

Endoscopic vs Microscopic Myringoplasty

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Abstract:-

Usually myringoplasty is done by post aural or end aural approach using operating microscope, after advent of rigid endoscopes surgeons are using them for ear surgeries like tympanoplasty, ossiculoplasty, myringotomy and grommet insertion. Although no of studies have been done on the use of endoscope in middle ear surgeries still there is need of lot more research on the advantages and challenges offered by the otoendoscope vis-a-vis the microscope. Therefore we conducted this study with the aim of evaluating technical and operational advantages and limitations of endoscopic myringoplasty over microscopic myringoplasty.

In this study successful graft uptake was seen in 30 (90.90%) patients of endoscopic (E) group and 31 (93.93%) patients of microscopic (M) group. Post-operative ABG within 20 dB which was considered as measure of success was obtained in 30 (90.90%) patients of endoscopic (E) group and 31 (93.93%) patients of microscopic (M) group. Average total time taken was 76 min in endoscopic myringoplasty and 95 min in microscopic myringoplasty. In the microscopic group 8(24.24%) complained of significant post-op pain in the post auricular area while as 3(9.09%) patients of endoscopic group complained of pain in supra-hairline incision area during post-op period. All the patients of Endoscopic group rated the cosmetic aspect of the procedure as excellent while as in the microscopic group 5 (15.15%) patients termed it excellent, 26 (78.79%) patients termed it satisfactory and 2 (6.06) patients termed it as poor.

Therefore endoscopic myringoplasty gives comparable graft uptake and audiometric outcome to microscopic myringoplasty and advantage in terms of less operative time, better cosmetic result and faster postoperative recovery.

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I. Introduction

Usually myringoplasty is done by post aural or end aural approach using operating microscope, after advent of rigid endoscopes surgeons are using them for ear surgeries like tympanoplasty, ossiculoplasty, myringotomy and grommet insertion [1, 2]. Rigid endoscopes were first developed by Hopkins, using rod shaped glass lenses in the relay system [3, 4]. The rod lens provides a wider viewing angle and exceptional resolution and brightness [5]. Mer and colleagues introduced the middle ear endoscopy in 1967. Since then endoscopes are increasingly used for various middle ear surgeries [3]. Endoscopes have lot of advantages over microscope. Unlike microscope, endoscope is easily transportable and hence ideal for use in ear surgery camps [6]. Variations of external auditory canal like stenosis, tortuosity, bony overhangs etc. hamper the view of tympanic membrane when visualized through microscope. Therefore we need to manipulate the patients head or the microscope repeatedly to visualize all the parts of tympanic membrane. Sometimes, in spite of manipulation, tympanic membrane will not be fully visualized and canaloplasty has to be done. This in turn may increase the operation time, Wullstien [7].

In sharp contrast, the endoscope brings the surgeon's eye to the tip of the scope. The wide angle of zero degree scope visualizes the entire tympanic membrane. There is no need to frequently adjust the patients head or to do canaloplasty thereby saving operative time-Rosenberg [8]. With angled endoscopes Raj and Meher [9], reported that it is possible to visualize other structures like round window niche, Eustachian tube orifice, incudo-stapedial joint. By avoiding post aural incision in Endoscopic Myringoplasty there is less dissection of normal tissues, less intra operative bleeding, less incidence of post-operative pain and better cosmetic outcome. Avoiding post aural route also reduces chance of auricular displacement and asymmetry of pinna.

Although no of studies have been done on the use of endoscope in middle ear surgeries still there is need of lot more research on the advantages and challenges offered by the otoendoscope vis-a-vis the

microscope. Therefore we conducted this study with the aim of evaluating technical and operational advantages and limitations of endoscopic myringoplasty over microscopic myringoplasty.

II. Methodology

The current study was conducted at District Hospital Kargil, Ladakh, J&K, India for a period of two years from September 2016 to October 2018. It comprised of 66 patients randomly divided into two equal groups called group E (endoscopic) and group M (microscopic) of 33 each. Written informed consent was taken from all patients to be part of the study and clearance was obtained from the institutional Ethical clearance committee.

Inclusion criteria for patients to be part of study were:

1. Csom with Dry Central Perforation.
2. Intact Ossicular Chain on pre-op High Resolution CT of temporal Bone
3. Pure Conductive hearing loss with PTA threshold below 45dB.

Exclusion Criteria

1. Csom with Marginal perforation, Cholesteatoma, Granulations or other pathologies
2. Ossicular chain abnormalities
3. Sensorineural or mixed hearing loss
4. Actively discharging ear
5. Revision cases

Patients in Group E were operated using the endoscope, and Group M patients underwent microscopic myringoplasty. Otoendoscopes used were 4 mm wide 10 cm length, 0 degree and 30 degree scopes and procedures were done directly off the monitor. Carl Zeiss Opmivario microscope with 250 focal length lens was used in the group M cases.

