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Case Series

Effectiveness and complications of ossiculoplasty in a tertiary care hospital of North East India

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ABSTRACT

Chronic otitis media is the leading acquired cause of hearing impairment which may be due to ossicular erosion. Restoration of ossicular chain continuity using autografts and allografts along with tympanoplasty can improve some degree of hearing with limited complications. Institution based prospective study was done on 20 patients diagnosed with chronic otitis media and history of trauma enrolled in the department of ENT and head and neck surgery, GMCH-Guwahati from July 2023-June 2024 to analyse the effectiveness and complications of ossiculoplasty using various autografts and allografts. After 3 months A-B gap was reduced in all the patients who were included in the post- operative follow- up but no significant difference could be elicited in the effectiveness of autografts and allografts. Extrusion of TORP was noted in 1 patient; 1 patient's graft uptake was not complete which concludes that ossiculoplasty improves the hearing and the risk benefit ratio of complications and quality of life is favourable.

Keywords: Ossiculoplasty, Chronic otitis media, Facial nerve palsy, A-B gap

INTRODUCTION

The ear is the primary organ of hearing in humans. It is divided into external ear, middle ear and inner ear. The three ossicles in the middle ear-malleus, incus and stapes are the conductive apparatus. They transmit sound energy from the tympanic membrane to the inner ear fluid.[1] Ossicular chain abnormality which can be discontinuity or fixation cause conductive hearing loss which may be congenital or acquired. The most common congenital cause is the fixation of stapes footplate while the most frequently acquired etiology is chronic otitis media. The most widely used classification of ossicular chain defects is the Austin Kartush system.[2] The middle ear risk index can be used to estimate likelihood of a successful ossiculoplasty.[3] There are many materials which can be used for ossicular chain reconstruction categorised into autografts, homografts and allografts. Autografts are tissues like ossicles, cortical bone and cartilage harvested from the patient itself. They are biocompatible but they can implant residual disease. Homografts are derived from donor tissue so it can reduce the operative hours but if not adequately sterilised they have the potential to transmit diseases like CJD.[4] Allograft was first used in 1950s and now there are various varieties like hydroxyapatite, plastipore, titanium, platinum, steel and teflon. They provide flexibility as they come in different shapes and sizes and also, they do not result in foreign body reactions. Incus is most commonly affected because of presence of tortuous arteries and absence of collateral branches but sometimes malleus and stapes are also involved for which partial ossicular replacement prosthesis or total ossicular replacement prosthesis are used. Detailed history including but not limited to ears only; with microscopic ear examination and relevant investigations like tuning fork tests, pure tone audiometry and HRCT mastoid are necessary for pre- operative assessment of patients planned for ossiculoplasty so as not to minimise incidental intra- operative findings with a post- operative review after 3 months. In this study we

will focus on improvement in hearing and post operative complications after ossiculoplasty.

CASE SERIES

It was an institution based prospective study done in the department of ENT and head and neck surgery, GMCH-Guwahati. Ethical approval from the institutional ethics committee was taken before the start of the study. The data was collected from July 2023-June 2024. When patients presented to the OPD with complaints of ear ache, ear discharge and reduced hearing or history of trauma; they were thoroughly examined followed by appropriate investigations i. e., Audiometry to find out the degree of hearing loss, HRCT mastoid to look for mastoid involvement, examination under microscopy to visualise the tympanic membrane and preliminary tuning fork tests. Total 20 patients were enrolled in this study and those with congenital ossicular deformity were excluded before the start of the study; out of which 11 were males and 9 were females. The mean age was 25 years. The 19 patients were suffering from chronic otitis media (14 cases of squamosal variety and 5 cases of mucosal type) and only 1 had a history of trauma with pre-op grade 4 facial nerve palsy. The 16 patients had unilateral ear involvement while both ears were affected in 4 patients. Canal wall down mastoidectomy was done in 15 patients and intact canal wall mastoidectomy was done in 5 patients. Synthetic allografts like TORP used in 9 patients and PORP was used in 1 patient Autografts like tragal cartilage was used in 7 patients and conchal cartilage was used in 3 patients. Extrusion of TORP was noted in 1 patient and graft uptake was incomplete in 1 patient; both were excluded from analysis. All 18 patients (100%) had reduction in post-op A-B gap when compared with pre- operative A-B gap. Facial nerve palsy of the patient with history of road traffic accident improved from grade 4 to 1. Intra-op biopsy was taken from the squamosal variety patients which turned out to be cholesteatoma. Improvement in hearing of 9 patients with autografts and 9 patients with allograft was compared. Group A (Autografts) had improvement in mean AC from 44.6 dB to 28.8 dB after 3 months and group B (Allografts) had improvement in mean AC from 45.4 dB to 29.2 dB after 3 months. MS excel was used to tabulate data which was interpreted to determine the significance.

