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Original Research Article

Endoscopic myringoplasty: outcome and hearing gain in inactive mucosal chronic otitis media

B. T. Subramanya, S. Lohith*, B. Sphoorthi

Department of ENT, Subbaiah Institute of Medical Sciences, Shimoga, Karnataka, India

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***Correspondence:**
Dr. S. Lohith,
E-mail: dr.shivappalohith@gmail.com

ABSTRACT

Background: Chronic otitis media is an inflammatory process in the middle ear cleft that poses serious health problem in developing countries. Myringoplasty is a common otological procedure to reconstruct the tympanic membrane to prevent recurrent otorrhea, and restore sound-conducting mechanism. The use of rigid endoscope in transcanal myringoplasty has significant advantage as it provides magnified, close up as well as wide angle view, less morbidity and early postoperative wound healing with better cosmetic results without compromising success rate and postoperative hearing gain. The aims and objectives of the study were to analyze the results of endoscopic transcanal interlay myringoplasty, in terms of graft uptake and hearing improvement in cases of chronic suppurative otitis media with inactive mucosal disease with central perforation.
Methods: This is a prospective study conducted from January 2016 to August 2018 in 30 patients of inactive mucosal chronic otitis media (COM). All patients underwent transcanal endoscopic interlay myringoplasty and patients were called for regular follow up for 12 weeks and results were statistically analysed.
Results: The graft uptake rate in the present study was found to be 93.33%. Pre operatively mean air bone gap (ABG) was 27.33 dB and post operatively after 12 weeks mean air bone gap improved to 10.5 dB. Mean ABG gain was 16.33%.
Conclusions: Endoscopic transcanal interlay myringoplasty with superiorly based TM flap is an effective technique over conventional microscopic technique in terms of graft uptake, hearing improvement, better postoperative scar and less morbidity in cases of inactive mucosal COM.

Keywords: Inactive mucosal chronic otitis media, Interlay, Endoscopic myringoplasty, Air bone gap, Graft uptake

INTRODUCTION

Chronic otitis media is an inflammatory process in the middle ear space that results in long-term or more often permanent changes in the tympanic membrane including atelactasis, perforation, tympanosclerosis, development of retraction pocket or cholesteatoma.[1] Otitis media is a highly prevalent disease of the middle ear and poses serious health problem in developing countries. Myringoplasty is a common otological procedure indicated in mucosal chronic otitis media. It aims to close the tympanic membrane perforation to prevent recurrent otorrhea, and restore sound-conducting mechanism.[2] It was introduced by Berthold in 1878, who used a thick skin graft, while Wullstein and Zollner further developed the procedure and used a split skin graft.[3] Graft of mesodermal origin, such as perichondrium, fascia, vein, or fat are increasingly being used now a days.

Operating microscope is widely used for myringoplasty and provides good illumination and magnified images but in a straight line extending from the objective lens,

therefore any deep recesses within the temporal bone cannot be visualized directly without the surgeon taking measures to increase surgical exposure.[4] With introduction of endoscope into other branches of surgery, there have been attempts at its utilization in ear surgery. First published middle ear endoscopy imaging was done by Mer et al in 1967.[5] The use of rigid endoscope in transcanal myringoplasty has significant advantage as it provides magnified view and enables to change rapidly from close up view to wide angle view. Anterior meatal recess, sinus tympani, facial recess, hypotympanum and attic are well visualized by using angled endoscopes.[6] It provides early postoperative wound healing better cosmetic results with less morbidity without compromising success rate and postoperative hearing gain.

Several factors may affect the outcome of myringoplasty, such as the site and size of the perforation, technique (underlay, overlay or interlay), approach (endaural versus postaural), experience of the surgeon, type of graft used, age of the patient, and condition of the operated ear (dry versus wet).[3] In the present study, endoscopic transcanal interlay myringoplasty was performed in patients with dry central perforations and the results were analyzed.

Aims and objectives

To analyze the results of endoscopic transcanal interlay myringoplasty, in terms of graft uptake and hearing improvement in cases of chronic suppurative otitis media with inactive mucosal disease with central perforation.

METHODS

Place of study

The present study was conducted at Subbaiah institute of medical sciences, Shimoga from January 2016 to August 2018.

Type of study

This is a randomized descriptive longitudinal study conducted after taking clearance from ethical committee. Patients were properly informed regarding the nature of the disease process, proposed surgical procedure including expected outcomes, potential complications and alternative treatments. Written consent was taken from patient and attendant both.

