

# A COMPARATIVE STUDY OF ENDOSCOPIC MYRINGOPLASTY V/S MICROSCOPIC MYRINGOPLASTY

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## ABSTRACT

### INTRODUCTION

Chronic suppurative otitis media (CSOM) is one of the common Otological conditions in India for which patients seek advice from an Otorhinolaryngologists. Poverty, illiteracy, overcrowding and poor hygiene are all factors which play an important role in the causation of the disease.

Various surgical modalities of treatment have been tried since ages to eliminate this disease from the middle ear cleft. The use of the surgical microscope brought revolutionary advances into the field of Otological surgery because its new technology expanded the ability of surgeons to see in limited confines of the temporal bone.

Initially endoscopes were used only for diagnostic and photographic purposes but now endoscopes are being used more and more for surgical purposes.

The current study attempts to study the advantages and disadvantages of endoscopic myringoplasty in comparison to the conventional microscope assisted myringoplasty.

### OBJECTIVES

To evaluate the efficacy of Endoscopic myringoplasty with Microscopic Myringoplasty with reference to hearing and graft uptake

### MATERIALS AND METHODS

Fifty cases of clinically diagnosed chronic suppurative otitis media with dry central perforation were taken into account of which 25 cases were undergone endoscopic myringoplasty

and 25 cases undergone conventional myringoplasty. All patients were followed up till 6 months after surgery.

### RESULTS

There was a strong statistical significant difference between the two groups ( $p < 0.001$ ) for duration of surgery, hospitalization and hearing gain and graft uptake. In endoscopic and conventional groups of myringoplasty, the mean hearing loss improved to 16.88 dB and 19.76 dB respectively.

### CONCLUSION

The surgical outcome of endoscope assisted myringoplasty was comparable in terms of tympanic membrane status after surgery, but in terms of duration of surgery, hospitalization and post-operative air bone gap patients in the endoscope group had better results.

### KEYWORDS

Chronic suppurative otitis media, Endoscopic Myringoplasty, Microscopic Myringoplasty.

### INTRODUCTION

Chronic suppurative otitis media (CSOM) is one of the common Otological conditions in India for which patients seek advice from an Otorhinolaryngologists. Poverty, illiteracy, overcrowding and poor hygiene are all factors which play an important role in the causation of the disease.

Various surgical modalities of treatment have been tried since ages to eliminate this disease from the middle ear cleft. In the surgical repair of tympanic membrane perforations, various factors come to play like size of perforation, bony overhang,

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Eustachian tube function, middle ear mucosa state, degree of pneumatisation and so on. Further factors like approaches (permeatal, end aural, post aural), graft sources (temporalis fascia, perichondrium, fascia lata), placement of graft (underlay, overlay) add to decision making and influence the results. Thus there can be no single best technique for tympanoplasty.

The use of the surgical microscope brought revolutionary advances into the field of Otolological surgery because its new technology expanded the ability of surgeons to see in limited confines of the temporal bone. Similarly, endoscope provides dramatic new vistas to the Otologist, and we are just in the early exciting phase of developing the appropriate applications and supporting instrumentation. The endoscope lens brings the surgeon's view into the depths of the operative field and can provide a wide field of view with perspectives not possible through a surgical microscope. Many deep recesses within the temporal bone cannot be visualized directly without the surgeon taking measures to expand the surgical exposure. Endoscopes have an immediate advantage with an inherently wide field of view that extends from the tip of the instrument's lens. Additional angulations of view are accomplished by placing prism on the end.<sup>1</sup> The most important advantage of endoscope in otology is its direct, natural, quick access to least accessible nook and corner of middle ear cavity which are hidden to surgeon's view even with the use of microscope. These areas of surgical failure are sinus tympani, anterior tympanic area, supra tubal recess, attic, tubal area, facial recess etc.

