

Original Research Article

Surgical and audiological outcome of canal wall down mastoidectomy in Sub Himalayan region: our experience

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ABSTRACT

Background: Pre-operative and post-operative hearing status and status of mastoid cavity were compared in patients undergoing canal wall down mastoidectomy (CWDM) with tympanoplasty.

Methods: Forty-three patients who underwent surgery and completed their follow up post-surgery were included in the study. Nineteen patients underwent CWDM with type III tympanoplasty with PORP, 7 patients underwent CWDM with type III tympanoplasty without PORP and 17 patients underwent CWDM with type IV tympanoplasty with TORP.

Results: Among enrolled patients, 21 patients were females and 22 patients were male. Right ear (29) was commonly involved than left ear (14). Hearing loss was predominant symptom followed by recurrent ear discharge and other symptoms. Patients underwent three types of surgeries, type III tympanoplasty with PORP (19/43), type III tympanoplasty without PORP (7/43) and type IV tympanoplasty with TORP (17/43) by using Teflon prosthesis.

Conclusions: Thirty seven percent (16/43) of patients had hearing threshold <25 dB post-surgery with maximum improvement in group A 47% (9/19). Forty seven percent (20/43) patients had hearing threshold between 26-40 dB with maximum improvement in group B 43% (3/7). Twelve percent (5/43) patients had hearing threshold between 41-60dB with almost equal improvement in all three groups. Five percent (2/43) of patients had >60dB hearing threshold, all belonging to group C. Anatomical results were assessed by examining the mastoid cavity showing 95%, 72%, 70% patients in group A, B and C had well epithelialized cavity.

Keywords: Chronic otitis media, Canal wall down mastoidectomy, Tympanoplasty

INTRODUCTION

Chronic active otitis media, squamosal variety (cholesteatoma) is a disease characterized by chronic inflammation of middle ear and mastoid air cells. Patients usually presents with chronic or recurrent ear discharge which may be of foul smelling and hearing loss. Rarely patients may present with signs and symptoms of either impending or apparent intracranial or extracranial complications. Examination reveals either retraction pocket with or without keratin debris or frank

cholesteatoma with minimal or extensive bone erosions. The management of cholesteatoma continues to be a big challenge of the otologists around the world. Even in developed countries with best health care facilities, there is a considerable burden of cholesteatoma and related complications in children and adults. Diagnosis of cholesteatoma is made by otologists on the basis of thorough clinical history, otomicroscopy, otoendoscopy, imaging techniques including computerized tomography (HRCT temporal bone) and magnetic resonance imaging and audiometry.¹ Despite of its common prevalence

throughout the world, there is still a considerable debate regarding its definition, classification and management. To achieve this, a recent discussion among the members of European Academy of Otolaryngology and Neuro-otology and consensus was achieved on the definition but not on the classification of cholesteatoma.² Cholesteatoma is managed mainly by surgical methods, canal wall down mastoidectomy (CWDM) and intact canal wall mastoidectomy (ICWM). CWDM is an established surgical technique in the management of cholesteatoma.³ Number of modifications has been introduced in CWDM in order to overcome some of its drawbacks while maintaining its best outcome. The commonest and well-established indications of CWDM are recurrent cholesteatoma, extensive attic cholesteatoma, pediatric cholesteatoma cases and extensive labyrinthine fistula.⁴ Advantages of CWDM are complete or near complete removal of the disease, easy visualization of the entire middle ear cleft, less formation of the new retraction pockets, early detection of recurrence of disease and improved post-surgical outcome.⁵

Although the expectations of hearing gain in post-surgery period is minimal but with the application of successful tympanoplasty or ossiculoplasty or partial or total ossicular replacement prosthesis (PORP/TORP) enables the hearing mechanism reconstruction and improved hearing status. TORP is a suitable option in cases of absent stapes superstructure where as PORP can be used in cases with intact stapes superstructure.⁶

We did CWDM with tympanoplasty in all cholesteatoma cases with partial obliteration of the mastoid cavity. The purpose of this study is to evaluate hearing outcome (functional results) and the status of final mastoid cavity in all CWDM cases operated in our institution.

