mA, helical pitch of 0.625, and a rotation time of 0.8 seconds. The scans were assessed for residual disease, status of the mastoid cavity, and anatomical anomalies.

Audiological assessment was performed using pure tone audiometry (PTA), comparing preoperative and postoperative air and bone conduction thresholds to evaluate hearing outcomes.

Intraoperatively, surgical observations were meticulously documented. Photographic records from microscopic and endoscopic evaluations were captured and archived. Parameters assessed included graft integrity, condition of ossicles, facial ridge height, attic status, presence of biofilms, cholesteatoma, tympanic opening of the Eustachian tube, retrofacial cells, low-lying dura, anteriorly positioned sinus plate, and incomplete exenteration of diseased air cells. Status of mastoid tip cells, canal overhangs, and cavity obliteration details, including materials used, were also recorded.

Pus samples were collected intraoperatively for microbiological studies, including culture and biofilm analysis, to identify resistant infections.

Descriptive statistical analysis was employed to evaluate outcomes. Data were compiled and presented as percentages, focusing on postoperative dry cavity status, hearing improvement, intraoperative challenges, and complications encountered.

Ethical Considerations: Ethical approval was obtained from the institutional committee. Written informed consent was taken from all patients. Participation was voluntary, and patients retained the right to withdraw at any stage without compromising their standard of care.

RESULTS

In our study, the total sample size was 31 patients with primary surgical failure. Most were aged 31–40 years (32.25%), and females (58.06%) slightly outnumbered males (41.93%). The majority were graduates (41.94%), and the most common occupations were housewives

(32.25%) and students (29.03%).

Slightly more patients were from urban areas (51.61%) than rural (41.93%).

Table 1: Clinical Features and Types of Previous Surgical Procedures

		n	%
Clinical Features	Ear discharge (unilateral/bilateral)	31	100.00
	Reduced hearing	3	9.68
	Abnormal sound during chewing(TMJ fistula)	1	3.22
	Tinnitus	1	3.22
	Tympanoplasty	11	35.50
Past Surgical Procedure	**Canal wall up mastoidectomy**	10	32.25
	a) Cortical mastoidectomy for non cholesteatoma	8	25.81
	b) Cortical mastoidectomy for cholesteatoma	1	3.22
	c) Others(tympanoplasty + check antrostomy)	1	3.22
	Canal wall down mastoidectomy	10	32.25
	a) MRM for cholesteatoma	9	29.02
	b) Others(atticotomy+cortical mastoidectomy)	1	3.22

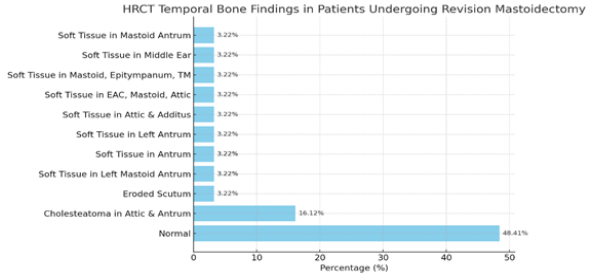

Figure 1: HRCT Temporal Bone Findings in Patients Undergoing Revision Mastoidectomy

Table 2: Status of Graft & External Auditory Canal (EAC) according to previous surgery cases

	TYPE OF PREVIOUS SURGERY						
Finding after previous surgery	**tympanoplasty**	**Cortical mastidectomy**	**Antrostomy**	**MRM**	**Atticotomy**	**n**	**%**
Perforation (marginal + subtotal + central)	5	6	0	4	1	14	51.65
Granulations/myringitis	3	1	1	2	0	7	22.60
Intact drum with discharge	1	1	0	1	0	3	9.65
Inflamed graft over cartilage	2	0	0	1	0	3	9.65
Retraction	0	1	0	1	0	2	6.45

Table 3: Middle Ear Pathology

Type of previous surgery								
Variable	**Category**	**tympanoplasty**	**Cortical mastidectomy**	**Antrostomy +tympanoplasty**	**MRM**	**Atticotomy**	**n**	**%**
Middle ear pathology	**Normal**						17	54.85
	Cholesteatoma	1	1	0	2	0	4	12.90
	Filled With Cartilage Pallisades/slice	2	0	1	0	0	3	9.67
	Hypertrophied mucosa	3	2	0	2	0	7	22.58
	Cholesterol granuloma	0	0	0	0	0	0	0

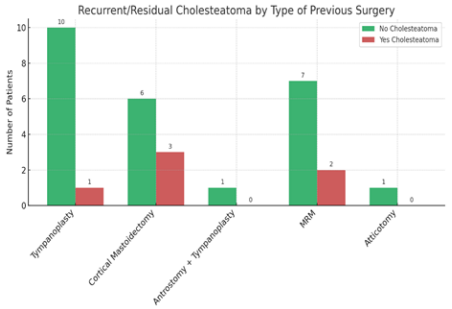

Figure 2: Recurrent/Residual Cholesteatoma by Type of Previous Surgery

Table 4: Incomplete Exenteration Of Diseased Cells

Site of Incomplete Clearance	Tympanoplasty	Cortical mastidectomy	Antrostomy +tympanoplasty	MRM	Atticotomy	n	%
Tip cells	0	1	0	0	0	**1**	**3.22**
Other cells	0	2	0	0	1	**3**	**9.63**
Retrofacial cells & sinus tympani (cholesteatoma)	0	1	0	1	0	**2**	**6.45**