Outcome measures for comparison between the two groups were; postoperative graft uptake at 1 year, postoperative air-bone gap closure at 1 year, time taken for the operative procedure, postoperative pain and overall sense of cosmetic acceptance for the patient.

Successful graft uptake and postoperative air bone gap (ABG) within 20 dB was considered as successful outcome of the procedure.

III. Operative technique

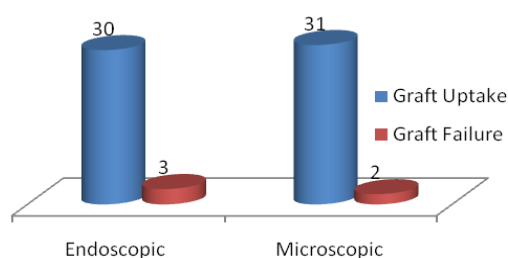
All patients were operated on by the same surgeon. All cases were done under local anaesthesia and sedation.

True temporalis fascia which was harvested through supra hairline incision in the E group patients and through standard postaural incision in the M group was used as the graft material in all cases and the technique employed was underlay in all cases. Trancanal approach was done in all endoscopic cases and postaural approach was done in all microscopic cases. Rest all the standard steps were same in both the groups except the curetting of postero-superior bony overhang which was done in several patients of only the microscopic group and closure of the post aural incision using interrupted vicryl sutures in again group M. Patients of the endoscopic group were discharged the same day evening while as patients of microscopic group were discharged the next day.

Follow up protocols in the groups was weekly for first 3 weeks then monthly for 3 months and then at 6 months and 1 year. A postoperative pain symptom was evaluated from just outside the OT till the end of 2nd week, graft uptake and audiometric evaluation with pure tone audiometry (PTA) was done at 1 year. Cosmetic and overall patient satisfaction with the procedure they underwent was noted again at one year.

IV. Observation & Discussion

Most common age group was between 20-30 followed by 30-40 and 10-20 years in both the M and E groups. Male to female ratio was 1:1.54 in M and 1:1.78 in E group. In this study successful graft uptake was seen in 30 (90.90%) patients of endoscopic (E) group and 31 (93.93%) patients of microscopic (M) group. Shoeb M. et al found the drum healing or graft uptake was 93.33% in both the groups (microscopic and endoscopic groups) [10]. Similar results were observed in the study conducted by Harugop AS et al, in their study, 41(82%) patients had a successful outcome in the endoscope group and 43 (86%) patients had a successful outcome in the microscope group [6]. Similarly in the study conducted by Lakpathi G. et al, they found at 6 months, 26 (88 %) patients had a successful outcome in the endoscope group and 27(90 %) patients had a successful outcome in microscope group[11]. Therefore graft uptake rate in our study matched the findings in similar studies quoted in literature.



In our study maximum patients i.e. 20(60.60%) in E group and 23(69.70%) in M group had preoperative air bone gap (ABG) within 30-40 dB as depicted in Table I.

S. No	Pre-op ABG in dB	Endoscopic Group (E)		Microscopic Group (M)	
		No of Pts	%	No of Pts	%
1.	0-10	0	0	0	0
2.	10-20	0	0	0	0
3.	20-30	8	24.24	6	18.18
4.	30-40	20	60.61	23	69.70
5.	40-45	5	15.15	4	12.12
6.	Total	33	100	33	100

While as 21 (63.63%) patients in E group and 20 (60.60%) patients in M group had postoperative air bone gap (ABG) with 10 dB. Post-operative ABG within 20 dB which was considered as measure of success was obtained in 30 (90.90%) patients of endoscopic (E) group and 31 (93.93%) patients of microscopic (M) group, table II. In the study conducted by Lakpathi G. et al almost 90 % of patients post operatively had an improvement in conductive hearing loss with average between 0 and 20 dB conductive hearing loss in both the microscopic as well as endoscopic groups[11]. In the study conducted by Shoeb M. et al found that in the microscopic and endoscopic groups the preoperative mean AB gap was 38.87 ± 4.88 dB and 35.6 ± 6.31 dB respectively and post-operative at 6 months mean AB gap was 17.47 ± 1.96 dB and 16.8 ± 74.32 dB respectively[10]. Kumar M. et al in their study observed that preoperative average AB gap in the microscopic group was 16.05dB and in the endoscopic group was 15dB. Average postoperative gain in the microscopic and endoscopic groups was 13.96 and 15.03 dB respectively[12]. Thus we found that the audiometric outcome in terms of postoperative gain in ABG was comparable in both the groups as was echoed in other studies done by other authors.