METHODS

A prospective study conducted at Mahatma Gandhi Medical Services Complex Khaneri, Rampur located in Sub Himalayan region from October 2014 to April 2017 to evaluate the outcome in patients undergoing CWDM with tympanoplasty in advanced cholesteatoma ears. The present study enrolled 43 patients who completed follow up post operatively over a period from 4months to 2.5 years post-surgery.

Inclusion criteria

Chronic otitis media (COM) with advanced cholesteatoma.

Exclusion criteria

- COM mucosal type,
- COM with intra cranial complications,
- Otitis media with effusion (OME),
- Chronic discharging ear without cholesteatoma
- Malignancy of external and middle ear.

After the fulfillment of the inclusion and exclusion criteria, every patient underwent thorough history, general physical examination, otomicroscopy, otoendoscopy and HRCT temporal bones (Figure 1).

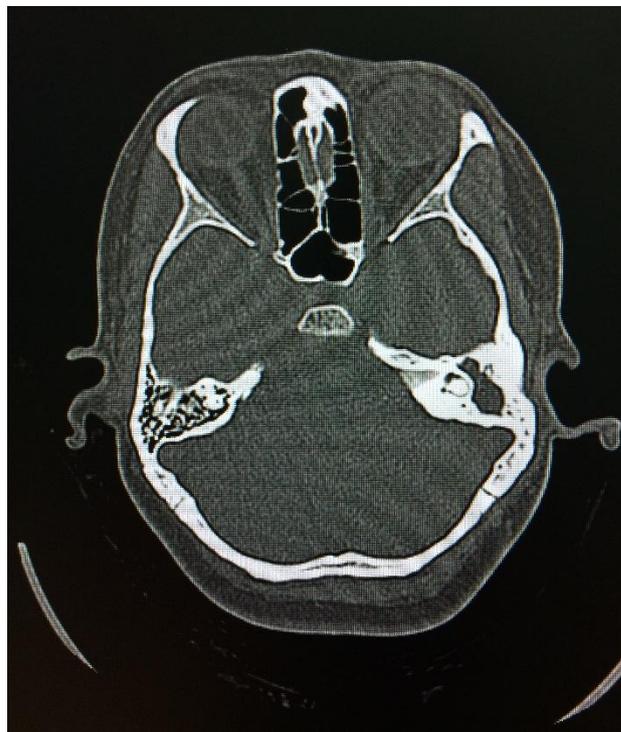


Figure 1: CT temporal bone axial section showing soft tissue density epitympanum(Cholesteatoma).

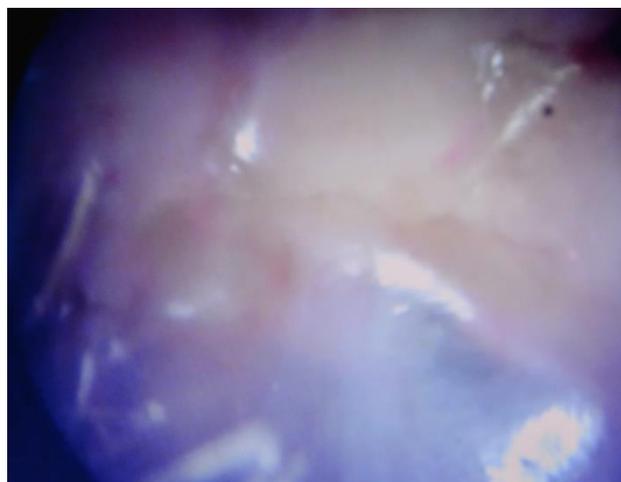


Figure 2: Well epithelised post mastoidectomy cavity.

