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COMPARISON OF GRAFT UPTAKE AND HEARING RESULTS BETWEEN ENDOSCOPIC AND MICROSCOPIC UNDERLAY MYRINGOPLASTY

ABSTRACT

Objective:
To compare the graft uptake rate and postoperative hearing results between endoscopic and microscopic underlay myringoplasty.

Materials and methods:
Patients of age 13 years and above with the diagnosis of chronic otitis media – mucosal type with any sized perforation of tympanic membrane were included for myringoplasty. The study was conducted at Ganesh Man Singh Memorial Academy of ENT Head and Neck Studies, Tribhuvan University Teaching Hospital between April 2013 to October 2014. Sixty cases were included for underlay myringoplasty with temporalis fascia graft. Patients were randomly allocated by lottery method with 30 cases in endoscopic group and 30 cases in microscopic group. Graft uptake and hearing results were assessed after 6 weeks and results were compared within and between the groups.

Results:
Graft uptake rate in endoscopic group was 83.3% (25/30) and in microscopic group was 86.6%(26/30) with no statistically significant difference in the graft uptake rate ($p = 0.718$) between the groups. The mean pre and post-operative air bone gap in endoscopic group were 26.96dB ± 7.98dB, 12.58dB ± 5.58dB and that in the microscopic group were 28.80 ± 9.78dB, 10.45dB ± 4.96dB, respectively. The difference obtained within the groups was statistically highly significant ($p < 0.001$). However, there was no statistically significant difference in hearing results between the two groups ($p = 0.457$).

Conclusion:
The graft uptake rate and hearing results of endoscopic underlay myringoplasty are comparable to those of microscopic underlay myringoplasty. Thus, endoscope can be used as an alternative option for microscope for the repair of tympanic membrane perforations.

Key words: Chronic otitis media, Endoscope, Myringoplasty, Pure tone audiometry, Temporalis fascia

INTRODUCTION

With the recent advent of endoscope and its refinement in resolution, it is being widely used in different surgical fields.[1] In otorhinolaryngology practice, it is being widely used in sinus surgeries. Lately, there have been attempts of using endoscope with good outcomes in different surgeries related to ear. [2,3]

Endoscopes provide an excellent magnified image with high resolution.[4] With minimal effort it can be utilized to examine every nook and corner of middle ear cavity including assessment of high jugular bulb.[1] It can be used to rule out presence of cholesteatoma which is a contraindication for myringoplasty.[1] Bony overhangs can be easily overcome with possible evaluation of anteroinferior recess which is almost impossible with microscope.[4] No bony drilling is required thus potentially less traumatic, less time consuming and less post operative pain with early return to activities.[1] Endoscopes are better aid in demonstrating surgical steps which adds up its utilization in teaching activities.[5] Furthermore, the easy transportability of endoscopes add up to its role in health camps, which can be very useful in a country like ours where people lack adequate access even to basic health facilities.[6]

MATERIALS AND METHODS

It was a prospective, comparative, randomized interventional study conducted at Ganesh Man Singh Memorial Academy for ENT-Head and Neck Studies, Institute of Medicine, Tribhuvan

University, Kathmandu, Nepal for 18 months from April, 2013 to October, 2014 after obtaining ethical clearance from institutional review committee. Patients with dry central perforation of both gender, aged 13 years and above were included in the study. Patients with wet ears, revision surgery cases, perforation with squamous disease and patients with only hearing ear were excluded from the study. Probability sampling method using simple random lottery was applied.

Detailed history, general physical examination, ear examination with otoscope and tuning fork test with 512 Hz were done. Pure tone audiometry was performed within 1 week of surgery and around 6 to 8 week after surgery by trained audiometrician.

All surgeries were done under local anaesthesia. Premedication was given with injection pethidine 50 mg and injection promethazine 25 mg intramuscular in deltoid region half an hour before surgery for sedation. Xylocaine (2%) with adrenaline (1:200,000) was used for four quadrant block and to anaesthetisize the graft site at maximum dose of 7mg/kg. Both types of myringoplasty were performed by the experienced surgeon.