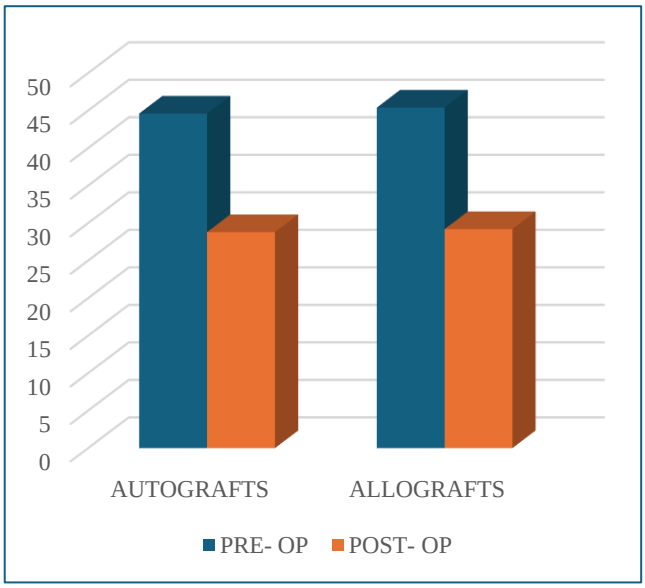

Figure 1: Autografts versus allografts.

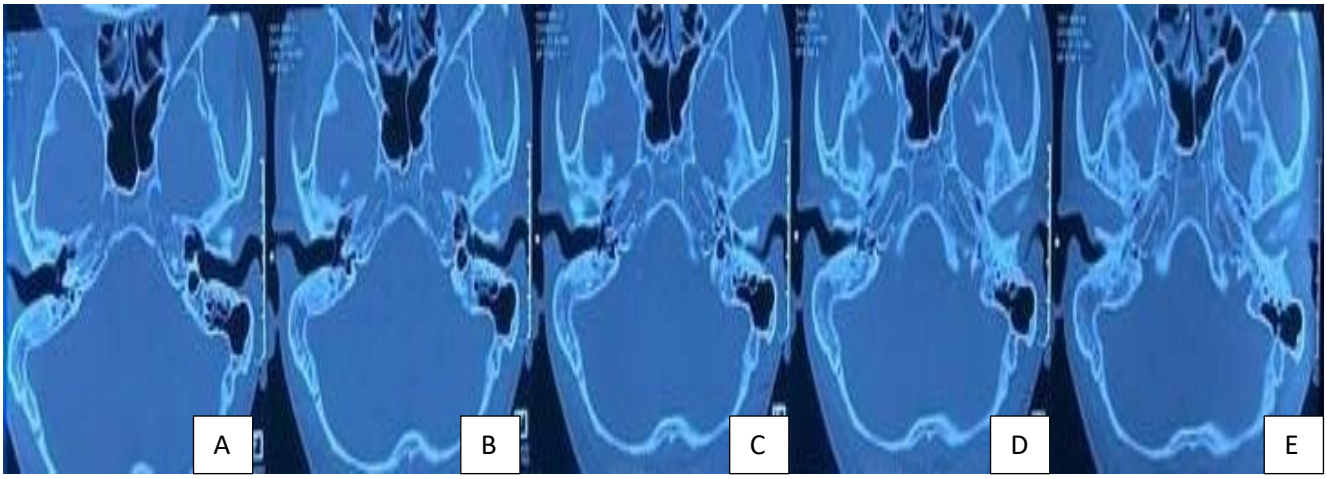

Figure 2 (A-E): Pre-operative HRCT mastoid.

Table 1: Distribution of enrolled subjects.

Total patients	Age (in years)	Male	Female	COM	Trauma	CWD mastoidectomy	ICW mastoidectomy
20	25	11	9	19	1	15	5

Table 2: Comparison of autografts versus allografts.

Variables	Total patients	Complications	Follow-up patients	Pre-op AC (dB)	Post-op AC (dB)
Autografts	10	1	9	44.6	28.8
Allografts	10	1	9	45.4	29.2

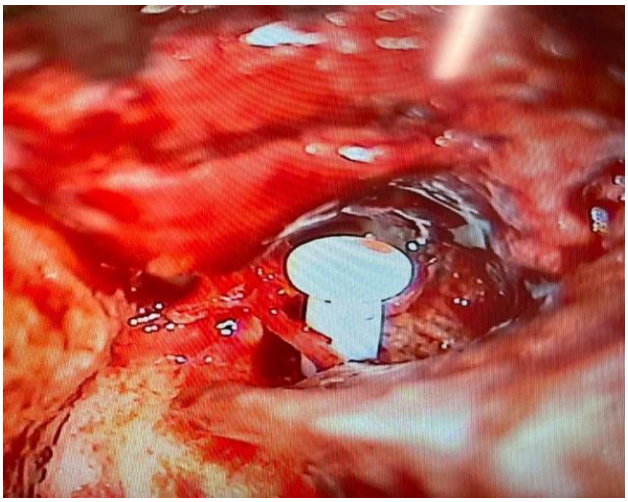

Figure 3: Intra-operative TORP placement.