Every patient underwent pre-operative audiometry and based on audiometry results, hearing threshold was calculated and divided into four groups <25dB, 26-40dB, 41-60dB and >60dB. On otomicroscopy/otoendoscopy, pre-operative status of ossicular chain for reconstruction purpose (presence or absence of stapes superstructure) was documented. Patients were subjected to routine investigations including blood test, electrocardiogram,

chest X ray and pre- anesthesia check-up for the complete wellbeing of the patients. Patients were divided into three groups based on the types of surgeries performed (group A: Type III tympanoplasty with PORP, group B: Type III tympanoplasty without PORP and group C: Type IV tympanoplasty with TORP). The extent of disease, fallopian canal or lateral semicircular canal involvement, ossicular chain status, type of tympanoplasty done, intra or post-operative complication if any and finally the status of mastoid cavity (at 4 months post op) of each and every patient was documented. We did our cases either under local or general anaesthesia depending upon the preference of the patients and operating surgeon. Graft material used for ossicular reconstruction was Teflon PORP/TORP and conchal cartilage with attached perichondrium for prosthesis stabilization. In all our cases, we used classical posterior to anterior approach with 360-degree tympanomeatal flap preservation for the local support as well as providing nutrition to the graft and rapid epithelialization of the mastoid cavity. We used large sized (3cm diameter) temporalis fascia graft for complete resurfacing of the mastoid cavity.

Any irregularities of mastoid cavity were filled with bits of conchal cartilages with attached perichondrium so as to make the cavity small and smooth surfaced. Appropriate sized meatoplasty was performed to allow easy view of mastoid cavity post operatively. No pack was kept in the mastoid cavity as we used ofloxacin and steroid drops impregnated gelfoams to fill entire mastoid cavity and external auditory canal. Patients were subjected for post-operative follow up at 1st week, 1st, 2nd and 4th month. Post-operative evaluation of hearing status was done with pure tone audiometry (500, 1000, 2000 and 3000 Hz) at 4-6 months post-surgery. Status of mastoid cavity was assessed in terms of well epithelialized or discharging cavity, any residual perforations and residual disease (Figure 2).

RESULTS

Forty-three eligible patients (who completed the entire follow up in post-operative period) were included in the present study including 22 males and 21 female patients. Twenty-nine patients have right side involvement and 14 had left ear involvement (Table 1).

Table 1: Demographic data.

	Male	Female	Total	Site of disease		Recurrent ear discharge	Hearing loss	Other complaints (earache, ear bleeding, tinnitus)
				Right	Left			
17-25 years	5	3	8	6	2	7	8	5
26-35 years	8	14	22	16	6	20	22	9
36-45 years	9	4	13	7	6	13	13	3

Table 2: Results (audiological).

Group (No)	Type of tympanoplasty with CWDM	Pre op hearing (dB)				Post op hearing (dB)			
		<25	26-40	41-60	>60	<25	26-40	41-60	>60
A (19)	Type III tympanoplasty with PORP	0 (0%)	7 (37%)	11 (58%)	1 (5%)	9 (47%)	8 (42%)	2 (11%)	0 (0%)
B (7)	Type III tympanoplasty without PORP	0 (0%)	2 (29%)	4 (57%)	1 (14%)	3 (43%)	3 (43%)	1 (14%)	0 (0%)
C (17)	Type IV tympanoplasty with TORP	0(0%)	5 (29%)	8 (47%)	4 (24%)	4 (24%)	9 (53%)	2 (12%)	2 (12%)

Hearing loss was predominant symptom in 100% (43/43) patients followed by recurrent or chronic discharge in 93% (40/43) patients. Other complaints including ear bleeding, earache, vertigo and tinnitus were present in significant number of patients 40% (17/43). All patients were having advanced cholesteatoma involving attic, adiatum and mastoid antrum. Polypoidal mucosal tissue along with cholesteatoma was present in 25% (11/43) patients involving attic, mesotympanum and antrum. Facial nerve and lateral semicircular canal and posterior canal wall were dehiscant in 5/43, 2/43 and 4/43 patients respectively. Patients underwent three types of surgeries, type III tympanoplasty with PORP (19/43), type III

tympanoplasty without PORP (7/43) and type IV tympanoplasty with TORP (17/43) by using Teflon prosthesis. Post-operative audiological assessment was performed 4-6 months following surgery. Thirty seven percent (16/43) of patients had hearing threshold <25 dB post-surgery with maximum improvement in group A 47% (9/19). Forty seven percent (20/43) patients had hearing threshold between 26-40 dB with maximum improvement in group B 43% (3/7). Twelve percent (5/43) patients had hearing threshold between 41-60dB with almost equal improvement in all three groups. Five percent (2/43) of patients had >60dB hearing threshold, all belonging to group C (Table 2). Anatomical results

were assessed by examining the mastoid cavity showing 95%, 72%, 70% patients in group A, B and C had well epithelialized cavity (Table 3). One patient in group B and 2 patients in group C had residual cholesteatoma

while none in group A. Well epithelialized mastoid cavity with residual perforation was present in 5% (1/19), 14% (1/7), 18% (3/17) patients in group A, B and C patients respectively (Table 4).