Inclusion criteria

Patients with inactive mucosal chronic otitis media [COM] having large central perforation in which the ear had been dry for at least 6 weeks.

Exclusion criteria

Patients with active mucosal COM, active or inactive squamosal COM, ossicular discontinuity, tympano-sclerosis, revision surgeries, sensorineural/mixed hearing loss, presence of focus of infection in nose, sinuses, or throat and failure to follow up for at least 3 months.

All these cases had undergone detailed workup which included history, clinical examination of ear, nose and throat including oto-endoscopy, tuning fork tests, pure tone audiometry, X-ray mastoid (Schuller's view) and routine lab investigations. Informed consent was obtained from all the patients.

All the cases were performed under local anaesthesia with intravenous sedation, through transcanal approach using zero degree wide angle 4mm rigid endoscope.

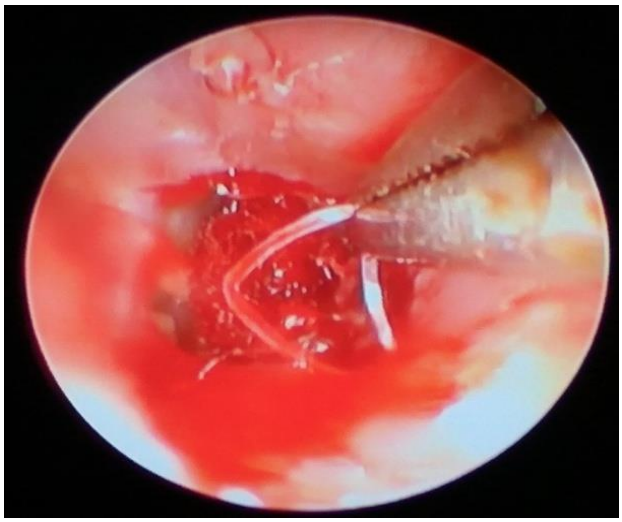

Figure 1: Freshening of margins of the perforation.

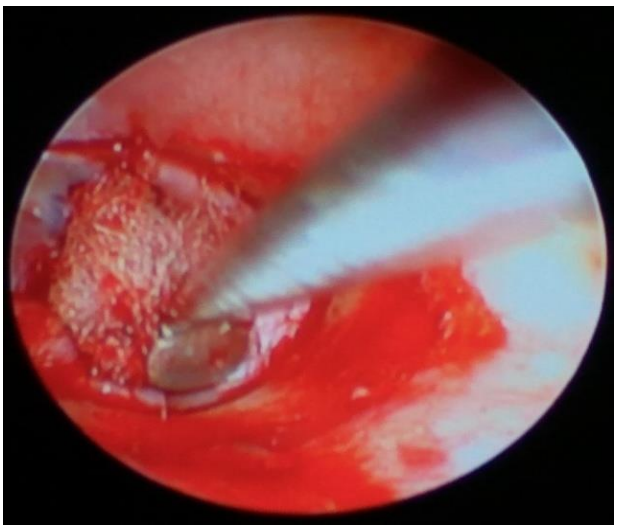

Figure 2: Circumferential incision 4 mm away from the annulus.

In all these cases, after freshening of margins, canal wall incision was given circumferentially 5mm away from the annulus so as to create a superiorly based flap (Figure 1 and 2). Tympanomeatal flap was then elevated along with

the annulus, leaving behind the mucosal layer of remnant tympanic membrane (Figure 3 and 4). Temporalis fascia was harvested with a 2 cm hair line incision and allowed to dry. Temporalis fascia was then grafted over the remnant mucosal layer, resting over the malleus handle and on the bony canal walls all around after placing the adequate gel foam in the middle ear (Figure 5). The tympanomeatal flap was then reposited and gel foam was placed again in the external auditory canal (Figure 6). In the postoperative period antibiotics, analgesics and decongestants were administered for 1week. Antibiotic ear drops were prescribed for 4 weeeks. Patients were followed up on a regular basis, at 1st week, 2nd week, 4th week, 8th week, and at 12th week. At 12th week, a postoperative pure tone audiogram was done to assess and compare with the preoperative hearing levels. 'Paired t test' was used to statistically analyze the results.

