

A Retrospective study on the Outcome of the Endoscopic type I tympanoplasty in Rapti Academy of Health Sciences

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Abstract

Introduction: Chronic otitis media is the infection of middle ear cleft for a prolonged period of 12 weeks. Chronic otitis media mucosal type is associated with central tympanic membrane perforation which can be treated with tympanoplasty. Tympanoplasty can be done by post aural microscopic or endoscopic permeal approach. The endoscope provides excellent magnification view of corners of ear. Endoscopic type I tympanoplasty is use of rigid endoscopes in surgical repair of tympanic membrane perforation. The purpose of this study was to evaluate the graft uptake and hearing results in patients who had undergone type I endoscopic tympanoplasty in Rapti Academy of Health Sciences.

Methods: This is a retrospective study in which patients who had undergone endoscopic type I tympanoplasty between 1st October 2021 to 30th September 2023 were included. The assessment of hearing outcome was done by comparing the pre and post-operative air bone gap and air bone gap closure in pure tone audiogram. The graft uptake was assessed by otoscopic examination in post-operative period follow up upto 12th weeks.

Results: The graft uptake was present in 97(92.3%) out of 105 cases. There was residual perforation in 8 (7.2%) cases. The average preoperative air bone gap was 38.9±.05 decibel while average postoperative air bone gap was 28.8±8.6 decibel. The air bone gap closure was 10 ±0.4 decibel after the surgery.

Conclusion: Endoscopic type I tympanoplasty is minimally invasive procedure with good graft uptake rate resulting in improvement in hearing.

Keywords: Chronic otitis media, Endoscopic tympanoplasty, Graft uptake rate

Introduction

A stage of ear disease known as chronic otitis media is characterized by a persistent infection of the middle ear cleft with a non-intact tympanic membrane and discharge for at least the two weeks prior.¹ Perforation in the tympanic membrane is deemed to be chronic if present for three months.² Chronic otitis media is commonly of two types which are Tubotympanic or mucosal type and atticotympanic or squamosal type. These condition leads to hearing loss and recurrent ear discharge. The prevalence of this condition in developing countries like ours is

7.2%.³ The chronic otitis media tubotympanic type can be surgically treated by tympanoplasty.

Tympanoplasty is one of the commonly used surgical technique for the treatment of chronic otitis media mucosal type. It involves the eradication of the disease in the middle ear, repair of perforated tympanic membrane and restoration of hearing.⁴ The various approaches for this procedure are endaural, transcanal and postauricular. Conventional microscopic ear surgery (MES) using a postauricular approach remains the most common tympanoplasty technique.⁵ But, microscope technique

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demands a large surgical incision which leads to big scar mark and more pain and discomfort to the patient. The other method for the procedure is endoscopic ear surgery.

The first endoscopic ear surgery was reported in 1990s.⁶ It became popular thereafter because of the smaller incisions and greater optical magnification.⁶ Transcanal endoscopic ear surgery (TEES) permits wide angle vision at a high resolution while enabling magnification of the structures of the middle ear as well as the direct visualization of hidden areas, such as hypotympanum, sinus tympani, epitympanum and posterior part of mesotympanum.⁵ The endoscope also allows a transcanal encompassing view of the three main elements in tympanoplasty surgery: the ear canal, tympanic membrane and the tympanic ring even in the presence of an anterior overhang.⁷ This also helps surgeon to gain a wide angle close up view of the operating field. It has been established that endoscopes make a positive difference in surgery of the ear, but the difference is not yet enough for the endoscope to gain worldwide popularity.⁸ There is limited studies in developing countries like Nepal regarding the outcome of endoscopic tympanoplasty.

The primary objective of our study is to assess the graft success rate and auditory outcomes following endoscopic type I tympanoplasty.

Methods

This is a retrospective study in which patients who had undergone endoscopic type I tympanoplasty between 1st October 2021 to 30th September 2023 were included. The data of all patients who had undergone endoscopic type I tympanoplasty during that period fulfilling the inclusion criterias were included in the study. Inclusion criterias were all chronic otitis media mucosal type, chronic otitis media mucosal type inactive or dry for a month, conductive type of hearing loss of air bone gap of 40 dB or less. The exclusion criterias were chronic otitis media squamous type, ossicular chain fixation, ossicular chain dislocation, revision tympanoplasty. Ethical approval was taken from the Institutional Review Committee of Rapti Academy of Health Sciences. (Proposal ID: 004:2024)

Tympanoplasty was done under Local anesthesia in patients over 15 years of age and under general anesthesia below 15 years of age. The surgeries were performed by two different surgeons. Pre and post operatively pure tone audiometry were performed using diagnostic audiometer proton Dx Arphi.

