

## Original Research

# A Comparative Analysis of the Healing Time after Mastoid Radical Mastoidectomy

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### Abstract

**Objectives:** The aim of the study was to contrast the healing times between patients undergoing Modified Radical Mastoidectomy (MRM) with and without mastoid cavity obliteration in Chronic Otitis Media squamous active type. It sought to contribute insights into the efficacy of these surgical approaches for mastoid cavity management.

**Methods:** The study, conducted in the ENT department at MGM Medical College, Jamshedpur, Jharkhand, India over one year, focused on COM squamous active patients aged  $\geq 8$  years. It employed a comparative approach, randomly dividing 30 patients into two groups: Group A (MRM with obliteration) and Group B (only MRM). Surgical procedures involved a post-aural approach, tympanomeatal flap creation, inferiorly based musculofascioperiosteal flap, CWD mastoidectomy, and mastoid cavity obliteration using bone chips and dust, followed by standard wound closure and postoperative care.

**Results:** In this study, the gender distribution revealed 53.3% males and 46.6% females in both obliterated and non-obliterated groups, without statistical significance. Predominantly, the 10-19 age group had 40% non-obliterated and 66.6% obliterated cases. In the 20-29 age group, there were 40% non-obliterated and 20% obliterated cases. The mean duration of healing for Group A was 11.86 weeks, significantly faster than Group B at 13.95 weeks ( $p = 0.005$ ).

**Conclusion:** This study reveals that mastoid obliteration significantly reduced healing time compared to non-obliterated cases in patients with COM squamous active disease. The study underscores the effectiveness of the inferiorly based musculofascioperiosteal flap technique in achieving faster recovery. These findings contribute valuable insights into optimizing surgical approaches for improved outcomes in chronic ear infection cases.

**Keywords:** Chronic otitis media, mastoid obliteration, musculofascioperiosteal flap, healing time

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### Introduction

Chronic otitis media (COM) is a condition which is often seen during the routine practice of Otolaryngologists [1]. This condition results in a persistent abnormality in either the flaccida or pars tensa, often stemming from previous episodes of negative middle ear ventilation, otitis media with effusion, or acute otitis media. A subtype of COM called COM squamous active is characterized by pus generation, flaccid membrane retraction, or keratin debris retention [2]. In many developing countries, COM remains a prevalent ear ailment, with persistent ear discharge and hearing loss being primary complaints, and the squamous type accounting for 3.5% of cases in Nepal [1,3,4]. According to the World Health Organization (WHO), more than 5% of the global population, totalling 360 million individuals, experience disabling hearing loss, comprising 32 million children and 328 million adults [5]. Genetics, allergies, and social, racial, and

environmental elements, are some of the contributors to the aetiology and pathology of otitis media [6]. Long-term ear infection typically arises from prolonged malfunctioning of the Eustachian tube, resulting in impaired middle ear aeration, recurrent episodes of sudden-onset ear inflammation, chronic middle ear infections, or other conditions. The incidence rates of ear infections in developing nations are primarily attributed to factors such as unsanitary conditions, nutritional deficits, overcrowding, and substandard living conditions [7]. While a substantial decrease in COM prevalence has been witnessed due to advancements in hygiene, antimicrobial therapy, and living conditions, challenges such as poverty, adherence to conservative beliefs, and ignorance remain significant predisposing factors, particularly in rural areas of Nepal [8]. Chronic otitis media (COM) is a main contributor to avoidable loss of hearing, particularly in developing nations, impacting the developmental aspects of language,

cognition, and communication in children [9]. The squamosal active subtype is influenced by factors such as deficient Eustachian function, leading to bone resorption and resultant conductive hearing impairment. Given the limited effectiveness of medical treatments, surgical intervention becomes crucial, focusing on eliminating the disease and restoring hearing. Canal wall down (CWD) procedures, notably Modified Radical Mastoidectomy (MRM), are frequently utilized, providing enduring mastoid cavities [10-13]. The ongoing debate about the most efficacious surgical approach persists, with varying long-term outcomes, and a subset of patients may experience persistent issues linked to the mastoid cavity [14,15]. Patients with mastoid cavities often experience recurrent drainage and infections, leading to dissatisfaction and the need for medical follow-up. Additional challenges include water intolerance, infection risk, frequent otomicroscopic cleaning, calorically induced vertigo, barometrically induced vertigo, and difficulties wearing traditional hearing aids [16]. Open cavity issues can be addressed by closing the mastoid cavity during the canal-down technique or in a subsequent session. Mosher's concept of mastoid obliteration aimed at healing defects, later modified by Palva, involves several methods like free autologous and alloplastic grafts or local flaps [17-19]. Mastoid cavity obliteration ensures nutrition and vascularity for the lining but may pose challenges in detecting disease recurrence [20]. In developing countries like Nepal, where patients from rural areas face obstacles in regular follow-ups, mastoid cavity obliteration emerges as a potential solution to address cavity-related problems [8].

