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ENDOSCOPIC TRANSCANAL MYRINGOPLASTY: EXPERIENCE IN TU TEACHING HOSPITAL

ABSTRACT

Objective:

The objective of the study was to assess the graft uptake and the postoperative hearing results of endoscope assisted myringoplasty performed in the department of ENT and Head & Neck Surgery, Ganesh Man Singh Memorial Academy of ENT and Head & Neck Studies, TUTH.

Methodology:

Patients of age 15 years and above who had undergone endoscopic myringoplasty from August 2013 to May 2016 were included. Pure tone audiometry done within 1 week prior to operation was taken. Endoscope assisted myringoplasty was performed. Graft uptake and hearing results were assessed after 6 weeks. Total closure of the perforation was taken as successful uptake and the hearing was assessed using improvement in Air Conduction threshold (AC threshold) and Air Bone gap (AB gap).

Results:

Total of seventy-six patients were analysed for graft uptake and hearing improvement. 53.9% were males and 46.1% were females. The graft uptake rate was 88.2% in endoscopic assisted myringoplasty at minimum of 6 weeks follow up. The mean pre and postoperative air conduction threshold was 37.45±8.82dB and 23.34±6.74dB. The mean pre and postoperative air bone gap were 26.95±7.98dB and 11.84±6.24dB. The difference between the pre and postoperative values obtained was highly significant ($p<0.001$).

Conclusion:

The graft uptake rate was 88.2%. The AC threshold and AB gap improvement was highly significant and comparable to other studies in the literatures.

Keywords: Air conduction threshold, Bone conduction threshold, Endoscopic myringoplasty, Pure tone audiogram (PTA)

INTRODUCTION

Myringoplasty is one of the commonest surgery done in Otology with the aim of closing the perforation in the pars tensa and improve the auditory thresholds.[1,2] Among the various approaches of myringoplasty like permeatal, postaural and endaural approaches; permeatal myringoplasty has advantages over other approaches in certain aspects. It has less operative time and minimal need of bigger external incision.[2,3] When myringoplasty is performed with the aid of a surgical microscope, the permeatal approach depends on a width of external auditory canal, change in the angle of the microscope for proper visualization of all margins of the tympanic perforation and good visualization of the ossicular chain as well.[3] Conventional myringoplasty with postaural incision, with or without canal wall drilling, is the approach of choice for cases of unfavorable external auditory canal (EAC) in transcanal approaches using microscope.[4]

Myringoplasty has since come a long way and was previously done using microscope only. But nowadays endoscopes are also being used for various middle ear surgeries. Initially it was started with otoendoscopy to visualize the middle ear structures only but now this has been increasingly used for various middle ear surgeries as well. Middle ear endoscopy was first introduced by Mer et al in 1967, mainly for diagnostic purposes only.[5] However, due to poor resolution, the endoscopic ear surgery didn't gain much popularity. But, with the recent advancement of the resolutions in the endoscope, it is being increasingly used in middle ear surgeries.

Using the endoscopes for middle ear surgeries has many distinct advantages.[6] The endoscopic middle ear surgeries have the advantages as better quality of image, easy evaluation of the middle ear structures avoiding unnecessary drilling of the posterosuperior canal wall, better documentation etc. It also allows better visualization of medial wall of the middle ear cavity, small recesses, through narrow spaces, without the need for canalplasty, even in cases of unfavorable EAC.[7,8,9] But there are disadvantages like a longer learning curve, one handed technique, less depth perception, decreased binocular vision, fogging of the lens and absence of 3D view.

The endoscopic middle ear surgery is done using Hopkin's rod rigid endoscope under visualization in the monitor. The 1.7mm, 2.7mm and 4mm endoscopes with 0^0, 30^0, 45^0, 70^0 and 90^0 are used for the endoscopic ear surgery. Endoscopes of 4mm provide better resolution than the smaller ones but the narrow external auditory canal may limit its usefulness in some cases. Once the expertise is gained the approach has the advantage in dealing with the need of postaural approach in narrow EAC cases, better. It also has the advantage of easy transportation and handling in a country like Nepal where lots of peripheral camps are being conducted as well.

The present study aims at assessing the graft uptake rate and the hearing status postoperatively in a tertiary care centre where myringoplasty is one of the commonest ear surgery done. This is one of the preliminary study about the endoscopic myringoplasty in the department and thus looks into the learning curve of the surgeons as well.