S. No	Post-op ABG in dB	Endoscopic Group (E)		Microscopic Group (M)	
		No of Pts	%	No of Pts	%
1.	0-10	21	63.63	20	60.61
2.	10-20	9	27.27	11	33.33
3.	20-30	1	3.03	0	0
4.	30-40	1	3.03	2	6.06
5.	40-45	1	3.03	0	0
6.	Total	33	100	33	100

As depicted in table III average total time taken was 76 min in endoscopic myringoplasty and 95 min in microscopic myringoplasty. Placement of the graft (20 min) and canal incision (8 min) took more time in E group than M group which was avg 15 min and 5 min respectively. This is understandable because endoscopic myringoplasty being a one handed procedure takes a little longer time during the steps needing two hands for holding different instruments. Rest of the steps took longer time in the M group especially the inspection of middle ear structures because it needed additional steps like curetting of the postero-superior bony overhang in several patients and frequent angulation and tilting of microscope and patients' head which ultimately led to the microscopic procedure being more time consuming. Similar results were observed by Patel J. et al who found that the average time taken for endoscope assisted tympanoplasty was around 75 minutes, while the same time taken for microscopic tympanoplasty was around 90 minutes[13]. In the study by Huang TY et al, the average operation time in microscopic group was 75.5 ± 20.4 minutes, compared to 50.4 ± 13.4 minutes in endoscopic group[14]. In the study by Ambani K. et al, average time taken for endoscopic myringoplasty was around 1 hour

30min with range of 70-140min[15]. In the study by Alguadivel J. et al, the time taken for the endoscopic technique is an average of 120 minutes with a range 80-160 minutes [16]. The difference in the operating time may be due to varying experience and expertise of the surgeon. However as was seen in our study, time taken in the endoscopic group is significantly lower in comparison to the microscopic group in all the studies quoted.

S. No.	Surgical Steps	Endoscopic Group	Microscopic Group
1.	External incision & Harvesting of Graft	15	25
2.	Freshening of perforation margins	6	9
3.	Canal Incision	8	5
4.	Elevation of TM flap	17	18
5.	Inspection of ME Structures	10	23
6.	Placement of graft	20	15
7.	Total	76	95

In the microscopic group 8(24.24%) complained of significant post-op pain in the post auricular area while as 3(9.09%) patients of endoscopic group complained of pain in supra-hairline incision area during post-op period. Quraishi et al. has also reported about less post-operative pain and morbidity in their endoscopic myringoplasty series [17]. Gadag R. et al in their study found that postoperative recovery was better in the endoscopic group [18].

All the patients of Endoscopic group rated the cosmetic aspect of the procedure as excellent while as in the microscopic group 5 (15.15%) patients termed it excellent, 26 (78.79%) patients termed it satisfactory and 2 (6.06%) patients termed it as poor. Lakpathi G et al in their study, found that (100%) patients in the endoscope group rated their cosmetic result as excellent, where as in the microscope group 06 (20 %) patients rated their cosmetic result as poor, 15 (50%) rated the cosmetic result as satisfactory and 9 (30%) patients rated their cosmetic result as excellent [12]. In the study conducted by Kumar M, et al, in the endoscopy group all the patients rated their cosmetic outcome as excellent, whereas in the microscopic group 10 patients (33.3%) rated their cosmetic result as excellent, 16(53.3%) and 4(13.3%) patients rated their cosmetic result as satisfactory and poor respectively [13]. Their findings were echoed by Harugop AS et al in their study, they observed that at the end of six months all (100%) patients in the endoscope group rated their cosmetic result as excellent whereas in the microscope group 10 (20%) patients rated their cosmetic result as poor, 25 (50%) patients rated the cosmetic result as satisfactory and 15(30%) patients rated their cosmetic result as excellent [6].

None of the endoscopic group patients developed any significant post-op complication but in the microscopic group 1(3.03%) patient developed post-op wound infection and dehiscence which was properly managed and 2(6.06%) patients complained of temporary taste alteration due to too much handling and stretching of the chorda tympani nerve.

V. Conclusion

From this study we conclude that use of endoscope in ear surgeries is a viable alternative. In terms of graft uptake and audiometric improvement it provides results comparable to that with conventional microscopic tympanoplasty. In addition there are several advantages of the endoscope over microscope like less operative time, better cosmetic outcome, early and better postoperative recovery and return to normal routine, portability and cost effectiveness as you need only the endoscopes which can be used with camera and monitor used in nasal endoscopic surgeries.

But there are some limitations to it also such as one hand is consumed in holding the endoscope so sometimes when there is much bleeding in the field needing frequent suctioning, it can make the procedure cumbersome. Loss of depth perception due to monocular vision can sometimes pose risk when near to critical structures. There is also a steep learning curve.

Weighing the pros and cons it can be said that endoscopic ear surgery is definitely a safe and effective alternative to conventional microscopic technique.

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