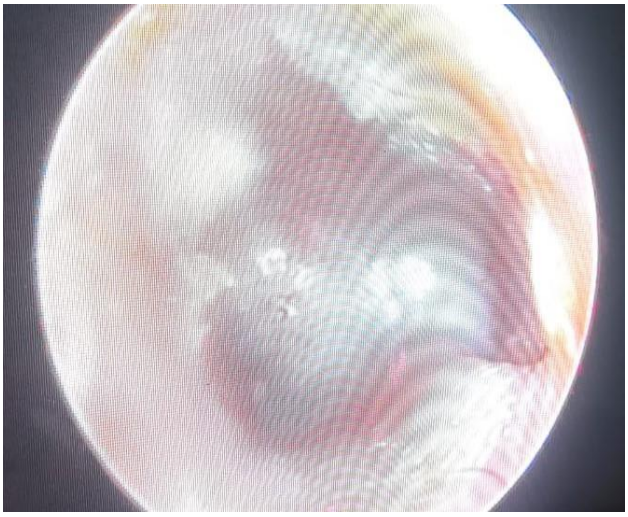

Figure 4: Post-operative examination under microscopy.

DISCUSSION

Chronic otitis media is the leading cause of hearing impairment. Sometimes the temporal bone can be fractured after a road traffic accident leading to facial nerve palsy. In every case the main aim is to restore the hearing as much as possible. Tympanoplasty includes removal of disease from the middle ear and reconstruction of tympanic membrane which can be combined with ossiculoplasty to maintain the ossicular chain continuity for better hearing. The ossicular reconstruction with autograft ossicles was done by Hall and Ryztner in 1957.[5] In 1965 Guilford did incus repositioning to limit the gap between ossicles.[6] In 1989 Yung came up with hydroxyapatite prosthesis which could be used for ossicular reconstruction.[7] Weiss et al stated that TORP and PORP gave similar post-operative outcomes.[8] Malhotra attempted umbrella graft ossiculoplasty and 77.3% patients had improved hearing.[9] Chaudhary et al determined that myringostapediopexy had marginally better hearing outcome than interposition ossiculoplasty.[10] Singh et al evaluated the post-operative results after type 3 tympanoplasty using cartilage ossiculoplasty and 100% cases had positive outcomes.[11] Lamba et al did a study using various graft materials for ossiculoplasty and concluded that the graft uptake and hearing gain of autografts when compared to allografts were found to be statistically insignificant.[12] Singh et al analysed the outcomes of ossiculoplasty using autografts and allografts; 72% autograft cases and 84% allograft cases had improved hearing following surgery.[13] Sharma et al observed that the success of ossiculoplasty in terms of hearing outcome using modified incus was 76.66% and with Teflon prosthesis was 70.00%.[14] In this study mastoidectomy with tympanoplasty and ossiculoplasty using various graft materials were done in 20 patients. Post-auricular approach was executed in all the cases and the in- patient stay was uneventful in every case. Granulations was found in 14 cases and cholesteatoma was removed in 10 cases. The patients were called for routine check-up after 3 months of surgery for repeat PTA in which we evaluated the A-B gap and EUM and SC in which we analysed the graft uptake. Extrusion of TORP was noted in 1 case and 1 case had incomplete graft uptake; both will be taken up for re- do surgery. The rest 18 patients were equally divided between those who had autografts and those with allografts. There was significant increase in hearing ability in 100% of the cases. Group A (Autografts) had improved mean AC from 44.6 dB to 28.8 dB and group B (Allografts) had better mean AC from 45.4 dB to 29.2 dB. Also, pre- operative grade 4 facial nerve Palsy reduced to grade 1 facial nerve palsy post-operatively. Even though the decrease in A-B gap after 3 month was convincing but there was not significant difference in the post-operative results when compared between autografts and allografts as the difference in A-B gap was only 0.4 dB between them. There are several studies done in the past to evaluate the effectiveness and complications of ossiculoplasty; but this study is one of the first to be done in a tertiary care hospital of North East India. Further prospective study

with larger sample size and longer follow up will be required to strengthen the findings.

CONCLUSION

Chronic otitis media affects the hearing sooner than later and with the widespread usage of antibiotics the disease can be controlled but the hearing cannot be improved if the ossicular chain integrity is still not restored. This disease affects both genders but it is generally found in rural areas. Autografts and allografts had similar results but keeping in mind the cost factor; autografts seem to be the ideal choice for low-income patients and both graft materials seem to have negligible complication so they can provide a better quality of life.

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Ethical approval: Not required

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