Table 5: Cause of Failure of Previous Surgery- Summary and Type of Revision Surgery

		N	%
Cause	Recurrent / Residual cholesteatoma	6	19.35
	Perforation of graft	2	6.45
	Persistent infection / granulation (undermined canal wall epithelium)	3	9.68
	Surgical Causes:	**9**	**29.03**
	a) Incomplete saucerisation + high facial ridge	2	6.45
	b) Incomplete exenteration	4	12.90
	c) Inadequate meatoplasty+ high facial ridge	2	6.45
	d) Inadequate epithelization	1	3.22
	Reduced ventilation leading to infection and graft perforation	**4**	**12.90**
	Other –mastoid fistula	**1**	**3.22**
	Acute infection/myringitis (medical management)	**6**	**19.35**
Type of Revision Surgery	**Canal Wall Up Mastoidectomy**	**14**	**45.14**
	a) Revision cortical mastoidectomy	6	19.35
	b) Revision tympanoplasty+ antrostomy onlay	2	6.45
	c) Revision tympanoplasty +antostomy underlay	5	16.12
	d) Revision tympanoplasty+ antrostomy +ossiculoplasty(underlay)	1	3.22
	Canal Wall Down Mastoidectomy	**11**	**35.50**
	a) MRM primary	4	12.90
	b) MRM revision	6	19.35
	c) Revision cortical mastoidectomy + atticotomy	1	3.22
	d) Conservative (e.g., ear toilet + antibiotics)	**6**	**19.36**

Table 6: Challenges Faced During Surgery And Overal Hearing Improvement

		n	%
Challenges	No significant finding	25	80.66
	Poor anatomical orientation	2	6.45
	Exposed dura/devascularized bone	1	3.22
	Deficient posterior canal skin	1	3.22
	Low-lying dura/forward-placed sigmoid sinus	2	6.45
Overall hearing Improvement	0db	12	38.70
	1-5db	5	16.12
	6-10 db	6	19.35

	11-15 db	6	19.35
	16-20 db	2	6.45

In our study, all patients (100%) achieved a dry ear postoperatively following revision mastoidectom

DISCUSSION

In this study, the most affected age group was 31–40 years, indicating that chronic otitis media (COM) requiring revision surgery commonly affects individuals in their productive years. This contrasts with other studies like Katewad et al. (2016) [9] who reported a younger average age and Dutta et al. (2019) [10] who focused on pediatric presentations. A slight female predominance (58.06%) was noted, aligning with Li et al. (2023) [11], possibly due to gender-based health-seeking behavior. Tympanoplasty was the most common previous surgery (35.5%), followed by CWU (32.25%) and CWD (32.25%). Revision was required across all types, with recurrence linked to incomplete clearance, especially in CWU cases. Our findings reflect those of Dornhoffer (2004) [12] and Kelly et al. (2011) [13], who identified higher recurrence in CWU due to limited disease exposure. Otorrhea was the most consistent symptom (100%), highlighting its role as a reliable indicator for revision. HRCT detected abnormalities in less than half of the cases, reinforcing the need to correlate radiology with clinical and intraoperative findings. Intraoperatively, ossicular damage, high facial ridges, and inadequate meatoplasty were common contributors to surgical failure. Residual or recurrent cholesteatoma was found in 19.35% of patients, most often in retrofacial and tip cells. These findings are consistent with Li et al. (2023) [11] and Kumar et al. (2013) [14], who emphasized the importance of clearing hidden mastoid air cells. Postoperatively, 100% of patients achieved a dry ear, and 58.07% showed hearing improvement. Only one patient experienced a minor complication. These favorable outcomes affirm that, with meticulous planning, revision mastoidectomy can provide excellent results in disease control and auditory rehabilitation, consistent with the outcomes reported by Nadol (2006) [15], Sami et al. (2009) [16], and Katewad et al. (2016) [9].

CONCLUSION

We concluded that revision mastoidectomy is a valuable intervention for managing failed primary surgeries, with ear discharge being the most consistent indication. Careful preoperative imaging, intraoperative assessment, and individualized surgical planning significantly improve outcomes. Complete disease clearance and correction of anatomical defects are essential to achieving a dry ear and preserving hearing in recurrent or residual middle ear disease.

Strengths Of The Study

This study provides a comprehensive intraoperative analysis of revision mastoidectomy cases in a tertiary care setting, highlighting surgical challenges and failure causes. It integrates radiological, microbiological, and clinical findings, offering practical insights for improving surgical outcomes. Consistent postoperative follow-up and 100% dry ear achievement enhance the study's clinical relevance and impact.

Limitations Of The Study

The study's single-center design and small sample size (n=31) may limit the generalizability of findings. Absence of long-term follow-up restricts evaluation of recurrence beyond the immediate postoperative period. Lack of objective quality-of-life assessment tools also limits insight into functional recovery. Multicenter studies with larger cohorts and extended follow-up are needed for broader validation.

Conflict Of Interest: None.
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Ethical Approval: Obtained.
Consent: Written consent secured.

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