Initially endoscopes were used only for diagnostic and photographic purposes but now endoscopes are being used more and more for surgical purposes. Endoscopes helps in the eradication and complete removal of the disease leading to less occurrence of recurrence of disease.<sup>2</sup> Middle ear endoscopic technique helps in Ossicular chain preservation in cholesteatoma surgeries<sup>3</sup>. By an exclusive transcanal endoscopic approach, surgical treatment of attic retraction pockets

preserving as much as possible the ventilation routes, anatomy and physiology of middle ear is possible. In future it may be possible to lift up the retraction pockets by re-establishing the ventilation pathways of attic without much dissection. Anatomy of middle ear spaces and folds have been revised through endoscopic studies of temporal bones.<sup>4</sup>

The current study attempts to study the advantages and disadvantages of endoscopic myringoplasty in comparison to the conventional microscope assisted myringoplasty. The findings of such a comparison study may help in decision making while choosing between the two techniques for any particular patient. It would help to tailor the technique used and thus individualize the decision.

#### **MATERIALS AND METHODS**

This prospective study was conducted from July 2016 to April 2017 in the Department of Otorhinolaryngology Rajarshee Chhatrapati Shahu Maharaj Government Medical College and Chhatrapati Pramila Raje Hospital, Kolhapur between 2016-2017 on 50 patients attending with a clinical diagnosis of chronic suppurative otitis media in the Otorhinolaryngology Out-Patient Department (OPD) of the hospital. Purposive sampling was done to obtain the sample size for this study.

#### **Inclusion criterias:**

1. Tubotympanic type of CSOM
2. Dry ear for the past 3 weeks
3. Conductive type hearing loss

#### **Exclusion Criterias:**

1. Patients who underwent Myringoplasty earlier
2. Discharging Ear
3. Patients with traumatic perforation of less than 2 months
4. Patients with Unsafe chronic suppurative otitis media

A total of 50 patients were taken in the study. They were divided in 2 groups for the study as below:

**Group 1:** Patients who underwent Endoscopic Myringoplasty (n=25)

**Group 2:** Patients who underwent Microscopic Myringoplasty (n=25)

All patients underwent a detailed clinical examination to evaluate perforation site & size by Otomicroscopy. Pure tone Audiometry (PTA) was done to assess type of hearing loss and to quantify hearing loss. X-ray mastoid Schullers view was taken to know the pneumatization pattern. Those who fit in the inclusion criteria were randomly allocated to the study group who were then operated by conventional Microscopic Myringoplasty & Endoscopic Myringoplasty. In all subjects Temporalis Fascia was taken as the source of graft.

For the postoperative evaluation, the patients were analysed for Duration of surgery, Duration of hospital stay, Graft uptake and Hearing improvement- by repeat pure tone Audiometry after 12 weeks.

**Statistical analysis:**

Descriptive and inferential statistical analysis was carried out in the study. Result on continuous measurements was presented on mean + SD and that on categorical measurements was presented in number (%). Statistical analysis was performed using Microsoft Excel and Statistical Package for Social Sciences version 20 (IBM Corp.; Armonk, NY, USA) software. Significance was assessed at 5 % level of significance. Student t-test was used to find the significance of the study parameters on continuous scale between two groups (Inter group analysis) on metric parameters. Chi-square test was used to find the significance of study parameters on categorical scale between two or more groups. P value of  $0.05 < P < 0.10$  was taken as significant. P value of  $0.01 < p < 0.05$  was taken as Moderately significant. P value of  $P < 0.01$  was taken as strongly significant

**OBSERVATIONS**

Out of the 50 subjects recruited into the study, 25 patients underwent endoscopic myringoplasty (group 1) while the other half underwent conventional myringoplasty (group 2).

**TABLE 1: AGE DISTRIBUTION**

Age in years	Group I	Group II	Total
11-20	3(12%)	1(4%)	4(8%)
21-30	6(24%)	9(36%)	15(30%)
31-40	7(28%)	5(20%)	12(24%)
41-50	5(20%)	5(20%)	10(20%)
>50	4(16%)	5(20%)	9(18%)
Total	25(100%)	25(100%)	50(100%)
Mean±SD	34.72 ±13.51	36.68 ±14.35	35.83 ±13.83

The mean age in the group 1 was 34.72 and group 2 was 36.68 (Table 1). There was no significant difference in the age distribution of the subjects in two groups ( $p=0.622$ ).

