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Transcanal endoscopic management of epitympanic cholesteatoma: a promising technique

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ABSTRACT

Background: The objective of the study was to evaluate the role of functional endoscopic ear surgery in epitympanic cholesteatoma removal.
Methods: This study included 15 cases of epitympanic cholesteatoma who underwent exclusive endoscopic surgeries for cholesteatoma removal in a tertiary care centre between December 2017 to May 2018. The improvement in hearing threshold and air bone closure was evaluated comparing the preoperative and postoperative audiogram. The incidence of recurrence and reperforation was noted postoperatively using otoendoscopy.
Results: Post-surgery improvement in hearing threshold was observed. There was no incidence of recurrence and reperforation during the mean follow up period of 7.8 months.
Conclusions: Endoscopic removal of epitympanic cholesteatoma is more natural way of removal of disease with less post-surgery morbidity and recurrence. It has potential to be a promising tool for treatment of epitympanic cholesteatoma in future.

Keywords: Cholesteatoma, Endoscopic ear surgery, Recurrence

INTRODUCTION

The concept of functional endoscopic ear surgery is based on 3 basic principles:

- Use of external auditory canal as natural conduit to tympanum
- Restore normal middle ear cavity and mastoid ventilation routes
- Preservation of normal anatomy by minimising dissection of soft tissue and bone for route of exposure.

Cholesteatoma of middle ear space represents the ideal condition to demonstrate the strength of functional endoscopic ear surgery. Cholesteatoma is usually subdivided into congenital and acquired form. The congenital form is seen in paediatric group and the most common site of occurrence is anterosuperior quadrant of mesotympanum. It can be directly visualized in front of handle of malleus and anterior tympani tendon using endoscopes and can be removed using inferior based flap with minimum or no bone drilling. Under microscopic examination; these areas are difficult to access.[1]

Acquired cholesteatoma most commonly arises in Prussac's space, the attic or mesotympanum. In all these situations, the disease as it spreads from its origin tends to migrate into subspaces of middle ear including difficult to visualize regions. Endoscope allows us direct visualization from origin to the end point and complete removal of cholesteotoma with minimal drilling.

Moreover visual access to retrotympanum, protympanum and lateral epitympanum is difficult using microscope.[2] Using endoscopes all the spaces and subspaces of middle ear can be completely visualized with the exception of deep type C sinus tympani and type A sub cochlear recess, allowing the surgeon complete disease removal.

Moreover, performing endoscopic surgery for epitympanic cholesteatoma allows the surgeon to check the epitympanic diaphragm and tensor fold.[3,4] It has been postulated that this surgical technique might improve the ventilation of epitympanic space and help in preventing recurrent cholesteatoma. Ventilation of the epitympanic space may also be improved by removal of mucosal folds and granulation tissue from the tympanic isthmus.[3]

In India we come across large number of number of cases where cholesteatoma is located in middle ear cavity and can be removed using transcanal endoscopic approach. This study tries to evaluate the efficacy of functional endoscopic ear surgery in epitympanic cholesteatoma removal.

METHODS

We studied the medical records of 15 cases that were diagnosed as epitympanic cholesteatoma and has undergone primary cholesteatoma surgery between December 2017 to May 2018 at Shri Guru Ram Rai Institute of Medical and Health Sciences, Dehradun. Those who needed mastoidectomy were excluded from the study.

Diagnosis was made using otoendoscopy and HRCT temporal bone. All subjects underwent pure tone audiogram pre and postoperatively. Postoperative hearing improvement was analyzed according to the reporting guidelines of American Academy of Otolaryngology-Head and Neck Surgery.[5] All patients were followed up for at least six month to evaluate their hearing level and to observe them for cholesteatoma recurrence.

All surgeries were done under GA. 2% xylocaine and adrenaline infiltration of external auditory canal, temporalis and tragal area using 26 gauze needle was done. A cotton wick containing adrenaline was kept in the external auditory canal. Incision in skin of medial wall of tragus is made 2 mm below the tip with 15 number knives under microscope. A pair of small pointed scissor was use to separate soft tissue from medial surface of tragal cartilage. Tragal perichondrial-cartilage composite graft was harvested. Incision was closed using 4-0 vicryl. Temporalis fascia graft was also harvested for grafting material. Tympanomeatal flap was elevated 5 to 7 mm lateral to annulus making an incision beginning from anterior wall of external auditory canal at the level of anterior malleolar fold, extending on superior and posterior meatal wall. In some cases incision was almost 270 degrees. The tympanomeatal flap was parked in the antroinferior part of external auditory canal. The bone was curetted and drilled. A protective cover was used on hand piece to protect cartilaginous portion of external auditory canal from injuries.

With utmost care and direct visualization using 0 and 45 degree wide angle 4mm endoscopes cholesteatoma was dissected out completely using curved blunt micro needle and Thomassin dissectors. The tensor tympani, anterior isthmus, posterior isthmus, retro tympanum and anterior epitympanic spaces were inspected. Osscicular chain reconstructed using refashioned incus, PORP and TORP if required. A piece of tragal composite graft was used for attic reconstruction. The tympanic membrane defect was reconstructed using perichondrial or temporalis fascia graft using underlay technique. Tympanomeatal flap was reposited back. Gel foam impregnated with topical antibiotic and wick was kept in external auditory canal.