METHODOLOGY

The prospective, interventional study was conducted in the department of ENT and Head & Neck surgery, Ganesh Man Singh Memorial Academy (GMSMA) of ENT and Head & Neck Studies, Tribhuvan University Teaching hospital. The study was conducted from August 2013 to May 2016. The patients above fifteen years of age and with dry central perforation needing myringoplasty were included. Revision surgery, wet ears and patients with sensorineural hearing loss were excluded from the study. Sample size was determined by convenience.

The patients meeting the inclusion criteria were evaluated by the consultant in the outpatient's department and planned for myringoplasty. Preoperative audiogram done within one week was included and recorded. The audiogram was done in a sound treated room by trained and experienced audiologists. Hugan and Westlake technique was used for the audiometric evaluation and performed with 5dB intensity interval. Air conduction included 250, 500, 1000, 2000, 3000, 4000 and 8000 Hz and bone conduction included 250, 500, 1000, 2000, 3000 and 4000 Hz. Average was calculated from 500, 1000, 2000, 3000 and 4000 Hz frequencies.

All the surgeries were done under sedation (25mg Promethazine and 50mg Pethidine) given around 30-45 minutes prior to surgery. Local anesthetic blockage using 2% Xylocaine with 1:200000 adrenaline with maximum of 7mg/kg was injected in the graft site and in four quadrants of the external auditory canal. Hopkin's zero degree, 4mm sized rigid endoscope (Karl Storz) with high definition video system was used for the surgery. Most of the surgical steps were done using 0° endoscope and 30° endoscope was used to visualize the ossicular chain.[10] The surgery was performed under the visualization of the monitor, one hand holding the endoscope and the other hand for the instruments. The temporalis fascia graft was harvested through a 2.5cm incision around an inch superior to the attachment of the pinna. All the cases were done by permeatal approach. The endoscope was slowly passed along the external auditory canal without causing local trauma. The margins of the perforation were made raw and the undersurface was freshened. The tympanomeatal flap was elevated from 12 to 6 o'clock position medially, annulus was raised and the middle ear was visualized. 30° angled telescope was used in cases where the ossicular chain was not visualized using the 0° endoscope. No drilling of the canal wall was required to visualize the ossicles. The mobility of the ossicular chain was assessed. Gelatin sponge was placed in the middle ear and then the temporal fascia graft was kept under the remnant tympanic membrane and the handle of malleus by Underlay technique. Then the tympanomeatal flap is repositioned back. Gel foam and BIPP was kept in the external auditory canal. Mastoid bandage was applied. Postoperative antibiotics was given for ten days and the pack was removed in seven days.

The patient was followed up after 6 weeks to assess the graft uptake and the hearing evaluation. Pure tone audiogram was done to assess the postoperative hearing status. The total graft uptake was taken as the successful graft take up and even a pin point perforation was taken as failure. Regarding the hearing assessment the air conduction and bone conduction were calculated by averaging the hearing thresholds at the frequencies 0.5, 1, 2, 3 and 4 kHz. The

air-bone gap was calculated as the difference between the preoperative bone conduction and the postoperative air conduction thresholds. The main outcome measures were assessed by the postoperative air bone gap and the postoperative air conduction average. The paired sample t-test was used to compare the differences in means. P value <0.05 was considered statistically significant.

RESULTS

A total of seventy-nine patients were taken for the study and three cases were lost to follow up thus seventy six patients were finally analysed for the graft uptake and hearing assessment after endoscopic myringoplasty. There were 41 (53.9%) males and 35 (46.1%) females (Fig.I). Right side surgery was done in 44 (57.9%) and left sided in 32 (42.1%) patients.

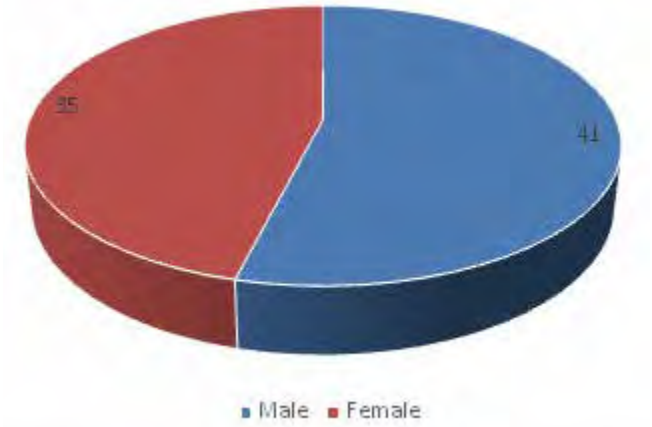

Fig. I: Gender distribution (n=76)

All the surgeries were done under local anesthesia and thus the minimal age limit of the patient was fifteen years. The maximum number of patients were in age group of 15-30 years (67.1%) followed by patients in the age group of 31-45 years (26.3%) of age and then above 45 years (6.6%) (Fig. II).

