Outcome of Endoscopic Assisted Underlay Myringoplasty for Chronic Otitis Media Mucosal Inactive Type: Endoscopic Versus Microscopic Approach

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ABSTRACT

Introduction: Myringoplasty is a common surgical procedure done for chronic otitis media mucosal inactive type. Operative microscope provides a magnified image in a straight line so surgeon cannot visualize all deep areas of middle ear. These limitations are addressed in endoscopic permeatal myringoplasty.

Methods: This was cross sectional study conducted on 86 patients of chronic otitis media mucosal inactive type. Patients were randomly selected for endoscopic or microscopic myringoplasty. Forty three patients were in endoscopic ear surgery and other forty three patients were in microscopic ear surgery. Underlay myringoplasty was performed with the help of either endoscope or microscope. Permeatal approach was used in endoscopic assisted myringoplasty and post auricular approach was used in microscopic assisted surgery. Underlay technique of myringoplasty was performed using cartilage perichondrium graft in all the patients. Post-operative evaluation was done in terms of graft uptake, operative time and postoperative complications compared with microscopic technique.

Results: The mean age of presentation was 29.33(SD=11.18) years and 27.74(SD=11.77) years (ranges 15-60 years) in endoscopic and microscopic group respectively (p = 0.525). The mean operating time was shorter in endoscopic group (55.81 minutes, SD=10.79) than microscopic group (92.44 minutes, SD=10.49) which was statistically significant (p<0.01). The graft uptake was 95.3% in endoscopic group and 88.4% in microscopic group. There was more success of graft uptake in endoscopic assisted group but it was not statistically significant. Regarding complications endoscopic group showed less complications (4.6%) compared to microscopic group (41.8%) in terms postoperative recovery and it was statistically significant (p<0.01).

Conclusion: Endoscope provides greater advantage over the microscope in myringoplasty surgery. Endoscope permeatal approach over postauricular approach should be utilized which takes less operative time, less postoperative complications and better graft uptake.

Keywords: cartilage perichondrium graft, endoscopic ear surgery, microscopic ear surgery, underlay myringoplasty

Citation: Pandey BR, Singh MM. Outcome of Endoscopic Assisted Underlay Myringoplasty for Chronic Otitis Media Mucosal Inactive Type: Endoscopic Versus Microscopic Approach. JKISTMC 2020; 2(1)3: (6-12)

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Conflict of interest: None
Source of support: None
Article info:
Received: 9 Sep, 2019.
Accepted: 15 Dec 2019.
Published: 31 Jan, 2020.

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INTRODUCTION

Chronic otitis media is common in lower socioeconomic population in developing country as compared to developed country. In 1978, Berthold introduced the term myringoplasty using free skin graft to close the perforation. Myringoplasty is one of the surgical techniques for the management of chronic Otitis Media mucosal inactive type. Previously temporalis facia was considered first grafting material but with lots of studies done in cartilage; it has shown that it is equally similar or even more successful for perforation closure.

Visibility under the microscope is limited so modern advances in endoscope design have provided a new tool for the examination of the anatomical structures in the middle ear and for the middle ear surgery. The advantages of using endoscope for chronic middle ear diseases are that it provides a wider field of view than microscope and offers higher resolution and magnification. Endoscope is superior to the microscope which provides better visual exposure of deep spaces and hidden structures like facial recess, sinus tympani, hypotympanum and epitympanic spaces.

So our main aim is to find out the outcome of endoscopic assisted underlay myringoplasty in terms of graft uptake, operative time and postoperative complication compared with conventional microscopic technique.

METHODS

This was an observational cross-sectional study conducted in the Department of Otorhinolaryngology in Lumbini Medical College, Teaching hospital over a period of 12 months from August 2018 to July 2019. Patients aged between 15 -60 years were included in study. Patients were randomly selected for endoscopic or microscopic myringoplasty. Group A underwent the endoscopic assisted methods and group B underwent the microscopic methods. A detailed history, clinical examination and otoscopic examination and audiological evaluation were done in all cases preoperatively. All surgery were done by main author to reduce bias and patients were called for follow-up after one week, then two weeks and then six weeks after surgery. The ethical approval was taken from institutional review committee of Lumbini Medical College and written informed consent was taken from individual patients.

Technique of local anesthesia: All surgeries were done in local anesthesia. Patients were called a day before the surgery. Routine investigations were done preoperatively and preanesthetic checkup was done. All patient got IM pethidine (meperidine) and Phenergan (promethazine) 30 minute before starting the procedure.