**TABLE 2: GENDER DISTRIBUTION**

Gender	Group I	Group II	Total
Male	16(64%)	13(52%)	29(58%)
Female	9(36%)	12(48%)	21(42%)
Total	25(100%)	25(100%)	50(100%)

Statistical analysis does not show any significant difference in female to male ratio between both the groups (16:9 versus 13:12;  $p=0.390$ ) (Table 2).

**TABLE 3: SOCIOECONOMIC STATUS**

Socio economic status	Group I	Group II	Total
LMC	13(52%)	14(56%)	27(54%)
UMC	12(48%)	11(44%)	23(46%)
Total	25(100%)	25(100%)	50(100%)

Both the groups had comparable proportions of low middle class and upper middle class socioeconomic status patients ( $p= 0.777$ ) (Table 3).

**TABLE 4: PREOPERATIVE AIR BONE GAP**

Preoperative audiometry (decibel)	Group I	Group II	Total
25-30	17(68%)	16(64%)	33(66%)
31-35	8(32%)	9(36%)	17(34%)
Total	25(100%)	25(100%)	50(100%)
Mean±SD	29.12±2.53	29.16±2.67	29.14±2.57

In preoperative audiometry, the median hearing loss in group 1 and group 2 were 29.12 (SD=2.53) and 29.16 (SD=2.67) decibel respectively (Table 4). This was comparable and there was no significant difference between the groups ( $p= 0.956$ ).

**TABLE 5: MEAN DURATION OF SURGERY**

Duration of surgery (hrs)	Group I	Group II	Total
1-2	9(36%)	0 (0%)	9(18%)
2-4	16(64%)	23(92%)	39(78%)
4-6	0(0%)	2(8%)	2(4%)
Total	25(100%)	25(100%)	50(100%)
Mean±SD	2.51±0.54	3.74±0.43	3.12±0.79

The mean duration of surgery in group 1 was 2.51 hours (SD=0.54) while that in group 2 was 3.74 hours (SD=0.43) (Table 5). There was a strong statistical significant difference in the duration of surgery between the two groups ( $p<0.001$ ).

**TABLE 6: MEAN DURATION OF HOSPITALIZATION (DAYS)**

Duration of hospitalization (days)	Group 1	Group 2	Total
3	2(8%)	0 (0%)	2(4%)
4	18(72%)	2(8%)	20(40%)
5	5(20%)	23(92%)	28(56%)
Total	25(100%)	25(100%)	50(100%)
Mean±SD	4.5± 0.27	4.92±0.27	4.52±0.57

The mean number of days of hospitalization in group 1 was 4.5 days (SD=0.27) while that in group 2 was 4.92 days (SD=0.27) (Table 6). There was a strong statistical significant difference in the duration of hospitalization between the two groups. ( $p<0.001$ )

**TABLE 7: POSTOPERATIVE AIR BONE GAP**

Post-operative audiometry at 24 weeks (decibel)	Group I	Group II	Total
10-14	3(12%)	0 (0%)	3(6%)
15-19	17(68%)	7(28%)	24(48%)
20-25	5(20%)	18(72%)	23(46%)
Total	25(100%)	25(100%)	50(100%)
Mean±SD	16.88±2.58	19.76±2.14	18.32±2.76

In postoperative Audiometry, the mean hearing loss improved in Group 1 was 16.88 decibel (SD=2.58) and in Group 2 was 19.76 decibel (SD=2.14). (Table 7) There was a strong statistical significant difference between the two groups ( $p<0.001$ ). So the extent of improvement in A-B gap was better in Group 1 than in Group 2.

