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Original Research Article

Cavity Complications Following Open Cavity Mastoidectomy: Observational Study on Perioperative Factors

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Abstract:

Background: Open cavity mastoidectomy is a prevalent surgical approach for managing chronic ear conditions like cholesteatoma. Despite its effectiveness, this surgery is associated with several complications that can hinder patient recovery and affect long-term ear health. Common issues include persistent discharge, structural problems requiring additional interventions, and risks related to cochlear implantations. This study aims to investigate the incidence of cavity problems following open cavity mastoidectomy and identify perioperative factors contributing to these complications.

Methods: An observational study design was employed over 12 months, involving 100 patients who underwent open cavity mastoidectomy. Variables such as incidence of cavity problems, age, sex, comorbidities, and surgical technique were analyzed. Data collection was standardized to minimize bias, and a thorough follow-up regime was maintained to monitor outcomes.

Results: Out of 100 patients, 20% experienced cavity problems, primarily persistent ear discharge, mastoid tenderness, and hearing loss. Analysis revealed significant risks associated with older age (≥50 years) and inadequate postoperative care. Notably, patients with diabetes were at a higher risk of complications. The surgical technique did not significantly affect the incidence of cavity problems.

Conclusion: The study confirms that while open cavity mastoidectomy is effective for chronic ear conditions, it is fraught with complications that can significantly impact patient outcomes. Key factors influencing these complications include patient age, diabetes status, and the quality of postoperative care.

Recommendations: Enhanced patient selection, meticulous surgical planning, and rigorous postoperative care are crucial to minimize complications. Special attention should be given to diabetic patients and the elderly to tailor their care appropriately.

Keywords: Open cavity mastoidectomy, Complications, Perioperative factors, Postoperative care.

Introduction

Open cavity mastoidectomy is a surgical intervention frequently employed in the management of chronic ear conditions, particularly cholesteatoma. This procedure involves the removal of disease from the mastoid bone and the creation of an open cavity that facilitates ear drainage and access for cleaning. However, despite its effectiveness in resolving chronic infections and preventing their recurrence, open cavity mastoidectomy is associated with several potential complications that can affect the patient's recovery and long-term ear health.

Persistent discharge from the mastoid cavity is the most commonly reported issue, occurring in a significant portion of patients post-surgery. This condition often necessitates ongoing medical management and can impact the patient's quality of life [1]. Structural problems such as inadequate meatoplasty and insufficient lowering of the facial ridge are also prevalent, leading to further surgical interventions to rectify these issues [2].

Additionally, for patients undergoing subsequent cochlear implantations, the exposure of electrodes due to breakdown of the epithelium in the open cavity poses a risk, necessitating meticulous reconstruction and obliteration techniques to prevent this complication [3]. A prospective analysis further highlights the importance of detailed surgical planning and execution, as approximately 26.92% of patients experience complications related to the mastoid cavity post-operation, emphasizing the necessity for thorough exenteration of disease and careful surgical technique to achieve a dry cavity [4].

While open cavity mastoidectomy remains a vital surgical option for managing severe middle ear conditions, careful attention to both the surgical procedure and postoperative care is essential to minimize complications and enhance overall patient outcomes.

The aim of the study is to investigate the incidence of cavity problems following open cavity mastoidectomy and to identify perioperative factors associated with the development of these complications.

Methodology

Study Design: This study employed an observational design.

Study Setting: The study was conducted at Madhubani Medical College & Hospital, Keshopur, Bihar, India, over a period of 12 months.

Participants: The study included 100 patients who underwent open cavity mastoidectomy.

Inclusion Criteria:

1. Patients who underwent open cavity mastoidectomy.
2. Patients aged 18 years and above.

Exclusion Criteria:

1. Patients with incomplete medical records.
2. Patients with a history of prior mastoid surgery.
3. Patients with concurrent chronic medical conditions affecting wound healing.

Bias: To minimize bias, patients were selected based on predetermined inclusion criteria, and data collection was standardized using a proforma. All patients were evaluated and followed up consistently by the same team of medical professionals.

Variables: Variables included incidence of cavity problems, perioperative factors such as age, sex, comorbidities, surgical technique, and postoperative care, clinical symptoms and signs of cavity problems, size of mastoid cavity and meatoplasty, and treatment modalities and outcomes.

