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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. 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.

Materials and methods: This study is a prospective study conducted on 132 patients at the department of ENT, Rangaraya Medical College, Kakinada, between January 2023 and October 2023. Patients with chronic otitis media with cholesteatoma involving the middle ear and mastoid who will require a canal wall down mastoidectomy with tympanoplasty were included. 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: 132 patients were enrolled into the study. There were 76 males and 56 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 72 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, chronic otitis media, pure tone thresholds and air bone gap.

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.[1] 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]

Aim of the study is 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 132 patients at the department of ENT, Rangaraya Medical College, Kakinada, between January 2023 and October 2023.

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.

Exclusion Criteria:

1. Patients with residual or recurrent cholesteatoma.
2. Patients with a history of trauma to the ear or temporal bone.
3. 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 placed on the stapes footplate and stabilized by gelfoam. 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

132 patients were enrolled into the study. There were 76 males and 56 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 72 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.

S.No	Gender	N (%)
1	Male	76 (57%)
2	Female	56 (43%)

Table 1: Gender distribution

S.No	Parameter	Mean
1	Pre operative mean air gap	38.1
2	Post operative mean air gap	29.3

Table 2: Preoperative and postoperative mean air bone gap

DISCUSSION

Otologists in the early part of the twentieth century were pre occupied in treating aural suppuration and complications caused by it. Surgical correction of deafness was not a priority in those days. The scenario slowly changed when Nylen in 1921 discovered the monoocular operative microscope. A year later in 1922, Holmgren invented the binocular operating microscope. This major technological advancement led to good visualization of the middle ear and mastoid structures enabling surgeons to define the anatomy better.[6]

The discovery of Penicillin by Alexander Fleming in 1928 and Sulfonamides by Domagk in 1932 and their use in the treatment of middle ear infections and its complications led to a drastic fall in the incidence of complications. Surgeons could now direct their attention towards the treatment of hearing loss due to chronic ear disease.[7] Wullsteinan Zollner of Germany in 1953 described the tympanoplasty operation for the treatment of chronic otitis media. Tympanoplasty can be defined as a procedure to eradicate disease in the middle ear and to reconstruct the hearing mechanism with or without tympanic membrane grafting.[8]

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. 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.[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]

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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