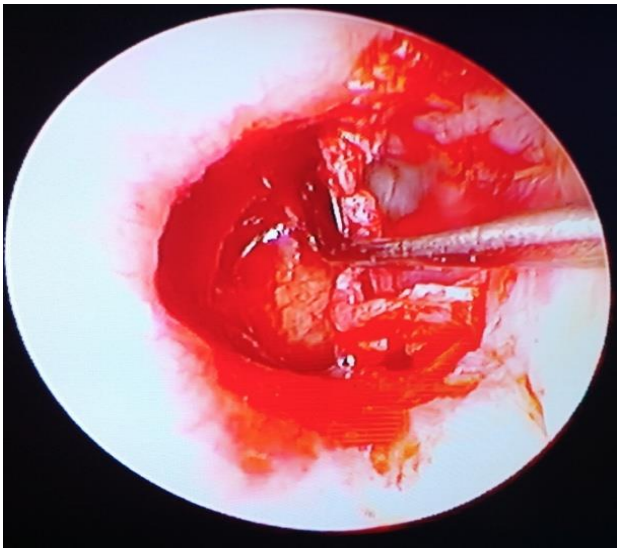

Figure 3: Elevation of superiorly based tympanomeatal flap.

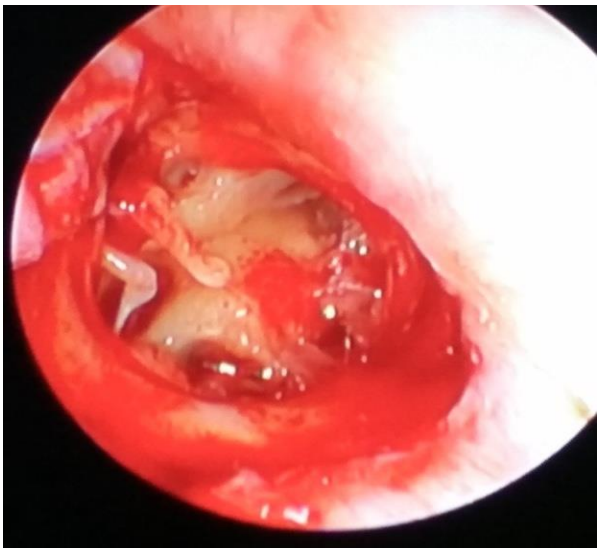

Figure 4: View of middle ear after flap elevation.

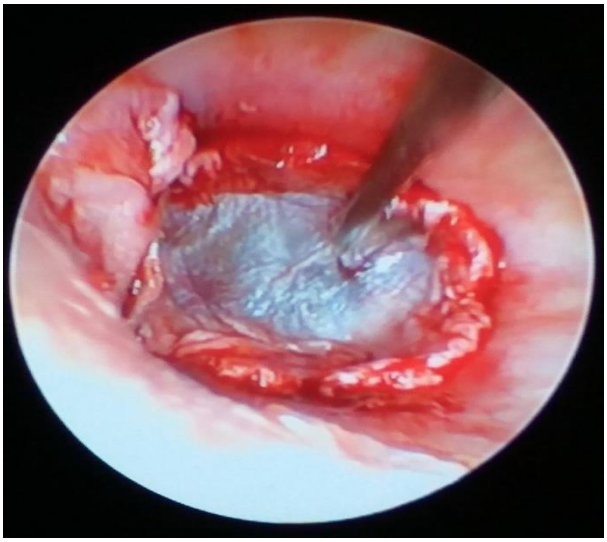

Figure 5: Temporalis fascia graft placement.

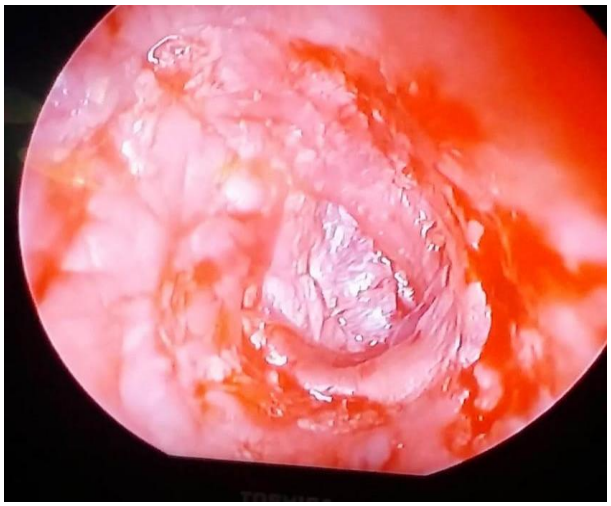

Figure 6: Tympanomeatal flap reposited after graft placement.