**TABLE 8: TYMPANIC MEMBRANE STATUS AFTER SURGERY**

Tympanic Membrane status	Group I	Group II	Total
Intact	22(88%)	20(80%)	42(84%)
Perforation	3(12%)	5(20%)	8(16%)
Total	25(100%)	25(100%)	50(100%)

After 24 weeks of surgery, the tympanic membrane was found to be intact in 88% cases in group 1 and 80% cases in group 2 (Table 8). The study showed a better graft uptake in Endoscopic Myringoplasty as compared to Microscopic Myringoplasty. Graft uptake status show in Table 8 (88% in Group 1 versus 80% in group 2).

**DISCUSSION:**

The present study compared the surgical outcome of conventional myringoplasty with that of endoscopic myringoplasty in Chronic Suppurative Otitis Media (CSOM). 25 subjects with Chronic Suppurative Otitis Media were recruited into each of these groups with 25 subjects each and outcome variables were assessed 24 weeks after surgery. Both the groups were comparable in terms of age distribution. Majority of patients in both the groups were between age 18-40 which is similar to previous studies (Harugop et al).<sup>5</sup> Michael and Glasscock et al. (1982)<sup>6</sup> reported in their study of 1556 patients with tympanic membrane grafting that there was no difference in the rate of graft uptake based upon age of the patient. Both the groups were comparable in terms of gender. In our study male to female ratio is 1:1.2 which is comparable to the previous studies like Caye Thomas et al. (2007)<sup>7</sup> where male to female ratio was 1.36. Both the groups were comparable in terms of

socioeconomic status. Browning GG (1991)<sup>8</sup> stated that there is a close relationship between chronic otitis media and low socioeconomic status. This may probably be because of poor general health, malnutrition and overcrowding. This may have implications in post-operative aftercare and prognosis. But as both the groups were comparable, it is unlikely that such sociocultural factors have affected the comparison of surgical outcomes between the groups.

Regarding pre-operative air bone gap (Table 4), tympanic membrane perforation was  $\leq 3$  mm in 12 patients and between 3 and 6 mm in 20 patients. The air-bone gap (ABG) of the patients was  $18.5 \pm 6.29$  dB preoperatively,  $8.81 \pm 3.53$  dB postoperatively at second month,  $8.09 \pm 3.55$  dB postoperatively at sixth month, and  $7.96 \pm 3.32$  dB postoperatively at twelfth month. Two (6.3%) of the patients had postoperative myringitis. Two (6.3%) patients had recurrent perforation in the postoperative follow-ups. In our study preoperative audiometry, the median hearing loss in group 1 and group 2 were 29.12 (SD=2.53) and 29.16 (SD=2.67) decibel respectively. This was comparable and there was no significant difference between the groups.

The duration of surgery was found to be significantly lower in the group that underwent endoscopic surgery compared to that of conventional myringoplasty. Raghvendra Singh Gaur et al.<sup>9</sup> observed that endoscopic assisted myringoplasty required an average 132 min (range of 90–180 min) and microscopic assisted myringoplasty required an average of 116 min (range of 80–150 min). In our study, around 40% patients had duration of surgery of 2 hours. More than 90% cases of conventional surgery were completed within 4 hours. This suggests that duration of surgery and related morbidity can be reduced with endoscopic myringoplasty. None of the subjects had any postoperative complications

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in the immediate period.

There was a significant difference between the two groups in the duration of hospitalization after surgery. Subjects who underwent endoscopic myringoplasty had significantly lesser number of days of hospitalization compared to conventional myringoplasty. 72% of patients who underwent endoscopic surgery required hospitalization for four days while around 92% of cases who underwent conventional surgery required five days of hospitalization after surgery. This difference has been observed consistently in other studies also.<sup>10</sup>In the study by Harugopet al<sup>5</sup>, subjects who underwent endoscopic surgery took an average of 2.4 days to return to daily routine while this was 5.4 days in subjects who underwent conventional surgery. So for patients who insist on early mobility, endoscopic myringoplasty is a viable choice.

