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Original Research Article

A comparative study of endoscopic and microscopic myringoplasty in a rural tertiary care teaching hospital

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ABSTRACT

Background: Myringoplasty is the procedure done to repair the tympanic membrane perforation. In this study we aimed to compare the results of endoscopic myringoplasty and microscopic tympanoplasty.
Methods: A total of 50 patients with central perforation of tympanic membrane and dry ear of minimum 6 months were divided into two groups of 25 each. The even serial numbers were subjected to microscopic myringoplasty through post aural route and odd serial numbers were subjected to endoscopic myringoplasty done through endomeatal route. Both the procedures were done under general anaesthesia. Dried temporalis fascia graft was used and follow up till 1 year post op. Air-bone gap closure, average time taken for surgery, success and failure rates, scar evaluation by doctor and patient along with postoperative return to routine activity were compared. The p value was calculated to find out statistical significance.
Results: Post operatively the average air-bone gap reduced to 12.6 dB in endoscopic group and 14.28 dB in microscopic group. There was no statistical significant difference in the time taken for both the procedures. There was significant difference in the assessment of postoperative scar and number of days taken for return to routine activity. The success and failure rates of both the procedures were also found to be comparable.
Conclusions: Our study showed that the success rates and average time taken for the procedures were the same for both the techniques but a better cosmetic appeal and considerably fewer days for return to routine activity by the patients who underwent endoscopic procedure.

Keywords: CSOM, Endoscopic myringoplasty, Microscopic myringoplasty, Otorrhoea, Otoendoscopy

INTRODUCTION

Chronic suppurative otitis media continues to be a major otological problem accounting for a large number of outpatient cases in India. Patients suffering from chronic suppurative otitis media of tubotympanic type with permanent perforation syndrome are handicapped, not only because of hearing loss but also from recurrent otorrhoea. Myringoplasty is one among the different surgical management options of this condition. It is a surgical closure of tympanic membrane perforation without any ossicular chain reconstruction. The ultimate aim being the attainment of a well healed perforation closure and improved hearing levels. Berthold in 1878 started the concept of tympanic membrane repair with thick skin graft which was later modified by Wullstien and Zollner using split thickness skin grafts. Ever since a variety of materials and techniques were brought forward for the same over the years. Among them autologous temporalis fascia graft has always retained popularity due to it being thin, non-shrinkable and having a low metabolic rate with resemblance to tympanic membrane structure and texture. Overlay, underlay and interlay techniques have been used with variable success rates. With the adoption of operating microscope, the accuracy outcomes have improved over leaps and bounds. Though

the operating microscope provides magnified view, it is in a straight line which prevents proper and accurate visualisation of the deep recesses of the middle ear in a single operating field. In the beginning, the microscopic myringoplasty was a permeatal overlay; however presently the post aural underlay technique has become more popular as the permeatal approach has its limitations. These limitations are addressed in endoscopic permeatal myringoplasty. Middle ear endoscopy was introduced by Mer and colleagues.[1] The use of rigid endoscopes for myringoplasty has brought about enormous advantages as it is simple to use, not only for examination but also for the repair of tympanic membrane, ossiculoplasty, myringotomy and grommet insertion.[2] This provides a magnified vision and hence enables the surgeon to change rapidly from a close up view to a wide angle view, just by going closer or by withdrawing the scope. It also helps to visualise the hidden and difficult to access areas of middle ear by using angled scopes. It follows the path of minimally invasive surgery. Although all said and done it is also not without disadvantages, some to mentions are that only a single hand is available for the procedure unless an endoscope holder is used and the learning curve being steep.

METHODS

The study was conducted at the DM Wayanad Institute of Medical Sciences, Meppadi, Kalpetta, Kerala which is a rural tertiary care teaching hospital. The study was conducted after obtaining the prescribed institutional ethical committee clearance, during January 2018 to September 2018. Written and informed consent was taken from the patients included in the study.

A total of 50 patients were selected who were having medium to subtotal dry central perforation in either sex with documented conductive hearing loss of not more than 30dB and dry ear for at least 6 months. Patients with discharging ear, previous history of ear surgeries, those with ossicular chain abnormalities and sensorineural hearing loss were excluded. Then patients were numbered on first come first serve basis with even serial numbers being allotted to microscopic technique and odd serial numbers for endoscopic technique.

All patients underwent myringoplasty under general anesthesia, being operated by the same surgeon and using underlay technique with temporalis fascia graft. Post aural route was used for microscopic myringoplasty and endomeatal route for endoscopic myringoplasty. The patients were kept under follow up for up to 1 year and parameters like pre op and post op air bone gap, average time taken for surgeries, success and failure of graft uptake and closure of air-bone gap, scar evaluation by doctor and patient and days taken for postoperative return to routine activity were compared. Chi square test was used to determine the significance of the variables.