At the time of surgery, lottery was used for the selection of method to be followed. Group A: Endoscopic underlay, Group B: Microscopic underlay.

Permeatal approach was used for endoscopic group whereas either permeatal, postauricular or endaural approach was used to access the tympanic membrane and middle ear according to necessity in the microscopic group. Fascia of the ipsilateral temporalis muscle was harvested by a transverse supra-auricular incision

Hopkins rod rigid endoscope of 2.7mm size 30 degrees or 4mm sized 0 degree was used for surgery in endoscopic group and Carl Zeiss microscope in microscopic group. Tympanomeatal flap was elevated by giving the incision in the bony external auditory canal about 5-6 mm lateral to annulus. Middle ear and ossicular status were evaluated. Gelatin sponge (Gel foam) was kept in the middle ear and graft kept medial to handle of malleus and remnant of tympanic membrane by underlay technique.

Patients were given oral antibiotics (ciprofloxacin 500 mg 12 hourly) for 7 days and analgesics ibuprofen 400mg + paracetamol 500mg 8 hourly for 3 days and as needed in post-operative period in both groups. Follow up was done in 6th post-operative day and after 6 weeks of surgery. In 6th post-operative day, suture and pack were removed. Topical antibiotic and steroid ear drops were given for 2 weeks. Patients were followed at or after 6 weeks. Graft uptake result was noted and PTA was performed. Average four frequency air bone gap and air conduction threshold was used to compare the results between two groups pre operatively as well as postoperatively. Residual perforation of any size was reported as failure.

RESULTS

Total number of patients enrolled for the study was 64. These patients were randomized into two groups, endoscopic myringoplasty (Group A) and microscopic myringoplasty (Group B) randomly using lottery method, with 31 patients in group A and 33 patients in group B. Out of them 4 were lost to follow up and were excluded from the study with remaining 30 patients in each group were available for analysis.

Age of the patients enrolled ranged between 14 to 59 years with mean age of 29.07 years (SD -11.79yrs). Mean age of patients in endoscopic group was 27.87 years and in microscopic group 30.27 years, with no statistical difference in the age between two groups. The most common age group was 13-30 years in both the groups.

There were 17 (56.7%) male patients and 13 (43.3%) female patients in endoscopic (Group A) and 16 (53.3%) male and 14 (46.7%) female patients in microscopic group (Group B). Male to female ratio was 1.3:1 in group A and 1.14:1 in group B. There was no statistically significant difference noted in gender distribution in both the groups. ($p = 0.795$)

In endoscopic group (Group A), graft uptake was found in 25 (83.3%) cases and failure in 5 (16.7%) cases whereas in microscopic group (Group B), graft uptake was observed in 26 (86.6%) cases and failure in 4 (13.4%) cases. There was no statistical difference noted between these two groups. ($p = 0.718$) (Table 1).

Table 1: Post-operative graft status in two groups

Groups	Uptake	Failure	Total
Group A (Endoscopic)	25 (83.3%)	5 (16.7%)	30 (100%)
Group B (Microscopic)	26 (86.6%)	4 (13.4%)	30 (100%)

Chi-square test (p = 0.718)

For the homogeneity of the study, only those with the normal ossicular chains were taken for the comparison of hearing results in both groups. There were 2 cases of restricted mobility, 1 case of fixed ossicles in endoscopic group with 27 cases of normal ossiclular chain. Similarly, there were 3 case of restricted mobility, 2 fixed ossicles and in 3 cases ossicles were not assessed due to significant posterosuperior bony overhang in microscopic group (Group B) leaving only 22 cases with normal ossicular function. Also the cases with graft failure were excluded from hearing assessment post operatively. Finally 24 cases in group A and 20 cases in group B were included and studied for the pre and post operative hearing status within and between the groups.

In group A (endoscopic underlay group) the mean pre-operative air conduction threshold was 38.04 dB (SD - 9.57dB) and post-operative air conduction threshold was 23.46 dB (SD -7.13dB). The mean pre-operative air bone gap was 26.96 dB (SD - 7.98dB) and post-operative air bone gap was 12.58 dB (SD - 5.58dB). Hearing improvement after surgery was found to be statistically significant ($p < 0.001$) (Table 2).