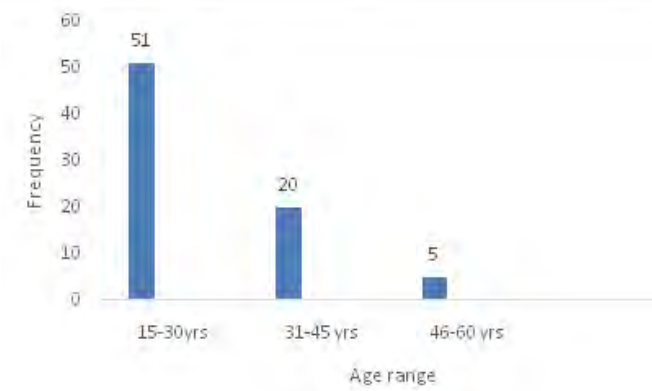

Fig. II: Age distribution of the patients (n=76)

The average duration of the surgery time was 80 minutes from the start of local anesthetic injection till the time mastoid dressing was done. During the surgery, the ossicular status of the patients were noted and the mobility was checked. The posterior superior canal wall was curetted if the ossicles were not visualized. The ossicular mobility status was reported as normal, fixed, restricted or dislocated. There were 65 (85.6%) patients with normal ossicular mobility, 3 (3.9%) patients with fixed ossicular chain, 5 (6.6%) patients with restricted mobility and 3 (3.9%) patients with dislocated ossicular chain (Fig. III).

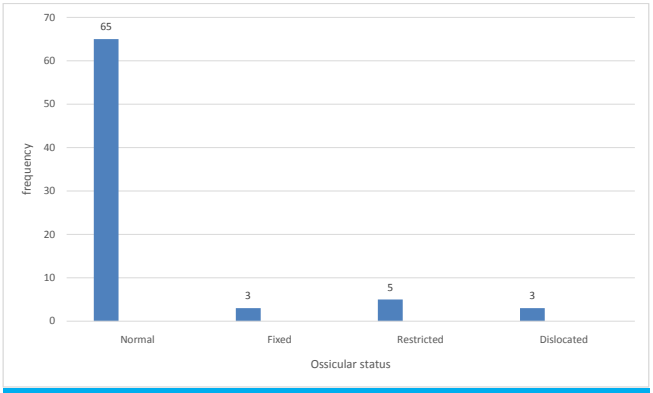

Fig. III: Peroperative status of the ossicular chain (n=76)

After a minimum period of six weeks when the patients were followed up for graft uptake, sixty-seven (88.2%) of them had graft uptake (Fig. IV). Nine remaining patients (11.8%) had residual perforation ranging from pinpoint perforation to large residual perforations.

Fig. IV: Postoperative graft Status (n=76)

The postoperative hearing was assessed in sixty-five patients who had intact and mobile ossicular chain. The hearing was assessed by measuring the change in the Air Conduction threshold and Air Bone gap pre and postoperatively. There was improvement in both the AB gap and the AC threshold improvement (Table 1).

Table 1: Pre & Postoperative hearing evaluation (n=65)

	Mean (dB)	Std. deviation	Std. error of Mean
Preoperative AC threshold	37.45	8.82	2.01
Postoperative AC threshold	23.34	6.74	1.96
Preoperative AB gap	26.95	7.98	1.62
Postoperative AB gap	11.84	6.24	1.26

The data was entered on SPSS 20 and analysed. The paired t-test was applied in the above values. The AC threshold difference between the pre and postoperative values showed $p<0.001$ signifying highly significant difference. Similarly, the AB gap difference between the pre and postoperative values showed $p<0.001$ signifying highly significant difference in the AB gap too.

