

A Comparative Longitudinal Study of Surgical Outcomes of Microscopic Approach and Endoscopic Approach of Myringoplasty in Patients with Mucosal Type of Chronic Otitis Media

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ABSTRACT

BACKGROUND

To compare the outcome of the endoscopic technique and microscopic technique of myringoplasty in patients with chronic otitis media of inactive mucosal type and determine the advantages and disadvantages of both the methods.

METHODS

In this study, 100 consecutive patients aged between 12 and 60 years with chronic otitis media of inactive mucosal type who required surgery in our institute with myringoplasty were randomized to receive either microscopic myringoplasty (Group A) or endoscopic myringoplasty (Group B).

RESULTS

Between the two study groups, the post-operative hearing gain, graft uptake, and post-operative complications were similar. But the duration of surgery in the endoscopic technique was significantly less compared to the other group. This could be explained by the time taken to focus each structure to be visualized during surgery in case of microscopic assisted myringoplasty.

CONCLUSIONS

Microscopic myringoplasty surgery has the advantage of using two handed technique, which provides better precision and an easier learning curve. It is still the most accepted procedure performed. The advantages of endoscopic myringoplasty over microscopic myringoplasty are better magnification, versatility and duration of the surgery. Therefore we conclude that microscopic technique and endoscopic technique of myringoplasty surgery are equally effective.

KEYWORDS

Chronic Otitis Media, Conductive Hearing Loss, Microscopic Myringoplasty, Endoscopic Myringoplasty, Central Perforation

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BACKGROUND

Chronic Otitis Media (COM) is defined as chronic inflammation of the mucoperiosteal lining of the middle ear cleft.¹ Poor socio-economic status, illiteracy, overcrowding and poor hygiene are all factors which play an essential role in this disease.² Prevalence surveys estimate that the global burden of illness from COM involves around 65 to 330 million individuals with draining ears.³ Over 90 % of the disease burden is from the countries in the South-East Asia and Western Pacific regions, Africa, and several ethnic minorities in the Pacific-Rim. Among these countries, India was found to have the highest prevalence (around 7.8 %).³

Myringoplasty is defined as an operation in which the reconstructive procedure is limited to the repair of a tympanic membrane (TM) perforation to prevent chances of reinfection of the same. Myringoplasty can be performed if there is a dry and inactive perforation for 3 to 6 months. Commonly, temporalis fascia is used for grafting because of its availability nearby. Its thickness is similar to that of normal TM.⁴ It has also got a low basal metabolic rate.

Traditionally over the decades, myringoplasty has been done using an operating microscope.⁵ Middle ear endoscopy was first introduced by Mer and colleagues in 1967, but it was mainly used for diagnostic and photographic purposes.⁶ Recently there is an increase in the use of endoscope assisted myringoplasty, and the success rate is 80 to 100 %. The possible causes of failures are the graft undergoing necrosis in the middle without an infection, blunting of anterior part of the graft and infection.

The endoscope has better magnification and field of view which provides a complete picture of the middle ear cavity, tympanic membrane, and external auditory canal without the need for continuous repositioning of the patient's head and the microscope.⁷ Despite its advantage of being an effective surgical technique, it has the disadvantage of being a single-handed technique.

Objectives

To compare the outcome of the endoscopic technique and microscopic technique of myringoplasty in patients with chronic otitis media of inactive mucosal type and determine the advantages and disadvantages of both the techniques.

METHODS

The study was a longitudinal comparative study done on patients with chronic otitis media. This study was carried out in the Department of ENT, Meenakshi Medical College and Research Institute, from January 2018 to August 2019.

Inclusion Criteria

- Patients between the age groups 12 - 60 years.
- Patients with chronic otitis media of inactive mucosal type.

- Patients with demonstrable degree of conductive hearing loss.

Exclusion Criteria

- Active mucosal disease.
- External ear diseases like otomycosis, otitis externa.
- Mixed hearing loss.
- Upper respiratory tract infections.
- Recurrent cases.
- Contraindications to general anesthesia.