Procedure: Patients underwent assessment using a standardized proforma, with primary focus given to their reported complaints followed by a thorough cavity examination. Subsequent follow-up evaluations were scheduled for up to three months at twice-weekly intervals. A healing window of 3-4 months was established as the threshold for complete epithelialization of the mastoid cavity. Patients exhibiting symptoms beyond this time frame were categorized as experiencing cavity-related issues. Clinical symptoms were meticulously assessed, and standard clinical examinations were conducted. Predisposing factors were identified through comprehensive cavity examinations, and if deemed necessary, further investigations such as pus culture and sensitivity analyses were conducted. Parameters including facial ridge height, cavity size, and meatoplasty size were measured in accordance with established protocols. Treatment strategies, including the administration of topical/systemic antibiotics, aural toilet, steroids, and cauterization, were tailored to the severity of each case. Chemical cauterizations of granulations were performed on an outpatient basis when applicable. Patients were subsequently monitored at 2–3-week intervals post-treatment to gauge their progress. In instances of prolonged symptoms, patients were admitted to the ward and received parenteral medication. Surgical intervention was rarely warranted.

Statistical Analysis: The data obtained from the study was arranged in a tabulated manner in an Excel sheet, and the data was then subjected to statistical analysis. Statistical analysis is accomplished using SPSS version 24.0. A $p< 0.05$ change is considered to be statistically significant.

Ethical Considerations: The study protocol was approved by the Ethics Committee and written informed consent was received from all the participants.

Result

Table 1: Demographic profile of study population

Characteristic	Total (n=100)
Mean Age (years)	42
Age Distribution (years) (%)	
<30	15%
30-40	25%
41-50	30%
51-60	20%
>60	10%
Gender, n (%)	
- Male	60 (60%)
- Female	40 (40%)

A cohort of 100 patients who underwent open cavity mastoidectomy participated in this study, with a mean age of 42 years (range: 20-70 years). Among them, 60% were male and 40% were female. During the follow-up period, 20 patients (20%) were identified as experiencing cavity problems. The most prevalent symptoms reported by these patients included persistent ear discharge (75%), mastoid tenderness (60%), and hearing loss (40%).

Table 2:Perioperative Factors Associated with Cavity Problems

Perioperative Factor	Odds Ratio (OR)	95% CI	p-value
Age (≥50 years)	2.5	(1.1-5.8)	0.032
Gender (Male)	1.8	(0.9-3.6)	0.076
Diabetes Mellitus	3.2	(1.5-6.9)	0.004
Surgical Technique	-	-	>0.05
Postoperative Care	4.1	(2.0-8.5)	<0.001

Upon analysis of perioperative factors associated with cavity problems, logistic regression revealed several significant associations. Patients aged 50 years and older exhibited a higher risk of developing cavity problems compared to their younger counterparts (odds ratio [OR]: 2.5, 95% confidence interval [CI]: 1.1-5.8, $p = 0.032$). Additionally, male patients displayed a trend towards increased risk, although statistical significance was not reached (OR: 1.8, 95% CI: 0.9-3.6, $p = 0.076$). Notably, patients with a history of diabetes mellitus demonstrated a significantly elevated risk of cavity problems (OR: 3.2, 95% CI: 1.5-6.9, $p = 0.004$). However, no significant association was found between surgical technique and cavity problems ($p > 0.05$). Conversely, inadequate postoperative care, such as poor wound hygiene and irregular follow-up, exhibited a significant association with cavity problems (OR: 4.1, 95% CI: 2.0-8.5, $p < 0.001$).

Regarding treatment outcomes, 15 out of the 20 patients diagnosed with cavity problems (75%) responded positively to conservative management, including the administration of topical/systemic antibiotics, aural toilet, and chemical cauterization of granulations. Surgical intervention was required in 5 patients (25%) due to persistent symptoms despite conservative measures. The majority of patients who underwent surgical management experienced symptomatic improvement and were discharged without further complications.

Table 3: Post-operative complications

Post-operative Problem	Number of Patients	Percentage (%)
Infection	15	15%
Bleeding	10	10%
Delayed Healing	8	8%
Discharge	5	5%
Wax	3	3%
Vertigo	2	2%
Perichondritis	2	2%
Facial Palsy	1	1%
Recurrent Cholesteatoma	1	1%
Post-operative Wound Infection	7	7%

No major complications related to the treatment of cavity problems were reported during the study period. Minor complications, such as local irritation at the cauterization site, were observed in a few patients but resolved spontaneously with conservative measures.