Table 2: Comparison of pre- and post-operative hearing in endoscopic group (Group A) (n =24)

	Mean (dB)	S. D.	p Value
Pre-operative PTA- AC threshold	38.04	9.57	< 0.001
Post-operative PTA- AC threshold	23.46	7.13	
Pre-operative AB Gap	26.96	7.98	< 0.001
Post-operative AB Gap	12.58	12.58	

(S. D. – Standard Deviation) (Paired t-test)

The mean pre-operative air conduction threshold was 40.70 dB (SD-11.5) and post-operative air conduction threshold was 22.65 dB (SD -6.42). The mean pre-operative air bone gap was 28.8 dB (SD - 7.85) and post-operative air bone gap was 10.45 dB (SD- 4.97). Hearing improvement after surgery was found to be statistically significant ($p < 0.001$) (Table 3).

Table 3: Comparison of pre- and post-operative hearing in microscopic group (Group B) (n = 20)

	Mean (dB)	S. D.	p Value
Pre-operative PTA-AC threshold	40.70	11.5	< 0.001
Post-operative PTA-AC threshold	22.65	6.42	
Pre-operative PTA-AB Gap	28.8	9.78	< 0.001
Post-operative PTA-AB Gap	10.45	4.97	

(S. D. – Standard Deviation) (Paired t-test)

The mean pre-operative PTA-AC threshold was found to be 38.04 dB in group A and 40.70 dB in group B, post-operative PTA-AC threshold was 23.46 dB in group A and 22.65 dB in group B. Pre-operative PTA-AB Gap was 26.96 db and 12.58 dB, post-operative PTA-AB Gap was 28.8 dB and 10.45 dB in Endoscopic group (group A) and microscopic group (group B) respectively. Applying independent T-test, the difference in means between the groups in each category was found to be not significant statistically (Fig. I).

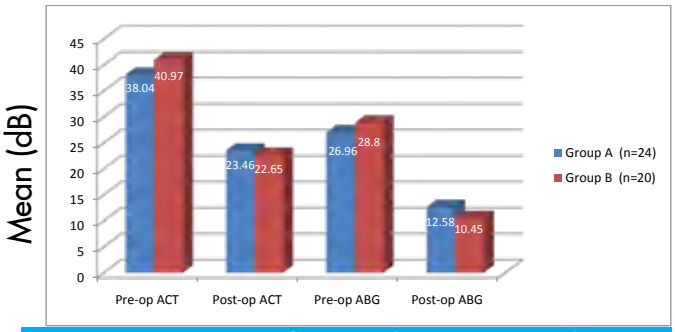

Figure I: Comparison of pre- and post-operative hearing between two group

DISCUSSION

This study was done to assess the graft uptake rate and post-operative hearing results of myringoplasty using endoscope and microscope and to compare the graft uptake rate and post-operative hearing results between these two groups.

Sixty four patients were enrolled for the study and among them 4 were excluded as they were lost to follow up. The mean age of patients was 29.87 years in endoscopic group and the mean age of

patients was 30.27 years in microscopic group. There was no statistically significant difference seen between the two groups when comparing the mean age (*p*-0.702). Study by Lade et al also had similar findings with mean age of 28.3 ± 9.39 years in endoscopic group and 25.53 ± 8.38 years in microscopic group with p value of 0.571.[5] Other studies report similar findings. Harugop et al had 75% cases and Mohindra et al 61% cases in 13-30 years age group.[6,7] This age group being highly active group with social exposure tends to get bothered with discharge and seek early health care.