Patients attending the out-patient department of ENT from January 2018 to August 2019, fulfilling the inclusion and exclusion criteria were block randomized and allotted into two groups. Group A were cases being operated by endoscopic assisted myringoplasty, and Group B were cases being operated by microscopic assisted myringoplasty. The sample size was calculated to be a hundred. Fifty cases each were allotted to both the groups. A brief explanation of the procedure was given to the patients with chief complaints of ear discharge and hard of hearing. Patients with a central perforation which was dry at least for a period of 6 weeks and who were willing for surgery were included in this study after taking informed and written consent.

Size of the central perforation was assessed according to the number of quadrants the perforation occupied. The type and degree of hearing loss were determined by tuning fork tests. Further, the patient was subjected to routine preoperative blood investigations. Pure tone audiometry (PTA) was done according to the technique given by the American Speech and Hearing Association (ASHA), and air-bone (A-B) gap at frequencies 500 Hz, 1000 Hz and 2000 Hz were noted, and the degree of hearing loss was calculated. Patch test was done using a cigarette paper, and audiological assessment was carried out before and after patching.

Radiological evaluation was done by taking plain X-ray Law's view of both mastoids. Further clinical examination was conducted using an Examination Under Microscope (EUM). After obtaining pre-anaesthetic

Fitness, the patients underwent underlay myringoplasty surgery. Microscopic myringoplasty was done in 50 patients. Endoscopic myringoplasty was done in 50 patients using 0 degree, 17 centimetres long, 4 mm wide Hopkin's rod rigid endoscope. Duration of surgery, an outcome with respect to hearing gain and graft success rate of both surgeries was followed up to a post-operative period of the six months and PTA was done at the 3rd and 6th post-operative month respectively.

Standard Operating Procedures

After obtaining informed and written consent regarding the surgery and study, the participants underwent preoperative investigations as per the study parameters, including preoperative PTA for determining the degree and type of hearing loss. Routine preoperative assessment was done, and the anaesthetic clearance was obtained. The patients

received preoperative intravenous antibiotics. All patients underwent underlay technique of myringoplasty surgery under general anaesthesia with oral endotracheal intubation with either microscopic or endoscopic approach using a block randomization method.

General anaesthesia was administered with a cuffed endotracheal tube under oral intubation. Propofol was used as an inducing agent and sevoflurane as the inhalational anaesthetic. After placing the patient on the operation table in a supine position with the ear to be operated uppermost, the ear and surrounding region were painted with betadine and patient draped with sterile towels.

In all cases, the region about half to one inch above and behind the ear was infiltrated with 2 % Xylocaine with 1 in 1,00,000 adrenaline. The same was infiltrated in the external auditory canal in the superior, inferior and posterior quadrants. A total of about 3 - 4 ml was used for the entire procedure. Myringoplasty was performed using underlay technique, and the graft material used was temporalis fascia. A single postauricular incision (Wilde's incision) was used for all the cases. After exposing the deep fascia over the temporalis muscle, the superficial surface of the fascia was cleared off as far as possible all around. Normal saline was taken in a 5 ml syringe and injected in such a way that the fascia was separated from the deeper muscle layer. Once the fascia was properly separated, a circular incision about 2 cm in diameter was made in the fascia and then removed by grasping it with a non-toothed dissecting forceps and freeing it from temporalis muscle. The fascia was teased properly, and with the help of a graft presser, it was made into a thin and uniform piece. Any muscle tissue remnant attached to the fascia was carefully dissected free. The fascia was then kept aside and was allowed to dry. With a periosteal elevator, the periosteum was freed and the auricle was pushed anteriorly. Using a surgical knife no. 15, an incision was taken in the posterior canal skin at the junction of bony and cartilaginous part to complete the meatotomy. A self-retaining haemostatic mastoid retractor was applied to give adequate exposure of the External auditory canal and the tympanic Membrane.

Microscopic technique of myringoplasty was done using a standard operating microscope to visualize the tympanic membrane and middle ear whereas a Hopkins rigid zero-degree endoscope of 17 cm length and 4 mm width was used for the endoscopic technique of myringoplasty. Under magnification, the tympanic remnant perforation and the middle ear mucosa were seen. The perforation was carefully examined. Using a straight pick or a sickle knife, the edges of the perforation were freshened and removed. The mucosa on the medial aspect of tympanic membrane was scraped with the help of a sickle knife. With the help of a Plester knife, incisions were made at the 12 o'clock and 6 o'clock positions to aid in the elevation of the tympanomeatal flap. Using a Rosen's knife, these two incisions were joined at a distance of about 2 - 3 mm from the annulus. The tympanomeatal Flap thus formed was gently elevated with a circular knife up to the level of the tympanic sulcus. The tympanic annulus was elevated in a similar manner with a drum elevator. The handle of malleus was identified,

visualized clearly and the tags on it were carefully removed without disrupting the ossicular chain.