The concha was pulled anteriorly, 0.5 ml Xylocaine (1:200,000) in injected in post auricular fold and with the same needle with 0.5 ml was injected anteriorly, superiorly and inferiorly. External meatus was opened by small killian speculum and 0.5 ml of Xylocaine (1:2,000,000) solution was infiltrated in four quadrant of external auditory canal at bony cartilaginous junction. Cleaning of external auditory canal was done with normal saline. Examination was done with endoscope for endoscopic group and under microscope for microscopic group. Findings were noted and size of perforation was categorized on basis of involving the quadrant.

1. Small perforation- involving one quadrant of pars tensa
2. Medium perforation- involving two quadrants of pars tensa
3. Large perforation- involving three or four quadrants of pars tensa
4. Subtotal perforation- involving all quadrants reaches up to tympanic annulus
5. The operative time of each surgery was recorded. The time taken to perform the surgery was calculated from the starting of the graft harvesting till the closure of surgery.

Procedure: To harvest the tragal cartilage with perichondrium, 1.5 cm long incision with the help of 15 no blade is made 2 mm medially from tragal tip. The skin is undermined and tragus with perichondrium is dissected. The dissected cartilage attached with perichondrium is kept in saline. Perichondrium away from external auditory canal is removed. A cartilage 2 mm in width is removed vertically from center of cartilage to accommodate the entire malleus handle. The entire graft is placed in an underlay technique with malleus fitting in the groove and antibiotic soaked gelfoams kept in external auditory canal. The conchal cartilage with perichondrium is harvested after post auricular incision for the patient who underwent surgery by microscope.
0 degree 4 mm, 17 cm long rigid endoscope (Tekno Germany) was used along with monitor system. The endoscope was held in left hand and instrument in right hand. All endoscopic ear surgery was done by permeantal approach. Examination under endoscope was done and debris were removed. Margin of perforation was freshened with curved needle followed by freshening the undersurface of tympanic membrane. Tympanometal flap was elevated 6 mm lateral to annulus from 12 o’clock to 6 o’clock position. Ossicular chain, chorda tympanic nerve and middle ear mucosa were inspected and perichondrium cartilage graft kept medial to tympanic annulus. Post auricular approach was used for narrow external auditory canal. Conchal cartilage perichondrium graft was harvested and used. Rest of the procedure was similar to endoscopic approach.

Post-operative care: Patients were shifted to ward and given liquid orally after 2 hours of postoperative period. They were discharged with oral antibiotic cefpodoxime 200 mg two times a day for seven days, Nasal Decongest, Proton pump inhibitor and Paracetamol. Patients were followed up in 1 week to remove external auditory canal pack and suture. Antibiotic ear drops (ofloxacin combined with dexamethasone) was prescribed for two weeks. Then they were called after 2 weeks later to look for any gelfoam. Presence of gelfoam was removed and finally they were called after 6 weeks to look for success of graft uptake. Immediate and late postoperative complications were noted.

Data entry and analysis:

Data were entered into and analyzed by Statistical Package for Social Science Version 16 (SPSS). Data were expressed as frequency, percentage, mean and standard deviation (SD). Student t test was used to compare mean of continuous variables. Likewise, Chi-square test or Fisher-Exact tests were used for comparing categorical variable whichever was applicable first. P value less than 0.05 was considered as statistically significant.

RESULTS

A total of 86 patients with diagnosis of chronic otitis media mucosal inactive type were enrolled in the study. Forty three patients were in endoscopic ear surgery and the other forty three patients were in microscopic ear surgery. The mean age of presentation was 29.33 years (SD=11.18) and 27.74 years (SD=11.77) years (ranges 15-60 years) in endoscopic and microscopic group respectively (p = 0.525). 46(53.5%) patients had right sided and 40(46.5%) had left sided chronic otitis media. There were 25(58.1%) males and 18(41.9%) females in endoscopic group and 14(32.6%) males and 29(67.4%) females in microscopic group.

The tympanic membrane perforation size was categorized into small, medium, large and subtotal. 12(27.9%) and 4(9.3%) patients in endoscopic group and 19(44.2%) and 6(14.0%) in microscopic group had large and subtotal central perforation (p <0.01). Both endoscopic and microscopic assisted underlay myringoplasty were compared in respect to above characteristics (Table 1).

The mean operating time was shorter in endoscopic group (55.81 minutes, SD=10.79) than microscopic group (92.44 minutes, SD=10.49) which was statistically significant (p<0.01)

The overall rate of graft uptake was 91.9% by using cartilage perichondrium composite graft. 41(95.3%) patients of endoscopic group had graft uptake, while 38(88.4%) patients of microscopic assisted group had graft uptake (Table 2).