RESULTS

A total of 30 cases included in the present study. The age of the patients ranged from 19 to 62 years, with mean age of 36.2 years. Maximum number of patients was in the age group of 31 to 40 years (Table 1).

Table 1: Age distribution of the patients.

Age group (years)	Number of patients	%
11-20	1	3.33
21-30	10	33.33
31-40	9	30
41-50	6	20
51-60	3	10
61-70	1	3.33
Total	30	100

Among total of 30 cases 13 (43.3%) were male and 17 (56.7%) were female patients with male female ratio of 0.76:1 (Table 2).

Table 2: Gender distribution of the patients.

Gender	Number of patients	%
Male	13	43.3
Female	17	56.7
Total	30	100

Table 3: Preoperative air bone gap of the patients.

Preoperative ABG (dB)	Number of patients	%
0-10 dB	1	3.33
11-20 dB	7	23.33
21-30 dB	15	50
31-40 dB	6	20
41-50 dB	1	3.33

Table 4: Outcome of graft uptake at 12 week follow up.

Graft outcome	Frequency	%
Accepted	28	93.3
Rejected	2	6.7
Total	30	100

The preoperative air bone gap (ABG) was between 0-10dB in 1 (3.33%) patient, 11-20 dB in 7 (23.33%) patients, 21–30 dB in 15 (50%) patients, 31-40 dB in 6 (20%) patients and 41-50 dB in 1 (3.33%) patient as shown in Table 3 with the mean preoperative ABG being 27.33 dB with standard deviation of 7.51.

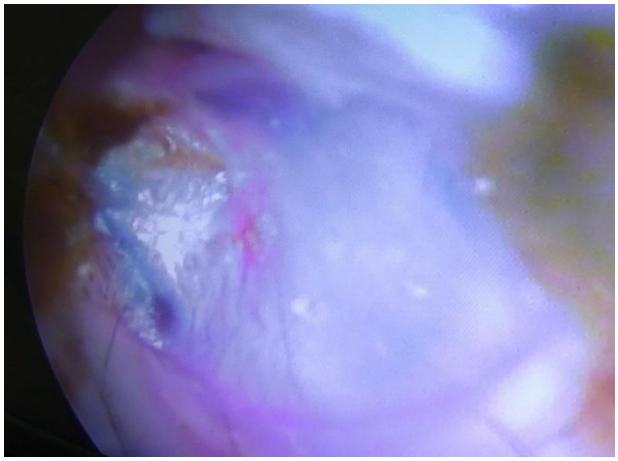

Figure 7: Well taken up graft at the end of 12weeks.

Post operatively at 12weeks follow up graft was taken up in 28 (93.33%) out of 30 patients while rejected in 2 (6.7%) patients (Table 4 and Figure 7 and 8).

Figure 8: Well taken up graft at the end of 12 weeks.

Table 5: Postoperative air bone gap of study population.

Postoperative ABG (dB)	Number of patients	%
0-10 dB	23	76.66
11-20 dB	5	16.66
21-30 dB	2	6.66
31-40 dB	0	0
41-50 dB	0	0

The mean postoperative ABG was reduced to 10.5dB with standard deviation 6.06 and the postoperative ABG changing to 0-10 dB in 23 (76.66) patients, 11-20 dB in 5 (16.66%) patients and 21-30 dB in 2 (6.66%) patients (Table 5 and Figure 11). Mean ABG gain was 16.33dB with standard deviation 5.56. The change in ABG distribution after the surgery was statistically significant ($p<0.001$)

None of the patients needed canaloplasty to increase surgical exposure, no patients had keloid formation. Scar at the site of graft harvest was acceptable in all the patients.

DISCUSSION

Endoscope has many advantages in performing ear surgeries. It gives the panoramic as well as magnified view of whole of the tympanic membrane, ear canal and middle ear cavity without having to manipulate the patient's head. It extended view of the operative field in transcanal procedures into structures usually hidden under the microscopic view such as anterior canal recess, anterior perforation, fundus of retraction pocket, facial recess, sinus tympani and hypotympanum. There is no need for canaloplasty except in few circumstances where a little curettage of the canal is sufficient to visualize the annulus all around and middle ear structures. It is possible to have visualization from multiple angles as opposed to the single axis view by the microscope along the ear canal.

Karhuketo et al studied the endoscopic assisted myringoplasty in 30 ears of 29 patients with different sized perforation and concluded that it is reliable and simple procedure with the benefit of minimal trauma to the healthy tissue. They achieved success rate of 80% and ABG closure of less than 10db in 90% of ears.[7] The success rate of present study is better but ABG closure is poorer than Karhuketo et al.