The temporalis fascia was fashioned to the size of perforation. The gel foam pieces soaked in antibiotic were kept in middle ear, starting from the opening of Eustachian tube anteriorly and then all over. After that, the temporalis fascia graft was tucked in underlay and spread all over to cover the defect. In cases of large / subtotal perforation, an incision / slit was made in the graft, and while placing the graft, the slit was pulled around the handle of malleus for adequate closure and support. Then the tympanomeatal flap along with the intact tympanic annulus was replaced on the posterior canal wall in such a way that the bone in the posterior canal wall was not exposed, to prevent bony osteitis. The External Auditory Canal (EAC) was packed with gel foam pieces soaked in the antibiotic ointment. The elevated periosteum was replaced and sutured with 3 - 0 chromic catgut. After achieving haemostasis, the skin was sutured with 3 - 0 interrupted nylon sutures. A small gauze was kept in the meatus. A firm mastoid bandage was applied.

Postoperatively the patient was put on broad-spectrum antibiotics, analgesics and antihistamines. The mastoid bandage was removed after 48 hours following which a simple dressing was applied twice a day after cleaning the wound with betadine and normal saline. The patient was discharged after 3 - 5 days once it was confirmed that there is no infection in the EAC or post aural wound. One week after the surgery, sutures of post aural wound were removed. Two weeks after the surgery, the ear was examined, and the gauze from the EAC was removed.

Statistical Methods

Statistical analysis was carried out using SPSS version 17.0 (IBM SPSS, US) software. Descriptive statistics and independent sample t-test were used. A hundred patients were included in this study. Fifty of them underwent endoscopic myringoplasty, and another fifty underwent microscopic myringoplasty. Duration of surgery, graft uptake rate and post-operative hearing gain were compared between group A and group B. The demographic profiles such as age and gender were described in percentages and mean. Graft uptake rate and hearing gain postoperatively were summarized in mean, standard deviation, and between two groups, it was compared by t-test. Duration of surgery between the study groups was compared with a t-test. A p-value of less than 0.05 was considered significant.

RESULTS

From the study, we have concluded that between the two study groups, the postoperative hearing gain was similar, and the difference was not significant (p-value = 0.25). In the study, we also studied the post-operative graft uptake rate between both the groups. The endoscopic technique of myringoplasty had a success rate of 88 % whereas Microscopic method of myringoplasty had 84 % success rate. Similar to this study, Anoop et al., Furukawa et al. and

Harugop et al. also found that the graft success rate was similar between both the methods.^{8,9,10}

PTA (dB)	Group A		Group B		P-Value (t-Test)
	Mean	SD	Mean	SD	
Pre-Operative	35.31	14.3	34.56	16.8	0.8105
Post-Operative	18.43	5.3	19.61	5.7	0.2863
Hearing Gain	16.74	7.1	14.92	8.5	0.2506

Table 1. Pure Tone Average among Group A and Group B Participants

Variable	Group A		Group B		P-Value (t-Test)
	Mean	SD	Mean	SD	
Duration of Surgery (in mins)	54.1	10.3	84.2	12.6	< 0.001

Table 2. Association between Duration of Surgery within the Study Groups

*Significant

Graft Uptake	Group A		Group B		Total	P-Value (t-Test)
	Frequency	%	Frequency	%		
Graft Taken	44	88	42	84	86	0.5663
Graft Failed	06	12	08	16	14	
Total	50	100	50	100	100	

Table 3. Graft Uptake among Study Participants

Post-Operative Complications	Group A		Group B		Total	P-Value (t-Test)
	Frequency	%	Frequency	%		
Present	03	06	05	10	08	0.4632
Absent	47	94	45	90	92	
Total	50	100	50	100	100	

Table 4. Post-Operative Complications among Study Group Participants

Another observation made from our study is the duration of surgery between both the groups. In endoscopic assisted myringoplasty, the average duration of surgery was 54.1 ± 10.3 minutes, and in microscopic assisted myringoplasty, the duration of surgery was 84.2 ± 12.6 minutes. This difference was statistically significant (p-value < 0.00). This can be explained due the time taken to focus each structure to be visualized during surgery in case of microscopic assisted myringoplasty. There are no studies done till date, which compares the duration of surgery between two groups.

