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# A PROSPECTIVE STUDY OF HEARING OUTCOME IN CANAL WALL DOWN MASTOIDECTOMY WITH TYMPANOPLASTY

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## Abstract

**Introduction:** Tympanoplasty with a mastoidectomy that preserves the bony external auditory canal is referred to as closed technique or integrated approach tympanoplasty. Sheehy and Janson first introduced this method as a way to enhance the traditional mastoidectomy. This dual approach aims to preserve the bone external auditory canal while eradicating infected foci. When compared to a traditional mastoidectomy, this technique avoids leaving the mastoid cavity exposed and does not necessitate routine cleaning of the operative cavity of dry scabs.

**Materials and methods:** This study is a prospective study conducted on 66 patients at the department of ENT, KPM Hospital, Kanpur, UP, between January 2022 to December 2022. Patients who were enrolled into the study were thoroughly examined. A complete ENT examination was performed. The involved ear was examined using an ear endoscope and microscope and the findings were recorded. A pure tone audiometry was performed, pure tone thresholds and air bone gap (ABG) in the speech frequencies was determined.

**Results:** 33 patients were enrolled into the study. There were 19 males and 14 females with a male to female ratio of 1.35:1. The age ranged from 7 years to 48 years with a mean age of 23, 25 years. Thirty patients underwent canal wall down mastoidectomy with type 3 tympanoplasty. Canal wall down mastoidectomy with tympanoplasty using homograft septal spur cartilage as long columella was done in 36 patients. The hearing results were as follows. The preoperative mean air bone gap was 38.10 dB and the post-operative mean air bone gap was 29.30 dB with a gain of 8.8 dB.

**Conclusion:** Canal wall down mastoidectomy with tympanoplasty is a good surgical procedure for chronic otitis media with cholesteatoma. A modest closure of the air bone gap can be expected helping the patient to achieve acceptable social hearing levels.

**Key Words:** Tympanoplasty, mastoidectomy, endoscope, audiometry.

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## INTRODUCTION

Tympanoplasty with a mastoidectomy that preserves the bony external auditory canal is referred to as closed technique or integrated approach tympanoplasty. Sheehy and Janson first introduced this method as a way to enhance the traditional mastoidectomy.[1] This dual approach aims to preserve the bone external auditory canal while eradicating infected foci. When compared to a traditional mastoidectomy, this technique avoids leaving the mastoid cavity exposed and does not necessitate routine cleaning of the operative cavity of dry scabs. By wearing hearing aids or participating in water sports, patients' hearing can still be kept in good condition. This approach so better satisfies the requirements of pathophysiology.[2]

Tympanoplasty is a difficult operation with variable results. Patients who have undergone a tympanoplasty must be diligently followed up to validate hearing improvement. Patients with tympanoplasty failure should be carefully examined for causes which should be addressed during a revision procedure.[3]

Chronic Suppurative Otitis Media (CSOM) is clinically characterized as an inflammatory condition associated with otorrhoea and tympanic membrane perforation in some cases. The disease course is more than 3 months in duration and histopathologically it is associated with irreversible tissue changes and significant hearing loss.[4] It is characterized by epithelial accumulation with keratin production in the middle ear. Atticoantral disease erodes the bone, destroys the ossicles and has the potential to cause life-threatening complications. Cholesteatoma is classified as congenital or acquired and is further categorized as primary or secondary cholesteatoma. The incidence of CSOM is higher in less developed countries.[5]

However, due to the significant demands on surgical technique and equipment as well as the wrong selection of indications that may result in a high recurrence risk, some otologists prefer open surgery to this approach.

## AIM OF THE STUDY

To compare the pre-operative versus post-operative hearing status in patients undergoing canal wall down mastoidectomy with tympanoplasty.

## MATERIALS AND METHODS

This study is a prospective study conducted on 66 patients at the department of ENT, KPM Hospital, Kanpur, UP, between January 2022 to December 2022.

**Inclusion Criteria:** Patients with chronic otitis media with cholesteatoma involving the middle ear and mastoid who will require a canal wall down mastoidectomy with tympanoplasty.

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**Exclusion Criteria:**

- Patients with residual or recurrent cholesteatoma.
- Patients with a history of trauma to the ear or temporal bone.
- Patients with complications of otitis media.