In both the groups there was an improvement in the A-B gap from the preoperative condition at 24 weeks. This suggests that myringoplasty was effective in improving the hearing deficit in these patients. The study revealed significant differences between the two groups in the extent of improvement in A-B gap. This is consistent with the existing literature.<sup>11,12</sup> So the clinical improvement in hearing is comparable in both conventional and endoscopic myringoplasty at the end of 6 months. Choice of a specific method may depend on other aspects related to the patient and surgery.

Majority of subjects in both groups had healthy graft status after 6 months. 22 in endoscopic group and 20 in conventional group had healthy tympanic membrane. The success rates after myringoplasty are comparable to other studies. Lade et al<sup>12</sup>found graft uptake in 83% of cases in both the groups. In the study by Harugopet al<sup>5</sup>, success rate at 6 months was 82% in conventional myringoplasty and 86% in endoscopic myringoplasty. El Guindy (1993)<sup>13</sup> found graft uptake of 91.7% in endoscopic group. Tarabichi

(1999)<sup>14</sup> found graft uptake of 94% in his study of endoscope assisted ear surgery.

In addition to the above mentioned quantitative aspects related to the surgical outcome, endoscopic myringoplasty offers some practical advantages to the surgeon. These pragmatic and qualitative aspects also need to add upto other considerations in choosing between endoscopic or conventional myringoplasty in a specific patient.

The mobility of the endoscopic camera is much better than a microscope with its fixed heavy stand. It gives a continuous movie camera type of picture by moving easily to the site of interest in contrast to static vision of the microscope. The angled scopes help in increasing the visibility and accessibility to difficult areas like canal wall, anterior recess, anterior perforation and Eustachian tube and the Ossicular chain. This is helpful while shifting from one area to the other like in elevation of the flap. There is no need of repeated adjustments like in the microscope with the endoscope. Vision beyond the shaft of the instruments is possible so instruments do not interfere with the vision like in the microscope.

The magnification is very high through the T.V. monitor. Physical posture of the surgeon is also better because of the monitor. Communication between the surgeon and assistants, peers and students is also better as everyone sees the same image. Recording is possible which is useful for medico-legal and teaching purposes.

## **CONCLUSION**

The objectives of this study were to compare the advantages and disadvantages of endoscope assisted myringoplasty with conventional myringoplasty and compare the results in terms of duration of surgery, post-operative stay, percentage of graft uptake and improvement in Air bone gap in patients requiring only myringoplasty done by the same surgeon. The study included 50 patients, out of which 25 patients underwent endoscopic myringoplasty and 25 patients

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underwent conventional myringoplasty.

In our study, the success rate of endoscope assisted myringoplasty was comparable to that of microscope assisted myringoplasty in terms of hearing and graft uptake. In terms of duration of surgery and duration of hospitalisation and postoperative hearing improvement, endoscopic myringoplasty had an advantage over conventional myringoplasty without added expenditure. We were able to achieve good access to least accessible nook and corner of middle ear cavity like sinus tympani, facial recess etc. Using the endoscopes even in narrow canals and overhangs Loss of depth perception and one handed technique are the limitations of the endoscope that can be easily overcome with practice.

We feel that the endoscope has a definite place in all ear and mastoid surgeries. Although a study with greater number of patients will add to the significance of the present study.

#### **Ethical Considerations of the Study:**

1. Ethics Committee Approval; Ethics committee approval was received for this study from the Institutional Ethics Committee of RCSM Government Medical College and CPR General Hospital Kolhapur, India. (Approval Date: 11/02/2016; Approval No.: RCSMGMCK/Pharmac/Ethics Comm/13/2016).
2. Written Informed Consent was obtained from concerned subjects and authority of institutions.
3. Privacy, confidentiality and anonymity were granted.
4. Scientific objectivity was maintained with honesty and impartiality.

**Authors Contributions:** Concept – A.A.; Design – A.A.; Supervision – A.A., SS; Resource - A.A., SS; Materials - A.A.; Data Collection and/or Processing – A.A., SS; Analysis and/or Interpretation – A.A.; Literature Search – A.A., SS; Writing – A.A., SS; Critical Reviews - A.A., SS.

**Conflict of Interest:** The authors declare that this study has had no conflicts of interest.

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