In our investigation, we employed bone chips and dust from the healthy mastoid cortex, along with a musculofascioperiosteal graft with inferior base, for mastoid cavity closure across different age groups. The aim of this research was to assess and contrast the healing duration between mastoid cavities that underwent obliteration and those that did not in cases of COM-squamous active type disease.

## Methods

A prospective investigation was carried out at the ENT department of MGM Medical College, Jamshedpur, Jharkhand, India, spanning for 1 year. The study specifically targeted patients aged  $\geq 8$  years, of all genders, who were diagnosed with cholesteatoma disease. For the study cohort, through random division two groups were designated: Group A (MRM with mastoid cavity obliteration) and Group B (MRM without mastoid cavity obliteration), each comprising 30 patients. Exclusions from the study criteria included children under 8 years old, cases with complications

of long-term ear infections, those with diseases such as tuberculosis, and revision MRM. Patients diagnosed with COM squamosal active disease in the outpatient department underwent consultations with faculties, audiometric assessment, regular investigations, and X-rays of mastoid lateral projection and Towne's views before being scheduled for regular MRM using general anesthesia.

**Preoperative Preparation:** Patients were hospitalized one day before the surgery. An intravenous dose of 1 gram ceftriaxone was administered 2-4 hours before the surgery for prophylaxis. Shaving was performed on the day of surgery, and local anesthesia (2% lignocaine with adrenaline) was used for hemostasis at the site of incision and the quadrants of the external auditory canal.

**Surgical Approach and Flap Harvesting:** Both groups underwent a post-aural approach. Group B received classical MRM, while Group A underwent modified surgical steps. A generous tympanomeatal flap was raised through an incision made postaurally. A generous temporalis fascia graft was harvested for ensuring adequacy of flap. An musculofascioperiosteal flap at the lower base was fashioned.

**CWD Mastoidectomy and Reconstruction:** The dorsal canal wall was appropriately lowered without saucerization to eliminate the ear condition. Following complete disease removal, mastoid cavity reconstruction involved sculpturing mastoid cortical bone for the attic as well as the dorsal canal wall. The cavity and spaces were obliterated using collected bone dust, bone chips, and the musculofascial flap which is situated inferiorly. Temporalis fascia contributed to covering these structures and the sealed mastoid cavity. These procedures were followed by standard wound closure, dressings, prescription of medications, and postoperative care.

**Statistical methods:** The data was analyzed using SPSS 23.0 software, employing the independent T test, with a significance level set at  $p < 0.05$ .

## Results

The gender distribution across obliterated and non-obliterated groups consisted of 16 (53.3 %) men and 14 (46.6 %) women, without any statistically significance. The majority of cases belonged to the 10 to 19 age group, with 12 in group B and 20 in group A. In the 20 to 29 age group, there were 12 (40 %) non-obliterated and 6 (20 %) obliterated cases. The lowest frequencies, 2 (6.6 %), were seen in the 40 to 49 age group in both groups (Table 1).

**Table 1: Distribution of patients based on their age groups**

Age range	Group A (n = 30)	Group B (n = 30)	p- value
10 to 19 yrs	20 (66.6 %)	12 (40 %)	0.416

20 to 29 yrs	6 (20 %)	12 (40 %)	
30 to 39 yrs	2 (6.6 %)	4 (13.3 %)	
40 to 49 yrs	2 (6.6 %)	2 (6.6 %)	

The mean period for in Group A was 11.86 weeks, while in the latter group, it was 13.95 weeks. Statistically significant differences were noted in this aspect (p-value = 0.005) (Table 2). When the healing time (weeks) of both the groups were compared, Group A showed quicker healing at 10.67 weeks compared to Group B at 12.47 weeks, with statistical significance (p-value=0.005).