We also found out that among Group A, 6 % of the patients had recurrent infections, and 94 % had nil complications, and among Group B, 90 % of the patients had nil complications. This difference was also not significant.

Hence from our study, we report that both endoscopic and microscopic myringoplasty are equally effective in treatment for COM and the surgery can be chosen in the comfort of the operating surgeon.

DISCUSSION

The microscopic technique of myringoplasty has been done conventionally over a decade. The main benefit of the microscopic technique of myringoplasty are the use of both hands during the surgery and the three-dimensional image while a demerit of microscopic approach is that the field of visualization has to be changed often. Patient's position of the head has to be changed, or the microscope has to be

moved frequently to correct variations that hamper the view of the surgical field.

Recently endoscopes are increasingly used not only for documentation and diagnostic purpose but widely used in otological surgeries as well.⁷ The endoscope provides a better magnification. The wide-angle of the zero degrees scope visualizes the entire tympanic membrane in one frame.⁷ Unlike the microscope, the endoscope is easily transportable and hence is ideal for use in ear surgery camps that are conducted in remote places.⁸

Endoscopic ear surgery is a technique which is done using one hand, which becomes especially cumbersome when there is excessive bleeding.¹¹ Endoscope provides monocular vision which leads to loss of depth perception. Diligent haemostasis is required in endoscopic ear surgery. The strengths of our study are; it is a prospective comparative study, and all the advantages and disadvantages of both the groups were studied. Limitations in our study are small sample size, and long term follow-up was not done.

CONCLUSIONS

Microscopic myringoplasty surgery has the luxury of using the two-handed technique, which provides better precision and an easier learning curve. It is still the most accepted procedure performed. The advantages of endoscopic myringoplasty over microscopic myringoplasty are better magnification, versatility and duration of the surgery. But the disadvantage is that the non-dominant hand is used to hold the rigid endoscope, only one hand is used for surgery which limits the surgeon. Therefore, we conclude that microscopic technique and endoscopic technique of myringoplasty surgery are equally effective.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.

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REFERENCES

- [1] Shambaugh GE. Chronic suppurative otitis media. Arch Otolaryngol - Head Neck Surg 1930;12(6):753-759.
- [2] Acuin J. Chronic suppurative otitis media. BMJ Clin Evid 2007;2007:0507.
- [3] World Health Organization (2004). Chronic suppurative otitis media: burden of illness and management options. Geneva 27, Switzerland, WHO 2004.
- [4] Raj A, Meher R. Endoscopic transcanal myringoplasty - a study. Indian J Otolaryngol Head Neck Surg 2001;53(1):47-49.
- [5] El-Guindy A. Endoscopic transcanal myringoplasty. J Laryngol Otol 1992;106(6):493-495.

- [6] Shambaugh GE, Glasscock ME 3rd, Gulya AJ, et al. Surgery of the ear. Shelton, Ct.: People's Medical Publishing House-USA 2010.
- [7] Tarabichi M. Endoscopic middle ear surgery. *Ann Otol Rhinol Laryngol* 1999;108(1):39-46.
- [8] Harugop AS, Mudhol RS, Godhi RA. A comparative study of endoscope assisted myringoplasty and microscope assisted myringoplasty. *Indian J Otolaryngol Head Neck Surg* 2008;60(4):298-302.
- [9] Furukawa T, Watanabe T, Ito T, et al. Feasibility and advantages of transcanal endoscopic myringoplasty. *Otol Neurotol* 2014;35(4):e140-e145.
- [10] Raj A, Meher R. Endoscopic transcanal myringoplasty - a study. *Indian J Otolaryngol Head Neck Surg* 2001;53(1):47-49.
- [11] Gaur RS, Tejavath P, Chandel S. Comparative study of microscopic-assisted and endoscopic-assisted myringoplasty. *Indian J Otol* 2016;22(3):177-182.