The patient was given a mixture of 25mg of pethidine and 25mg of promethazine hydrochloride via intramuscular route. Four quadrant canal wall block was used in all cases by infiltrating 10ml of 2% lignocaine with adrenaline. The tragal perichondrium and cartilage graft was harvested

by giving 1-2 cm vertical incision from incisura terminalis to lower end of tragal cartilage.(figure 1) The graft was prepared. The site was then closed with Prolene 3-0 cutting body suture. The rigid Karl Storz 4mm internal diameter 0 degree endoscope was used for the surgery. Initially, proper wash of the canal wall and middle ear was done by warm saline followed by freshening of the margins of perforation by straight needle.(figure 3) Then, the ossicular chain status was checked by ball probe. Then, gelfoam was placed in the middle ear cavity followed by placement of cartilage- perichondrium composite graft. (figure 4) Gelfoam packing of external auditory canal was done. Then, ribbon gauge packing of the canal was done followed by dressing of the wound.

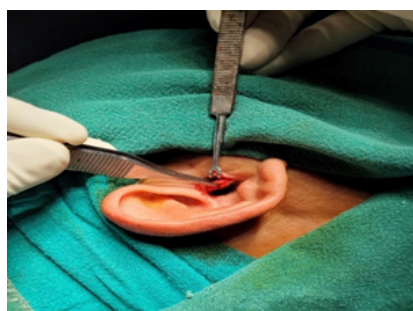


Figure 1: Harvesting of graft

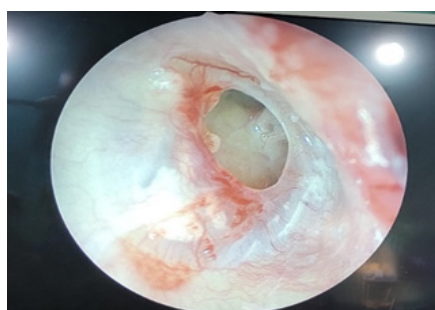


Figure 2: Central perforation of left ear



Figure 3: Margins freshening

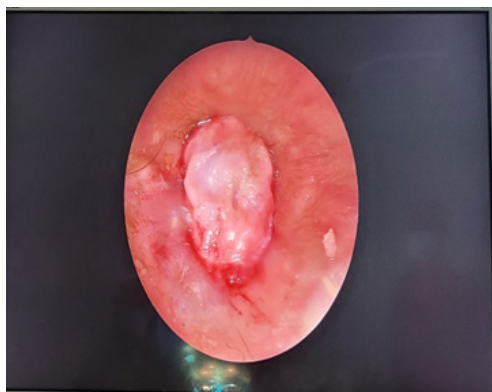


Figure 4: Placement of graft

Patient was kept overnight with intravenous ceftriaxone and discharged next day under oral antibiotics. On the second postoperative day, dressing was done and on the 6th postoperative day, suture out and pack out was done. Then, the patient was given oral antihistaminics and local antibiotic ear drop (ciprofloxacin) for one month. The patient was called for follow up on monthly basis for 12 weeks. On 12th week, pure tone audiometry was done. The results of the hearing and graft uptake were observed in the 12th week.

Results

Among the 105 patients, 52 (49.5%) were male, while 53 (50.4%) were female. The patients had an average age of 35.6 years, ranging from 15 to 66 years.

Most patients had medium central perforation which was 66 (62.8%) followed by small perforation which was 26 (24.7%). (figure 5) 13 (12.38%) had large perforation. (figure 6)



Figure 5: Medium central perforation of right ear



Figure 6: Large central perforation

The average preoperative Air Bone Gap was 38.9 ± 9.05 decibel (dB) while average postoperative Air bone gap was 28.8 ± 8.6 dB. The Air bone gap closure was 10 ± 0.4 dB after the surgery.

The graft uptake was present in 97 (92.3%). (figure 7) There was residual perforation in 8 cases. (figure 8) 2 (1.9%) cases had perichondritis postoperatively. However, the other complications like wound infection and facial nerve palsy were not seen.



Figure 7: Graft uptake



Figure 8: Residual perforation

Discussion

The use of endoscopes in ear surgery emerged in 1990s.⁹ Transcanal endoscopic ear surgery (TEES) is the operation

of ear where otoendoscopes are used to surgically treat the diseases. In 1992, Professor Ahmed El-Guindy was first of all to describe about the endoscopic ear surgery (EES).¹⁰ Dr. Muaaz Tarabichi has a significant contribution in the globalization of EES and he is recognized as the father of endoscopic ear surgery.⁽¹¹⁾ EES has been recently practised by many ENT surgeons in Nepal. Dhulikhel hospital had pioneered the use of endoscope in ear surgery in Nepal beginning from 2012 AD.¹² Before that, ear surgery was solely done with aid of microscopes. The advantages of TEES are detailed visualization of corners and narrow spaces, better magnification, less invasive compared to open techniques and less time consuming. However, the drawbacks are one hand technique, risk of mechanical and thermal trauma, absence of stereoscopic view, frequent fogging of the surgical field and long learning curve.