DISCUSSION

Over the years microscopes have been exclusively used for various middle ear surgeries. Microscopes have the advantages of bimanual surgical handling and 3D images as well.[10] Use of endoscopes in middle ear surgery is upcoming nowadays with its own advantages and disadvantages. Endoscopes have the advantages of giving a good quality image of middle ear structures, less need of drilling the posterior superior canal wall. Using both 0° and angled telescopes, endoscopes provide the panoramic view of the middle ear structures as well as the middle ear structures even in the presence of the bony overhang.[11] But the endoscopic ear surgery on the other hand is based on 2D images, which makes depth perception difficult. At times this makes the surgeon difficult to ascertain whether the graft has been sufficiently lifted to make contact with the edge of the remnant tympanic membrane.[12] It also has the disadvantage of giving one handed technique, need of defogging required frequently during the surgery and the learning curve of the surgeon to gain the expertise. Some articles mention the accidental patient movement with secondary trauma to the patient by the tip of the endoscope, but our study showed no such issues of accidental injury.[13]

This is one of the preliminary study regarding the endoscopic myringoplasty in our institution. There were three different surgeons doing the procedure and each of them had their own learning curve. As like in most of the studies Karl Storz 4mm Hopkin's rigid endoscope of 0° and 30° were used in our institute too. The 4mm endoscope gave a better resolution than the 2.7mm endoscope. Otoendoscope provided very sharp image with higher resolution[14] and good for teaching purposes too. We have limited ourselves to transcanal myringoplasty till date in our institution but there are number of studies regarding the role of endoscope in other middle ear surgeries too like the stapedotomy and cholesteatoma surgery.[15]

Seventy-nine cases were enrolled for the study, but three patients were lost to follow up thus seventy-six patients were finally analyzed. Patients of fifteen years and above only were taken for the study as all the cases done in local anesthesia were only included in the study. There was slightly male predominance in the study with the male to female ratio of 1.17:1. The majority of the patients were in the age group of 15-30 years of age. This might be due to the awareness and high mobility to health care in these age group of patients. All the cases were done by the permeatal approach and when the ossicular chain was not visualized fully by using 0° endoscope, 30° endoscope was used after which ossicles were visualized in all the patients thus alleviating the need of drilling the canal wall.

The assessment for the graft uptake and hearing improvement was done at or after 6weeks when the gelfoam would have dissolved by then. Many other studies have a longer period of follow up ranging from 6 months to 2 years period.[10,15, 16] Short term follow up is one of the drawbacks of our study.

On follow up the graft uptake rate in our study was 88.2%. The hearing improvement was assessed using the AC threshold and the AB gap closure like other studies mentioned in the literatures. Our study showed highly significant hearing improvement postoperatively. This is comparable to many other studies done in different parts of the world. Ahmed EG showed graft uptake of 91.7% in their study of 36 cases.[13] Usami et al had 81.8% graft uptake rate in their study of twenty-two endoscopic myringoplasties.[15] Similarly, Karhketo et al had 80% successful graft uptake in their study of twenty-nine patients. [16]

Like many other authors Lade H et al[10] had compared the graft uptake and postoperative hearing status between endoscopic and microscopic myringoplasty. They had used temporalis fascia as the graft material. A graft uptake rate of 83.3% was observed in both the groups after 24 weeks. The mean AB gap pre and postoperatively in the endoscopy group was 28.5

and 18.13 dB and in microscopy group was 32.4 and 16.9 dB respectively which is comparable to our study. Their study also highlighted the need of canalplasty in the microscopic group which was not needed in the endoscopic group. They have stated the advantage of the angled endoscopes to visualize the ossicles and the less need of curettage.

We had exclusively used temporalis fascia in all of our cases as the graft material. There are studies using cartilage as the graft material with the comparable graft uptake rate as compared to using the temporalis fascia. Ozgur et al showed 97.8% and 95.6% graft uptake rate at one and six months follow up in their series of endoscopic butterfly cartilage myringoplasty which is higher than in our study.[17] Celik et al in his study of cartilage endoscopic myringoplasty showed graft success rate of 87.5% in their study.[18] Preoperative mean air conduction hearing threshold was 25.9 dB, and the mean air-bone gap was 11.9 dB while these values improved to 19.5 dB and 5.3 dB respectively in the postoperative period. Though cartilage was used as the graft material in this study as compared to fascia in our study, the graft uptake and the hearing results were similar as in ours.

Thus, we have certain limitations in our study as it addresses only the short term hearing results, surgery being performed by multiple surgeons and the variable learning curves in the different surgeons. However, the results are comparable to other studies in the literature.

CONCLUSION

The graft uptake rate was 67/76 (88.2%). The difference in the AC threshold and AB gap pre and postoperatively was highly significant ($p<0.001$) and comparable to other studies in the literatures.

RECOMMENDATIONS

Single surgeon and long term follow up of at least a year would make the better assessment of the graft uptake. Similarly, comparative study between the microscopic and the endoscopic myringoplasty might highlight more on the advantage and drawbacks of the two methods.

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