Furukawa et al studied 25 ears and observed that the anterior edge of the perforation was not visible under microscope in 2 years after freshening of the perforation. Endoscopic views however revealed the entire image of the tympanic membrane in one field and clear visualization of the perforation edges even when the ear canal was narrow. The overall success rate for perforations was 84.0%. The mean preoperative ABG was 15.6 dB which reduced to 5.3 dB post operatively with ABG of less than 10 dB in 88.0% of the ears.[8]

In our study we did not experience problem in visualization of anterior edge of perforation in any of the ears.

Raj et al Studied endoscopic and microscopic myringolasty in 40 cases with 20 in each group. There was 90% graft uptake rate in endoscopic group as compared to 85% in microscopic group. Also the mean ABG gain in patients who had undergone endoscopic myringoplasty was 8.0 dB, while in microscopic group it was 7.5 dB which is comparable to success rate as well as post op ABG gain of our study. Postoperative air bone gap was less than l0dB in 60% of the patients in endoscopic group and 55% in microscopic group. But there was no statistically significant difference in the gain in ABG in the two groups.[9]

In study by Choi et al mean operation time for microscopic technique group (88.9±28.5 minutes) was significantly longer than the endoscopic technique group and canaloplasy had to be performed in 33.3% of patients but was not required in endoscopic technique group. Graft success rate in the endoscopic and microscopic technique groups were 100% and 95.8%, respectively.

The duration of operation is an important factor to reduce morbidity. In a study by Ghaffar et al, the mean duration was 62.65 min among 34 patients who underwent endoscopic tympanoplasty.[10]

In study by Ambani et al, the average time taken was around 1 hour 30 min which is consistent with duration of surgery in our study.[11]

Table 6: Success rate (Graft take up) of microscopic interlay technique as reported in different case series.

Sl.No	Source	Number of cases	Year	Success (%)
1	Kawatra et al[1]	30	2014	93.3
2	Komune et al[13]	69	1992	94
3	Hay et al[14]	116	2014	91
4	Jain et al[15]	500	2017	96.6
5	Patil et al[16]	100	2014	96

Table 7: Success rate and hearing gain in endoscopic myringoplasty as reported in different case series.

Sl.No	Source	No. of cases	Graft success rate (%)	ABG closure ≤10 dB (%)
1	El-Guindy et al[5]	36	91.7	83.3
2	Shoeb et al[6]	30	93.33	-
3	Karhuketo et al[7]	30	80	90
4	Furukawa et al[8]	25	84	88
5	Ambani et al[11]	40	87.5	30
6	Yadav et al[17]	50	80.0	80
7	Choi et al[18]	25	100	-
8	Kumar et al[19]	30	83	30
9	Present study	30	93.33	76.66

Success rate of microscopic interlay technique as well as different endoscopic techniques are shown in Table 6 and 7 respectively as reported in different case series. The results of endoscopic myringoplasty are comparable to the conventional myringoplasty done under operating microscope.

In study by Gaur et al none (0%) of the patients of endoscope group had a visible scar, whereas in the microscope group, 21 (70%) patients had a visible scar and in 9 (30%) patients, the scar was not visible.[12] In the present study none of the patients had visible scar. Endoscopic tympanoplasty has better cosmesis, less morbidity and early postoperative wound healing.

However endoscopic procedure also has disadvantages. One of the main disadvantages of endoscopic surgery is that it is a one handed technique as one hand is engaged

to hold the scope. So in a situation of active bleeding the endoscopic view is difficult and time consuming, as tip of endoscope has to be cleaned frequently. The images we get on the monitor are 2D images and hence surgeon will not have better depth perception so one has to be careful while working close to vital structures and while positioning of the graft. But this is not an issue as the surgeon gains the experience after few cases and newer high definition cameras have improved the quality of image and have minimized the drawback of 2D images. Other disadvantage is heating of the endoscope due to heat generation by light source which may cause thermal injury to the external auditory canal and middle ear structures, but this is usually overcome as endoscope will be withdrawn repeatedly for cleaning and defogging hence unlikely to cause tissue damage.

CONCLUSION

Endoscopes offer a great technical advantage in performing myringoplasty with extended view of operative field. Endoscopic transcanal interlay myringoplasty with superiorly based tympanomeatal flap is an effective technique over conventional microscopic technique in terms of graft uptake, hearing improvement, better postoperative scar and less morbidity in cases of inactive mucosal COM.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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