Surgical procedure

The post auricular region and external auricular canal was infiltrated with 2% lignocaine with 1 in 2,00,000 adrenaline injection, Temporalis fascia graft was harvested through a small incision and allowed to dry. 0 degree and 30 degree angled scopes were used for endoscopic procedure. The margins of the perforation was freshened and tympanomeatal flap was elevated after placing a curvilinear incision 5mm lateral to annulus extending between 6-O clock to 12-O clock along the posterior wall of external auditory canal. After skeletonising the handle of malleus the graft was placed using underlay technique. The tympanomeatal flap was repositioned and packed with gelfoam. Similar procedure was also used in the microscopic myringoplasty group through post aural route by placing a William Wilde's incision and exposing the external auditory canal. Post aural wound was sutured using 3-0 silk and was removed after 1 week.

Patient who underwent endoscopic procedure was discharged on the very next day and those who underwent microscopic procedure were discharge on 3rd post-operative day with antibiotics and analgesics for 1 week. The follow up schedule was 1 week, 2 weeks, 1 month, 2 months, 3 months, 6 months and 1-year post operatively. The final pure tone audiometry was done at the end of 1 year.

Ethical approval

All procedures in studies involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helksinki declaration and its later amendments or comparable ethical standards.

RESULTS

The mean age of the patients included for the study was 32 with the youngest of the group being 15 years of age and oldest being 60 years of age (Table 1).

Table 1: Age distribution.

Age in years	Number of patients
1-10	0
11-20	7
21-30	23
31-40	10
41-50	7
51-60	3

Table 2: Sex distribution.

Sex	Number of patients	Percentage (%)
Male	30	60
Female	20	40

Out of the 50 patients included, 30 were males and 20 were females (Table 2).

Table 3: Analysis of pure tone audiometry findings.

Average conductive hearing loss	Endoscopic myringoplasty group		Microscopic myringoplasty group	
	Pre-op	Post-op	Pre-op	Post-op
	N (%)	N (%)	N (%)	N (%)
0-10 dB	0	12 (48)	0	5 (20)
11-20 dB	10 (40)	11 (44)	10 (40)	17 (68)
20-30 dB	14 (56)	2 (8)	12 (48)	3 (12)
31-40 dB	1 (4)	0	3 (12)	0
	Average pre-op air-bone gap		Average post-op air-bone gap	
Endoscopic myringoplasty group	24.32		12.6	
Microscopic myringoplasty group	25.12		14.28	

The average pre-operative air-bone gap was 24.32 dB in endoscopic group and 25.12 dB in microscopic group.

Post operatively the average air-bone gap reduced to 12.6 dB in endoscopic group and 14.28 dB in microscopic group.

Table 4: Analysis of the time taken for endoscopic and microscopic myringoplasty.

Average time taken for surgery	Endoscopic myringoplasty group	Microscopic myringoplasty group
	86 minutes	90 minutes

The average time taken for surgery for endoscopic procedure was 86 minutes and 90 minutes for the microscopic procedure. The p value indicates that the difference is insignificant (p value is more than 0.05) (Table 4).

Table 5: Analysis of cosmetic results.

Objective result	Endoscopic myringoplasty group	Microscopic myringoplasty group
	N (%)	N (%)
Visible scar	0	19 (76)
No visible scar	25 (100)	6 (24)

The analysis of the objective assessment of cosmetic result in endoscopic group, none of the patient had any post auricular scar whereas 19 patients had recognisable scar. The p value shows that there is significant difference in this (p value is less than 0.05) (Table 5).

Table 6: Analysis of cosmetic result.

Subjective result	Endoscopic myringoplasty group	Microscopic myringoplasty group
	N (%)	N (%)
Excellent	25 (100)	8 (32)
Satisfactory	0	12 (48)
Poor	0	5 (20)

In subjective assessment all 25 patients of endoscopic group had excellent cosmetic outcome because of the absence of any post auricular scar. In microscopic group 8 patients reported to have excellent, 12 patients satisfactory and 5 reported to have poor cosmetic outcome. This is statistically significant when comparing both the groups (p value is less than 0.05) (Table 6).

Table 7: Analysis of number of days taken for post operative return to routine activity.

Average number of days	Endoscopic myringoplasty group	Microscopic myringoplasty group
	2 days (Range 1-3 days)	5 days (Range 2-8 days)

In comparison of the post-operative return to routine activity in endoscopic group showed an average of 2 days and 5 days in microscopic group. The p value shows significant statistical difference in this regard (p value is less than 0.05) (Table 7).

Table 8: Overall analysis based on success and failure.