There was slight higher preponderance of males seen in the study with male: female ratio of 1.3:1 in group A and 1.14:1 in group B. This signifies that both genders can equally be affected by the COM-mucosal type but males tend to seek health care than females in our country. Statistical analysis revealed no difference in gender distribution between the two groups ($p = 0.795$). Similarly no differences in gender distribution were noted in most other studies as well.[8,9] Only one study by Karhukheto et al in Finland had higher number of females(60%) as compared to males which may be because of higher prevalence of disease in females or good health care facility available to all.[10]

Graft uptake rate of myringoplasty using endoscope was 83.33% and with microscope was 86.66%. This difference was not statistically significant ($p = 0.718$). This is comparable with most other published series. Study by Lade et al showed uptake rates of 83.3%(25/30) for both groups at 24 weeks follow up.[5] They included cases with perforations of any size apart from small or moderate posterior based perforations which were repaired permeatally by simple underlay techinique. They used Hopkins rigid endoscopes of size 4mm, 0 and 30 degrees and temporalis fascia as graft similar to our study but all the cases in microscopic group were done via postaural approach and no gel foam was placed in the middle ear.

Harugop et al found 82%(41/50) success rate for endoscopic group and 86%(43/50) for microscopic group at 6 months follow up.[6] They included cases more than 12 years with medium size to subtotal perforation. They used 4mm rigid endoscope with zero degrees but raised superiorly based tympanomeatal flap. However, the success rate is comparable to our study. Thiagarajan et al found 84% (42/50) success rate with his experience on endoscopic myringoplasty.[11] They included 50 cases for underlay endoscopic myringoplasty of 20-40 years age group. Any size of perforation was repaired with standard tympanomeatal flap using 1.7mm rigid endoscope of 0 and 30 degrees. They also had a short period of follow up of 4 weeks. Mohindra et al had higher success rate of 91.5%(45/49) for closure of perforation.[7] They performed 49 myringoplasties with endoscope raising standard tympanomeatal flap with transcanal approach and temporalis fascia as graft using 4 mm rigid endoscope of 0 and 30 degrees. They had higher follow up range of 6 months to 2.9 years. They had higher success probably due to their experience with use of endoscopes in ear surgery for last 4 years.

However, Yadav et al had lower success rate of 80%(40/50) with endoscope assisted simple underlay myringoplasty.[1] They included cases with central perforation of size less than 5 mm and all cases were performed without raising tympanomeatal flap. This may explain their lower success rate.

Regarding Air Bone Gap in our study, mean pre-operative ABG was 26.96 dB (SD- 7.98) and mean post-operative ABG was 12.58 dB (SD -5.58) in endoscopic group and mean pre-operative ABG was 28.8 dB (SD -9.78) and mean post-operative ABG was 10.45 dB (SD-4.968) in microscopic group. These observed differences within the groups were highly statistically significant with $p<0.001$. This means there was significant hearing improvement in both the groups after surgery. However, between the two groups there was no statistically significant difference observed ($p> 0.05$).

The hearing results obtained in this study are similar to the results of others. Lade et al. found pre op and post op ABG in endoscopic group of 28.5dB (SD-5.11) and 18.13dB (SD-7.10) and those in microscopic group as 32.37dB (SD-5.79) and 16.87dB (SD-6.81) with p value of 0.247. Similar results were found by Mohindra et al pre op and post op ABG in endoscopic myringoplasty of 22.24dB and 12.28 dB respectively.[7] The findings for all these above mentioned studies show that the hearing results are comparable between the endoscopic group and microscopic group.

There are certain limitations of this study as it has short follow up period and only addresses short-term graft uptake and audiologic results. The surgeries were performed by different surgeons which leads to differences in success of surgery, more experienced senior surgeons have higher graft uptake rate than the junior surgeons.[9] Futhermore, endoscope being a new armamentarium for otologists in our institution, the learning curve certainly has an effect on success of surgery. However, results show comparable uptake rates in both groups which may signify that use of endoscope can further increase the success rate of myringoplasty in our center.

CONCLUSION

The graft uptake rate and hearing outcomes in myringoplasties done by endocopic or microscopic methods were comparables. Endoscope can be a good alternative to microscope for ear surgeries. However, larger sample size with longer follow up period would have increased strength of the study. Study done by single surgeon would have been more comparable.

Conflict of Interest: None

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