Table 3: Results (anatomical).

Group (No)	Type of tympanoplasty with CWDM	Status of mastoid cavity (post-operatively)		
		Well epithelialized	Discharging	Well epithelialized with residual perforation
A (19)	Type III tympanoplasty with PORP	18 (95%)	0 (0%)	1 (5%)
B (7)	Type III tympanoplasty without PORP	5(72%)	1 (14%)	1 (14%)
C (17)	Type IV tympanoplasty with TORP	12 (70%)	2 (12%)	3 (18%)

Table 4: Complications.

Group (No)	Type of tympanoplasty	Residual cholesteatoma	Implant extrusion	Residual perforation	Temporary facial nerve paralysis
A (19)	Type III tympanoplasty with PORP	0	0	1	0
B (7)	Type III tympanoplasty without PORP	1	-	1	0
C (17)	Type IV tympanoplasty with TORP	2	2	3	1

DISCUSSION

CWDM is a safe and effective surgical procedure when performed by the experienced hands. This procedure is commonly performed for COM squamosal type of ear disease and is preferred procedure in current otological practice. Initially, patients undergoing this procedure had little or no hope of hearing gain but with the development of modern techniques of ossiculoplasties or tympanoplasties, a new hope of hearing has developed.⁷ Most commonly used technique of ossiculoplasty involves interposition of reshaped body of incus between stapes superstructure and malleus in cases with necrosis of incus. Most common ossicular defects in order of frequency are necrosis of long process of incus, loss of incus with stapes superstructure and loss of all ossicles except stapes foot plate.⁴ In our study, stapes superstructure and isolated stapes foot plate were present in 26 and 17 patients respectively. To achieve optimum results, augmentation ossiculoplasty with CWDM is performed in single stage which involves increasing the height of superstructure stapes or stapes foot plate to the level of fallopian canal or above the canal. This technique is performed with the help of reshaped head of malleus or body of incus placed over stapes superstructure. In cases with absence of above bones either PORP or piece of conchal cartilage with attached perichondrium may be used for augmentation. We used teflon PORP (n=19) and conchal cartilage with attached perichondrium in our study of advanced cholesteatoma. In cases with absent stapes superstructure, we used teflon TORP (n=17) placed on stapes foot plate and conchal cartilage sandwiched between TORP medially and temporal fascia laterally. Prosthesis is placed in the centre of the cartilage

and this cartilage provides stability to the prosthesis and contributes to better hearing gain. The prosthesis used in ossiculoplasty is synthetic and biocompatible.

In our study, the hearing threshold was <25 dB in 37% (16/43) of the patients with CWDM with tympanoplasty with maximum in Type III tympanoplasty with PORP (47%) and least in type IV tympanoplasty with TORP (24%). Most of the patients (46.5%) were having hearing threshold between 26-40dB.

The incidence of residual or recurrent disease is between 5-71% and depends upon several factors including type of cholesteatoma, age of patient, length of follow up and most important factor is surgical technique and the experience of the surgeon.⁸ In our study, 7% (3/43) patients had residual cholesteatoma in anterior epitympanum, sinus tympani and sinodural angle.

Imaging of the temporal bone (HRCT) is a routine pre-operative work up in COM, squamosal ears. The cardinal features on CT scan are nodular tissular mass with surrounding area of oateolysis. Mass is usually homogenous non- enhancing, non-calcified tissue like density. Extension of the disease is another important factor determined of CT scan.⁹

CONCLUSION

Canal wall down mastoidectomy when performed by an experienced hand yields best results in terms of dry well epithelialized cavity. Further, the audiological results can be improved by using TORP/PORP. Partial obliteration of the mastoid cavity should be performed in each and

every patient. At last, the role of 360-degree tympanomeatal flap is very important for the rapid epithelialization of the mastoid cavity.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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