There were 2 patients in endoscopic group who had complications in the form of cartilage extrusion (2.3%) and medialization (2.3%). In microscopic group 18 patients had complications in the form of postauricular infection (11.6%), postauricular numbness (16.3%), cartilage extrusion (2.3%) and ear protrusion (11.6%). Better results were seen in endoscopic group and it was statistically significant (p<0.01).
Table -1 Demographic characteristics and clinical findings

<table>
<thead>
<tr>
<th></th>
<th>Endoscopic</th>
<th>Microscopic</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mean) in Years</td>
<td>29.33(SD=11.18)</td>
<td>27.74(SD=11.77)</td>
<td>t= 0.639, df=83.781, p=0.525</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>25(58.1%)</td>
<td>14(32.6%)</td>
<td>X² = 5.677, df = 1, p = 0.017</td>
</tr>
<tr>
<td>Female</td>
<td>18(41.9%)</td>
<td>29(67.4%)</td>
<td></td>
</tr>
<tr>
<td>Side</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>22(51.2%)</td>
<td>24(55.8%)</td>
<td>X² = 0.187, df = 1, p = 0.665</td>
</tr>
<tr>
<td>Left</td>
<td>21(48.8%)</td>
<td>19(44.2%)</td>
<td></td>
</tr>
<tr>
<td>Size of tympanic membrane perforation</td>
<td></td>
<td></td>
<td>X² = 8.409, df = 3, p = 0.038</td>
</tr>
<tr>
<td>Small</td>
<td>9 (20.9%)</td>
<td>1 (2.3%)</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>18 (41.9%)</td>
<td>17 (39.5%)</td>
<td></td>
</tr>
<tr>
<td>Large</td>
<td>12 (27.9%)</td>
<td>19 (44.2%)</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>4 (9.3%)</td>
<td>6 (14.0%)</td>
<td></td>
</tr>
</tbody>
</table>

Table: 2 Comparison between Endoscopic and Microscopic groups

<table>
<thead>
<tr>
<th>Variables</th>
<th>Endoscopic</th>
<th>Microscopic</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean operating time (minute)</td>
<td>55.81 (SD = 10.79)</td>
<td>92.44 (SD = 10.49)</td>
<td>t = -15.95, df = 83.93, p &lt; 0.001</td>
</tr>
<tr>
<td>Graft uptake</td>
<td></td>
<td></td>
<td>Fisher- Exact, p = 0.433</td>
</tr>
<tr>
<td>Success</td>
<td>41(95.3%)</td>
<td>38(88.4%)</td>
<td></td>
</tr>
<tr>
<td>Failure</td>
<td>2(4.7%)</td>
<td>5(11.6%)</td>
<td></td>
</tr>
<tr>
<td>Complications</td>
<td></td>
<td></td>
<td>Fisher-Exact = 22.083, p &lt; 0.001</td>
</tr>
<tr>
<td>None</td>
<td>41(95.3%)</td>
<td>25(58.1%)</td>
<td></td>
</tr>
<tr>
<td>Post auricular infection</td>
<td>0(0.0%)</td>
<td>5(11.6%)</td>
<td></td>
</tr>
<tr>
<td>Cartilage extrusion</td>
<td>0(0.0%)</td>
<td>7(16.3%)</td>
<td></td>
</tr>
<tr>
<td>Ear protrusion</td>
<td>1(2.3%)</td>
<td>5(11.6%)</td>
<td></td>
</tr>
<tr>
<td>Medialization</td>
<td>1(2.3%)</td>
<td>0(0.0%)</td>
<td></td>
</tr>
</tbody>
</table>
Table: 3 Results of literature review in term of graft success rate

<table>
<thead>
<tr>
<th>Source of data</th>
<th>Number of patients</th>
<th>Graft material</th>
<th>Graft success rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present study</td>
<td>86</td>
<td>Cartilage perichondrium</td>
<td>91.9%</td>
</tr>
<tr>
<td>Cavaliere M et al.[11]</td>
<td>306</td>
<td>Cartilage Perichondrium</td>
<td>99.35%</td>
</tr>
<tr>
<td>Dornhoffer j.[5]</td>
<td>1000</td>
<td>Cartilage Perichondrium</td>
<td>97.6%</td>
</tr>
<tr>
<td>Aidonis I.[12]</td>
<td>61</td>
<td>Cartilage shield</td>
<td>98.4%</td>
</tr>
<tr>
<td>Vadiya S et al.[13]</td>
<td>65</td>
<td>Cartilage Perichondrium</td>
<td>98.46%</td>
</tr>
<tr>
<td>Balaguer García R.[14]</td>
<td>126</td>
<td>Cartilage</td>
<td>71.1%</td>
</tr>
</tbody>
</table>