Audiological evaluation

Pure tone audiometry was done preoperatively and compared to audiogram taken in 3rd postoperative month. Pure tone average was calculated using frequencies 500, 1000, 2000 and 4000 Hz. The Air bone gap was calculated preoperatively and in 3rd postoperative month. The air bone closure was calculated using pure tone audiogram obtained in 3rd postoperative month.

Otoendoscopic evaluation

All subjects underwent otoendoscopy at the end of 1 month, 3rd month and 6th month to inspect neotympanum and especially to see for recurrence of cholesteotoma.

Statistical analysis

Statistical analysis was done using graph pad analysis software.

RESULTS

Demographic data

The age of patients in this study was between 9 yrs to 38 yrs with mean age of 25 yrs (SD ±9.8). The male to female ratio was 9:6. In 10 cases the osscicular chain was intact 10/15 (66%) and in 5 destructed 5/15 (33.3%).

Audio logical outcome

The mean preoperative and postoperative air conduction threshold (ACT) was 32.8 db (SD ±15.9) and 24.04 db (SD ±8.5) respectively. The p value (t test) was >0.05 which is statistically insignificant. The mean preoperative air bone gap (ABG) was 15.9db (SD ±11.7) and the post-operative air bone gap (ABG) was 10.2 db (SD ±7.4). The p value (t test) was >0.05 which is statistically insignificant (Table 1).

Table 1: Audiological outcome.

	Preoperative mean (SD) in db	Postoperative mean (SD) in db	P value using t test
ACT*	32.8 (SD ±15.9)	24.04 (SD ±8.5)	>0.05 (insignificant)
ABG#	15.9 (SD ±11.7)	10.2 (SD ±7.4)	>0.05 (insignificant)

*ACT= air conduction threshold; #ABG= air bone gap.

Follow up period and otoendoscopic findings

The mean follow up period was between 6 months to 11 months with mean follow up period of 7.8 months. None of the subjects had recurrence on otoendoscopy during follow up period.

DISCUSSION

At present we have two standard techniques of cholesteatoma removal, canal wall down and canal wall up mastoidectomy. In canal wall down mastoidectomy although rate of recurrence is low but it is often difficult to visualize sinus tympani even after removal of posterior bony canal wall using microscope.[6] More over other than cosmesis due to large meatoplasty it also needs routine cleaning of mastoid cavity. The disadvantage of canal wall up mastoidectomy is high rate of recurrence and residual disease. So many otologists advocate second look surgery months to year after primary surgery.[7,8] Both these techniques need external incision for exposure as it is almost impossible to clear the disease using endomeatal approach due to tortusity of external auditory canal.

Functional endoscopic ear surgery is gaining remarkable attention all over the world. In our opinion important reasons behind it are patients wish for scar less surgery and minimum postoperative morbidity. This has become possible due to revolutionary use of optics in endoscopes with high definition video cameras. This gives wide surgical field with better visualization of middle ear structures in comparison to microscopes. This also gives surgeons greater confidence to eradicate pathology with much ease under direct vision.

Based on endoscopic visualization of middle ear ventilation pathways, it has been hypothesized that selective dysventilation of the epitympanum may be a mechanism for development of epitympanic cholesteatoma. The cause of this selective dysventilation has been postulated as blocked tympanic isthmus due to congenital or acquired mucosal folds or granulation tissues. According to new hypothesis, retraction of pars tensa of the tympanic membrane and atelectesis of Prussak's space are two distinct independent phenomena leading to cholesteotoma.[9]

It will be more physiological to use endoscopes to correct epitympanic blockage which are often not easily visualized using operating microscope. Use of endoscopes also reduces chances of injury to vital structures like facial nerve, lateral semicircular canal, osscicular chain etc. because of better visualization and less bone work. In addition it will also reduce risk of sensorineural hearing loss due to drilling.

In this study the mean follow up period was 7.8 months with no recurrence and reperforation. It is similar to study done by Tarabichi et al.[10] In which 73 cases of epitympanic cholesteotoma were operated using exclusive endoscopic technique. He reported 5 recurrent cholesteotoma and 8 recurrent perforations or osscicular chain defects. This may be due long mean follow up period of 43 months.

Migirov et al reported results similar to this study using exclusive endoscopic technique with mean follow up period of 1 year.[11]

CONCLUSION

Transcanal endoscopic removal of epitympanic cholesteotoma seems to be more physiological and functional in comparison to microscopic approach. It also reduces postoperative morbidity due to less bone work and avoiding large meatoplasty. In first look it seems it has definite advantage because of low rate of recurrence due to better visualization of hidden areas and more visual control of ventilation pathways. This study emphasizes need for more studies on management of epitympanic cholesteatoma using endoscopes with long follow up period for definitive results. At present it looks to be a promising tool for management of cholesteatoma.

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