Among various endoscopic ear surgeries, Endoscopic tympanoplasty is the commonly performed surgery. Tympanoplasty is the surgical procedure performed to repair a perforated TM, with or without reconstruction of the ossicles (ossiculoplasty), aiming to prevent reinfection and restore hearing ability.¹³ Wullstein has classified tympanoplasty into five types.¹³ Type I tympanoplasty is defined as repair of tympanic membrane alone in cases where there is no middle ear abnormality. Myringoplasty is synonymous with Type I tympanoplasty.¹³ Endoscopic type I tympanoplasty is use of rigid endoscopes to repair the tympanic membrane perforation.

A study by Pradhan R.K, et al showed the age range of 8 to 60 years with average of 25.87 $\pm$ 10 years which was in contrast to our study with average of 35.6 years.¹⁴ In study by Lakpati et al, the outcome of endoscopic versus microscopic approach myringoplasty in 60 patients with age range of 15-55 years was compared which was similar to our study.¹⁵ In our study, young people was majority of patients undergoing surgery which might be due to health consciousness nature of young people compared to older age groups. Comparatively, young individuals are convinced easily for surgery as impact of hearing loss experienced by young people is more than older ones. Usually older individuals has co morbidities due to which they are less likely interested in any elective surgery.

Our study showed graft uptake rate of 92.3% with Air bone gap closure of 10.1 db. This result is similar to study by Gokgoz MC et al which showed graft uptake rate of 94% at 6 months post operative period.¹⁶ A study by Dhungana et al showed graft uptake rate of 91.4% in endoscopic group similar to our results.¹⁷ It showed mean air bone gain of 12.6 db similar to ours.¹⁷ The graft uptake rate of 95% was shown in study by Pradhan et al and ABG improvement was 13.7 $\pm$ 4.9db.¹⁴ Shrestha et al showed graft uptake of 93.3 %.¹⁸ This study showed mean preoperative and post

operative ABG on 12th month followup were 27.3 $\pm$ 12.5 db and 17.1 $\pm$ 8.5db respectively which was statistically significant.¹⁸

A study by Cho et al showed graft uptake rate of 87% with ABG improvement from 17.8 db before surgery to 9.8db at 6 months after surgery which is similar to our results.¹⁹

Shakya et al reported rate of graft uptake of 97.6%.²⁰ In this study, the preoperative air conduction threshold (ACT) was 43.4 $\pm$ 11.53 and air bone gap (ABG) was 24.7 $\pm$ 7.89. Post operatively, the ACT and ABG closure was 28.7 $\pm$ 15.7 and 11.9 $\pm$ 8.41 respectively.²⁰ The comparative study by Kawale M et al showed graft uptake rate of 80% in endoscopic tympanoplasty and 78% in microscopic tympanoplasty.²¹ Hence, endoscopic tympanoplasty provide similar results to that of microscopic tympanoplasty.

Our study showed graft failure rate of 7.6%. The failure might be due to large size of perforation, variation of technique by different surgeons and patient factors. This technique do not involve elevation of tympanomeatal flap which might decrease in proper support and vascularity of the graft postoperatively which might contribute to graft failure. Choi et al indicated that the success rate decreased for large tympanic membrane perforations due to the restricted visibility of the anterior tympanic membrane.²²

None of the patients had facial nerve palsy and severe damage to inner ear. But 2 patients had presented with perichondritis. One was managed conservatively by intravenous antibiotics while other one had undergone debridement. Perichondritis is the infection of aural cartilage. It results due to trauma, insect bite and following surgery. Perichondritis following endoscopic tympanoplasty is extremely rare. But, if it occurs, it is challenging to treat. In study by C.C. Tseng et al, 8 patients had postoperative auricular perichondritis after endaural approach tympanoplasty among 101 cases.²³ 5 patients had surgical excision of infected auricular cartilage under general or local anesthesia. In our study, 1 patient had undergone debridement and excision of necrosed conchal cartilage. The cause might be due to iatrogenic needle trauma to cartilage while infiltrating local anesthesia followed by infection at pricked site.

The retrospective nature of this study is one of the limitations. A long follow up period of six months would have been better for evaluation of outcome. Since more than one surgeon is involved in the procedure which might lead to difference in outcome depending on the variation in surgical techniques.

Conclusion

Endoscopic tympanoplasty is safe and less invasive procedure. It offers good graft uptake rate and significant

postoperative hearing improvement with better cosmesis. However, endoscopic tympanoplasty comes with a long learning curve which can be overcome with frequent hands on training. It might lead to fogging of surgical field and thermal injury.

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