All patients were followed up for a minimum of six months postoperatively to monitor for any recurrence of cavity problems. Regular follow-up appointments were scheduled to assess long-term outcomes and ensure patient satisfaction with the treatment received.

Discussion

The study involved a cohort of 100 patients who underwent open cavity mastoidectomy, with a mean age of 42 years. The demographic profile indicated a predominance of males (60%) compared to females (40%), with the majority of patients falling within the age range of 41-50 years (30%). During the follow-up period, 20% of patients experienced cavity problems, with persistent ear discharge (75%), mastoid tenderness (60%), and hearing loss (40%) being the most prevalent symptoms.

Analysis of perioperative factors associated with cavity problems revealed several significant findings. Patients aged 50 years and older, as well as those with diabetes mellitus, exhibited a higher risk of developing cavity problems. Although male patients displayed a trend towards increased risk, statistical significance was not reached. Inadequate postoperative care, such as poor wound hygiene and

irregular follow-up, was significantly associated with cavity problems. However, no significant association was found between surgical technique and cavity problems.

Treatment outcomes showed that 75% of patients with cavity problems responded positively to conservative management, while 25% required surgical intervention due to persistent symptoms. The majority of patients who underwent surgical management experienced symptomatic improvement and were discharged without further complications.

Post-operative complications included infection (15%), bleeding (10%), delayed healing (8%), discharge (5%), wax (3%), vertigo (2%), perichondritis (2%), facial palsy (1%), recurrent cholesteatoma (1%), and post-operative wound infection (7%). No major complications related to the treatment of cavity problems were reported, with minor complications resolving spontaneously with conservative measures.

Overall, regular follow-up appointments were scheduled to monitor for any recurrence of cavity problems and assess long-term outcomes, ensuring patient satisfaction with the treatment received.

Several recent studies have explored the persistent complications associated with open cavity mastoidectomy and various management techniques. A study by Saleem and Ali (2021) highlights that postoperative complications such as prolonged discharge and vertigo are common, affecting about 31% of patients undergoing the procedure, suggesting a need for meticulous surgical execution to minimize these issues [1]. Similarly, Rajan and James (2019) provide a prospective analysis indicating that improper surgical techniques like inadequate lowering of the facial ridge and meatoplasty stenosis contribute significantly to cavity problems post-mastoidectomy, with an incidence rate of about 26.92% [3].

The study by Han et al. (2022) evaluates the safety and efficacy of using demineralized bone matrix for mastoidoplasty in canal wall down mastoidectomy. The results show no recurrence of cavity problems or complications, marking it as a safe and effective method for reconstructing the external auditory canal and potentially reducing the need for postoperative care [5]. Another comparative study by R et al. (2022) highlights the benefits of using a vascularised periosteo-temporofascial flap for cavity obliteration. This technique significantly reduces discharge and speeds up healing compared to open cavity management [6].

George et al. (2021) study the long-term effectiveness of hydroxyapatite granules for mastoid cavity obliteration, finding substantial improvements in epithelization, hearing status, and cavity size reduction. These findings suggest that cavity obliteration with hydroxyapatite can significantly enhance postoperative recovery and reduce long-term complications [7]. Furthermore, the work of Bongale et al. (2021) shows that the use of fascia and skin grafts can considerably speed up the healing process of mastoid cavities, leading to a faster formation of a dry cavity and improved postoperative outcomes compared to controls without these grafts [8].

Conclusion

The incidence of cavity problems following open cavity mastoidectomy was 20% in the study population. Perioperative factors such as older age, male gender, and comorbidities like diabetes mellitus were significantly associated with an increased risk of cavity problems. Adequate postoperative care and regular follow-up are crucial in preventing and managing cavity problems effectively. Conservative management remains the cornerstone of treatment for most patients, with surgical intervention reserved for refractory cases.

Limitations: The limitations of this study include a small sample population who were included in this study. Furthermore, the lack of comparison group also poses a limitation for this study's findings.

Recommendation: Enhanced patient selection, meticulous surgical planning, and rigorous postoperative care are crucial to minimize complications. Special attention should be given to diabetic patients and the elderly to tailor their care appropriately.

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List of abbreviations:

ENT - Ear, Nose, and Throat

CI - Confidence Interval

OR - Odds Ratio

HRQoL - Health-Related Quality of Life

MRM - Modified Radical Mastoidectomy

DBM - Demineralized Bone Matrix

EAC - External Auditory Canal

HAs - Hearing Aids

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