Patients who were enrolled into the study were thoroughly examined. A complete ENT examination was performed. The involved ear was examined using an ear endoscope and microscope and the findings were recorded. A pure tone audiometry was performed, pure tone thresholds and air bone gap (ABG) in the speech frequencies was determined. 'A canal wall down mastoidectomy with tympanoplasty was performed, cholesteatoma in the middle ear and mastoid was excised. The ossicular chain was inspected and reconstruction was performed depending on the status of the ossicular chain. If the stapes suprastructure was intact, a type 3 tympanoplasty was performed. The temporalis fascia graft was placed on the stapes head and the tympanomeatal flap was replaced over the temporalis fascia graft.

When the stapes arch was destroyed by disease, a long columella ossiculoplasty was done. Homograft septal spur cartilage was sculptured as a long columella (Fig. 2) placed on the stapes footplate and stabilized by gelfoam.(4) The temporalis fascia graft was then placed on the lateral end of the columella.

Gelfoam impregnated with antibiotic ear drops were placed over the fascia graft and the mastoid cavity was packed with ribbon gauze smeared in antibiotic ointment. Post operatively the pack in the ear was removed after two weeks and standard dry ear precautions were advised. Antibiotic ear drops were instilled for three weeks after pack removal. A pure tone audiometry was done six months after surgery in all patients when the ear had completely healed. Post-operative air bone gap in the speech frequencies were recorded. All the above data was recorded in a predesigned proforma and analysed.

**RESULTS**

33 patients were enrolled into the study. There were 19 males and 14 females with a male to female ratio of 1.35:1. The age ranged from 7 years to 48 years with a mean age of 23, 25 years. Thirty patients underwent canal wall down mastoidectomy with type 3 tympanoplasty. Canal wall down mastoidectomy with tympanoplasty using homograft septal spur cartilage as long columella was done in 36 patients.

| S.No | Gender | N (%) |
|---|---|---|
| 1 | Male | 19 (57.57) |
| 2 | Female | 14 (42.42) |

**Table 1: Gender distribution**

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| S.No | Preoperative and postoperative mean air bone gap | mean air bone gap |
|---|---|---|
| 1 | Preoperative mean air bone gap (in dB) | 38.1 |
| 2 | Post operative mean air bone gap (in dB) | 29.3 |

**Table 2: Preoperative and postoperative mean air bone gap**

The hearing results were as follows. The preoperative mean air bone gap was 38.10 dB and the post-operative mean air bone gap was 29.30 dB with a gain of 8.8 dB.

## DISCUSSION

Tympanoplasty hence involves repair of the tympanic membrane defect and reconstruction of the damaged ossicular chain. Connective tissue like vein, temporalis fascia, tragal perichondrium and sliced tragal cartilage have been used for closing tympanic membrane perforations.[6] Temporalis fascia is the most popular graft material used by otologists. The fascia is placed medial to the tympanic membrane remnant which is called the underlay technique. Cholesteatoma of the middle ear will destroy the ossicular chain in most patients. Material like Autologous ossicles/cartilage, Homograft ossicles/cartilage, biomaterials like High density polyethylene sponge, hydroxylapatite, glass ionomer cement, and titanium have been used to reconstruct the damaged ossicular chain.[7]

Austin in a landmark paper classified ossicular defects depending upon the presence/absence of the malleus handle and stapes superstructure into four types. Type A (M+ S+), Type B (M+, S-), Type C (M -, S+) and Type D (M -, S-). In types A and C when the stapes superstructure is present the partial ossicular replacement prosthesis (PORP) is placed between the stapes head and tympanic membrane.[8] In a type B and D situation when only the stapes foot plate is present, a total ossicular replacement prosthesis (TORP) is placed between the foot plate and tympanic membrane. After a tympanoplasty is preformed and the ear is healed, patients must be evaluated clinically to determine graft take. Pure tone audiometry must be done and air bone gap closure after surgery must be estimated.[9]

In our study the pre-operative mean air bone gap was 38. 10 dB, post-operative mean air bone gap was 29.30 dB with a gain of 8.8 dB. Shrestha in 2008 performed a similar study. The pre-operative mean air bone gap was 37.8 dB and post-operative mean air bone gap was 29.8 dB with again of 8 dB. The results of our study are similar to the study conducted by Shrestha. Kabdwals study performed recently in 2014 showed near similar results. The preoperative mean air bone gap was 35.63 dB, post-operative mean air bone gap was 29. 54 dB with an air bone gap closure of 6.09 dB.[10]

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## CONCLUSION

Canal wall down mastoidectomy with tympanoplasty is a good surgical procedure for chronic otitis media with cholesteatoma. A modest closure of the air bone gap can be expected helping the patient to achieve acceptable social hearing levels.

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