Outcome	Endoscopic myringoplasty group	Microscopic myringoplasty group
	N (%)	N (%)
Success	20 (80)	21 (84)
Failure	5 (20)	4 (16)

Overall analysis of success rate in endoscopic group was 20 (80%) and 21 (84%) in microscopic group whereas the failure was 5 (20%) in endoscopic group and 4 (16%) in microscopic group. The p value shows that the results are comparable and the statistical differences are insignificant (p value is more than 0.05) (Table 8).

DISCUSSION

In our study we found out that the results of the endoscopic and microscopic techniques are comparable with respect to air bone gap closure, average time taken and overall analysis based on success and failure. Whereas the endoscopic technique gave us advantages like reduced postoperative hospital stay, early return to routine activity and better cosmetic appeal.

Hopkins developed the first rigid scopes.[8,9] There is no comparison to the superior wider viewing angle and exceptional resolution and brightness.[10] The uses of such scopes were initially limited to rhinology but as time passed it was adopted to otology and laryngology making use of these qualities. The endoscope brings the surgeon's eye to the tip of the scope and hence a better viewing angle and requires no need for the constant change of head positions.[13] Similar findings were brought about by Tarabichi and Usami et al.[14,15] Only a smaller incision is needed in endoscopic technique for the graft harvesting and that too if planned properly can be placed within the hairline. Less dissection of tissues, minimal intraoperative bleeding, less postoperative pain and better cosmetic result are the advantages of this technique. Quraishi et al has also reported about less postoperative pain and morbidity in their endoscopic myringoplasty series.[16] This in turn avoids auricular displacement and asymmetry of pinna. Positioning of the graft was much easier due to the wide viewing angle. The same scopes used for rhinology practice can be adopted for this procedure thereby bringing no extra financial burden on the operating surgeon. Portability of endoscopes can be utilised for conducting surgical camps.[13] Endoscopic procedure is not without its disadvantages because it is a one handed technique unless a holder is used, and becomes cumbersome in case of excessive bleeding.[11-13] Even small amount of bleeding can totally obscure the view and soil the scope therefore meticulous haemostasis is a must in endoscopic procedure. Neck strain and left arm fatigue are noticed by beginners but practice usually solves this. The binocular vision provided by the microscope can't be compared to the monocular vision of the endoscope which results in loss of depth.[2]

In our study we had an overall success rate of 80% in endoscopic group and 84% on microscopic group. This was taking into consideration the closure of air bone gap to less than 13 dB without postoperative residual tympanic membrane perforation. Out of the 5 failures in endoscopic group, 4 patients had air-bone gap of more than 13 dB with post op perforation and 1 patient had more than 13 dB closure alone. Out of the 4 failures in microscopic group 3 patients had more than 13 dB air-bone gap and postoperative perforation and one patient of more than 13 dB air-bone gap alone. The average preoperative air-bone gap was 24.32 dB in endoscopic group and 25.12 dB in microscopic group. In the study conducted by Mohindra et al the perforation closure rate was 91% and average air bone gap improvement was 22.24.[4] The graft uptake rate for Raj et al in endoscopic technique was 90% and microscopic was 85%.[5] Guindy has brought out a graft uptake rate of 91.7% and air bone gap was closed to less than 10 dB in 83.3%.[8]

Although our entire patients underwent myringoplasty using temporalis fascia graft, there are many other studies where tragal cartilage and perichondrium grafts were used.[17,18] There has also been studied where only 0 degree scopes are used and other studies were 0, 30 and 70 degree scopes have been used.[1,5] We have used only 0 and 30 degree scopes for our procedure and it has given us the capability to negotiate the curvy external auditory canal. Doing a bony canaloplasty might become essential in some cases where microscopic myringoplasty is done.[14,15]

The cosmetic appeal of the endoscopic procedure was accepted with great interest among the patients since it reduced the postoperative recovery time due to the absence of any post auricular wound to heal except for the small incision used for graft harvesting

The endoscopic technique is set to gain popularity than ever before as more and more procedures like stapedotomy and canal wall down procedures are done through endoscopy.[19]

CONCLUSION

Today we live in a very fast-moving world were people barely have time for anything. Many people even prolong treatments and surgeries because of lack of time that needs to be invested into consultations, diagnosis, operations and postoperative recovery time. The rural set up where this study was conducted has daily wages workers and population from the lower socioeconomic strata mainly. Even 2 or 3 days of loss of wages can cause a serious blow to their livelihood. By employing the endoscopic technique it has been proved that their postoperative recovery time is drastically reduced and this has helped them to be productive for themselves and for the nation at large. Having a scar less procedure or better cosmetic appeal will certainly boost their self confidence and is something that is looked at with greater importance in any surgeries these days. Hence, we arrive at the conclusion that endoscopic myringoplasty definitely has an upper hand in the above-mentioned aspects although we wouldn't like to forget that parameters showed results only and that endoscope assisted technique is not without flaws.

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