Figure: Intraoperative and postoperative
DISCUSSION

Myringoplasty is one of the common surgical procedures done by ear nose and throat surgeon and this surgery can be done with help of microscope or endoscope. Endoscopic ear surgery is minimally invasive, where surgeon inserts endoscope directly through ear canal which gives the surgeon great view of middle ear during surgery. It also provides a magnified vision and enables surgeon to change rapidly from close up to wide angle view. Endoscopic myringoplasty fulfills the criteria of minimal invasive surgery, with least trauma to normal tissue and less postoperative complications. However endoscopic methods have some disadvantages. Endoscope cannot be employed in every case because one hand is blocked during the surgery, and space becomes crowded because of the endoscope and the instrument being used. There is fogging of the endoscope which requires repeated withdrawal and cleaning with antifogging solution. 

The microscope assisted technique has advantage of both the hands being free to perform the surgery in placing the graft. Karhuketos TS et al and Tarabichi M also had similar observation. The mean age in our study was 29.33 years in endoscopic and 27.74 years in microscopic group which correlates with study done by Maran RK et al whose study showed 29.8 years in endoscopic group and 34.3 years in microscopic group. At the same time in our study there were 25(58.1%) male and 18(41.9%) female patients in endoscopic group and 14(32.6%) males and 29(67.4%) females in microscopic group.

The mean operating time was significantly less in endoscopic group (55.81 minutes, SD=10.79) in comparison to microscopic assisted surgery (92.44 minutes, SD=10.49). This difference was most likely due to avoiding the soft tissue dissection and wound closure in layers. Our study result matched with study done by Choi et al whose study showed 68.2 +/- 22.1 minutes in endoscopic and 88.9 +/- 28.5 minutes in microscopic group and does not correlate with the study done by Harugop et al in which mean time of endoscopic and microscopic assisted surgery was found to be 108 minutes and 106 minutes respectively which showed endoscope method was more time consuming.

In our study the overall graft success rate using cartilage perichondrium graft was 91.9%. There were various study done regarding the graft success rate using cartilage perichondrium table. The graft uptake was 95.3% in endoscopic group and 88.4% in microscopic group. There was more success of graft uptake in endoscopic assisted group. Graft failure was found in two patients of endoscopic group, one patient had cartilage extrusion and another had medialization of cartilage graft and five patients had failure in microscopic group. In a study done by Ayache S there was 96% graft uptake by doing endoscopic assisted transeanal technique surgery. This study correlates with study done by Raj A et al where they found 90% graft uptake in endoscopic group and 85% in microscopic group. Study done by Maran RK showed 90% in endoscopic group and 96.67% in microscopic group, which does not correlate with other studies.

Though the post auricular approach was helpful due to wide exposure and with both hands free while doing the surgery, there are several disadvantages associated with this approach including prolonged healing time, postoperative care, pain, possible infection of wound and even the protrusion of pinna. In our study five patients with microscopic surgery developed wound infection which was the main reason behind the unsuccessful graft uptake. It was mainly found in patients who were discharged after surgery and got contaminated. Once they had infectious wound all patient got oral antibiotic and aural ear drops. We have found that postoperative ear protrusion was 11.6% and post auricular numbness was 16.3% in microscopic group by doing postauricular approach. In study done by Plodpai Y et al they found 6% had ear protrusion and 25% had post auricular numbness. Post auricular numbness was due to injury of auricular and lesser occipital nerve. Another study done by Frampton SJ et al reported that 26% of patients undergoing surgery by post auricular approach had numbness beyond 8 months.

LIMITATION

This study does not study the tragal and conchal cartilage separately. Tragal cartilage with perichondrium was selected for endoscopic group and conchal cartilage with perichondrium was used for microscopic group. Thickness of the graft used was not measured in our study.

CONCLUSION

The endoscopic technique is an effective alternative to the conventional microscopic method using the permeatal approach and leads to comparable outcomes in terms of graft uptake and operative time. Canalplasty and postauricular incision can be avoided in
the absence of major canal overhangs. Endoscopic surgery is less invasive with less morbidity, provides better visualization of middle ear and better cosmetic results with the definite advantage of shorter duration of surgery. The main disadvantage is the need to hold the endoscope with one hand and instrument with the other thus overcrowding the operative area and also difficulty in cases of bleeding.

REFERENCES