**Table 2: Average healing duration of both the groups post mastoidectomy**

Group	Mean healing period
GroupA(WithObliteration)(n=30)	11.86 weeks
GroupB(WithoutObliteration)(n = 30)	13.95 weeks

## Discussion

The surgical approach to managing COM squamosal active type aims at disease elimination, achieving a dry ear, preventing reinfection, and reconstructing the aural capability. Canal wall up or closed procedures, preserving the posterior meatal wall, offer advantages like a dry ear and improved hearing but may necessitate extensive postoperative follow-up with a greater risk of recurrent or residual cholesteatoma [21]. This poses challenges in underdeveloped countries due to economic constraints, limited education, and inadequate transportation. Conversely, canal wall down (CWD) or open cavity mastoidectomy is another management option, aiming for a safe, dry, and "self-cleaning" ear. But a prominent percentage of infected individuals face challenges such as persisting otorrhea, regular ear toileting, and difficulties in hearing aid device placement [22,23]. Our study, utilizing an inferiorly based musculofascioperiosteal flap, focused on comparing. In this study, patients were randomly assigned to either group A or group B. The patient cohort of the former group underwent Modified Radical Mastoidectomy with mastoid cavity obliteration, while those belonging to the latter group were subjected to MRM alone. A comparable approach was observed in the study by Chhapola S, Matta, where random assignment of patients into 2 groups was carried out, with one group undergoing mastoid obliteration and the other having an open cavity [24]. Likewise, the study conducted by Harun et al had a cohort of 63 patients, with 18 in the open cavity group and the remainder undergoing obliteration [25]. The age range in our investigation was 10 to 49 years for the entire cohort, with the average age being 19.12 yrs in group A and 22.53 yrs in group B. Patients in the age range was 10 to 19 yrs were predominantly affected, and men slightly outnumbered the women in both groups. Yung included patients aged 5-80 years, with the majority of obliterations performed on males [26]. Ramsey had a cohort of 59 individuals lying between 4-84 years of age, evenly distributed between males and females, all undergoing Canal Wall Down (CWD) mastoidectomy and mastoid obliteration for Chronic Otitis Media [27]. All patients in our study achieved healing. The

mean period of healing was 11.86 weeks in group A and 13.95 weeks in group B. Wadhwa used a periosteal-temporofascial flap for mastoid cavity closure in a sample size of 50, comparing the healing rate between the obliteration and non-obliteration groups [28]. The obliteration group showed a faster healing rate, with 84% healing in 8 weeks, compared to 60% healing in 16 weeks in the non-obliteration group. Chhapola S, and Matta found better and early epithelialization in ears where the mastoid cavity was obliterated (90%) contrast to those with an open cavity (70%), with variations in healing outcomes based on the obliteration materials used [24]. In our study, patients were evaluated at three distinct postoperative intervals: days 10-14, 4-6 weeks, and 12 weeks after discharge. A flexible timeframe for the second and third assessments accommodated patients residing at a distance. For those who underwent Modified Radical Mastoidectomy (MRM) with mastoid obliteration, thorough examinations were conducted, with cavity healing defined by the absence of discharge, debris, or infection signs. While Canal Wall Down (CWD) surgery offers a clear view and complete lesion removal, it introduces challenges like cavity issues and hearing aid fitting difficulties. Efforts to reconstruct the dorsal canal wall and obliterate the mastoid cavity aim to address these challenges. Studies on lifestyle post-mastoid obliteration highlight enhanced self-confidence and reduced inconvenience. Despite our study's emphasis on short-term healing rates, concerns about buried residual disease necessitate long-term patient follow-up.

## Limitations

This study was constrained by its relatively small sample cohort, warranting caution in generalizing findings. Additionally, the focus on short-term outcomes may not capture the complete picture of long-term efficacy and potential challenges.

## Conclusion

The current study focussing on the comparing the healing time following MRM with or without closure of the mastoid cavity underscores utilization of inferiorly based musculofascioperiosteal flap for mastoid obliteration demonstrated favorable short-

term healing, addressing concerns related to open cavity problems. The approach holds promise for achieving a dry ear in COM squamosal active type cases. Long-term follow-up is crucial for comprehensive assessment and to monitor potential residual disease. These findings suggest the potential efficacy of mastoid obliteration in improving outcomes for this patient population.

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