

Pain and Paraesthesia of Pinna and Postaural Area- A Comparative Study

Arjita Sharda¹, Siddharth Chaudri², Mihir Suryavanshi³

¹Senior Resident, Department of Otorhinolaryngology, Terna Medical College, Navi Mumbai, Maharashtra. ²Consultant, Department of Otorhinolaryngology, Deenanath Mangeshkar Hospital and Research Center, Pune, Maharashtra. ³Consultant, Department of Otorhinolaryngology, Deenanath Mangeshkar Hospital and Research Center, Pune, Maharashtra.

ABSTRACT

BACKGROUND

An endoscope offers a new perspective of surgical procedures; it increases the surgeon's understanding of the disorder and its extension and provides a wide field of view of the middle ear compared to a microscope. In this study, we are comparing microscopic and endoscopic techniques for type I tympanoplasty on the basis of subjective and objective parameters which includes graft uptake, hearing improvement, postoperative pain and paraesthesia of the pinna and postaural area evaluated on visual analogue scale, cosmesis in terms of scar, scar related complications etc.

METHODS

We have included 66 patients in two groups according to the inclusion and exclusion criteria; 33 underwent endoscopic tympanoplasty; 33 underwent microscopic tympanoplasty; at the end of 1st, 6th and 12th week, we have compared the two on the basis of subjective and objective parameters i.e. improvement in air-bone gap at end of 12 weeks, graft uptake, postoperative pain and paraesthesia of the pinna and postaural area, evaluated on visual analogue scale, and cosmesis in terms of scar, scar related complications.

RESULTS

Statistically significant differences were found with regard to postoperative pain, paraesthesia and anaesthesia of the pinna and postaural region, cosmesis in terms of scar which favoured endoscopic tympanoplasty. Statistically nonsignificant differences were found with regard to improvement in hearing, and scar related complication. Objective parameters when studied and compared, results were found to be statistically insignificant in terms of improvement in hearing threshold as demonstrated by pure tone audiometry, and healed perforation as seen on otoendoscopy.

CONCLUSIONS

While comparing the success rates of endoscopic tympanoplasty and microscopic tympanoplasty, both the surgical techniques showed equal success rates in terms of graft uptake, subjective hearing improvement as well as air bone gap closure on pure tone audiometry. However, in terms of cosmesis and postoperative pain endoscopic tympanoplasty does have better results which are statistically significant. Postoperative paraesthesia and anaesthesia of pinna and postaural area were significant in microscopic tympanoplasty.

KEYWORDS

Endoscopic, Microscopic, Tympanoplasty, Pain, Paraesthesia

Corresponding Author:

*Dr. Arjita Sharda,
Flat No. 805, Platinum Venecia,
Sector 29, Nerul East,
Navi Mumbai- 400706, Maharashtra.
E-mail: arjita_sharda@yahoo.com*

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BACKGROUND

Chronic Otitis Media (COM) is a wide spread disease of the developing countries and continues to be a major otological problem accounting for a large number of out-patient cases in our country. Treating COM with surgery by Tympanoplasty is one of the common procedures in ENT. It is a disease which can have serious complications related to incorrect and inadequate treatment.

Till now Myringoplasty was being done under operating microscope that has its own pros and cons. With the introduction of the endoscope into other branches of surgery, its utilization in otology has been attempted. The use of the endoscope in various surgical procedures was extrapolated to otologic surgery, and the diagnostic and photographic use of that instrument in the examination of the tympanic membrane and the ear canal has been widely accepted. The endoscope offers a new perspective of surgical procedures; it increases the surgeon's understanding of the disorder and its extension and more importantly provides a wide field of view of the middle ear compared to the microscope. It provide direct, easy access to least accessible nooks and corners of middle ear cavity which are hidden through the surgeons view even with the use of operating microscope.

The operating microscope provides a magnified image in a straight line, hence the surgeon cannot visualize the deep recesses of the middle ear in single operating field. This can be overcome by use of a rigid endoscope (telescope) for tympanoplasty. With the rigid endoscopic view is better but surgeons both hands are not free so manipulation here is difficult, this is also now being overcome by some surgeons by use of endoscope holder.¹ Also, in cases of endoscopic revision tympanoplasty we can proceed with the surgery without encountering the fibrosed area and the scarred tissue in postauricular region, as the incision for the graft is taken above the hair line. In this study we are comparing microscopic and endoscopic techniques for type I tympanoplasty on the basis of subjective and objective parameters. Few studies have already been conducted till date to correlate the outcomes of microscopic and endoscopic tympanoplasty. We have compared the two techniques on the basis of postoperative pain and paraesthesia of the pinna and postaural area evaluated on visual analogue scale, Cosmesis in terms of scar, Scar related complication and graft uptake.

METHODS

The study was conducted in Deenanath Mangeshkar Hospital and Research Centre, Erandwane, Pune with prior approval from ethical committee. Patients with dry central perforation of pars tensa with conductive hearing loss were included into the study. We have included 66 pts in two groups, 33 in each meeting the inclusion and exclusion criteria mentioned below. In which we have included central perforations involving the pars tensa. Both the procedures were

explained to the patient according to choice of patient the patient was taken up for surgery. Initially there were 69 patients in total, 34 patients in group 1, 35 in group 2, 1 patient in endoscopic group lost follow up while 2 in microscopic group lost follow up. Hence there were equal number of patients in each group.

Study Duration

18 months (May 2014 to November 2015)

Inclusion Criteria

- Subjects with tympanic membrane perforation of pars tensa due to COM or trauma.
- Subjects with variable degree of conductive hearing loss due to COM or trauma.
- Subjects with inactive and quiescent COM.
- Age between 15-60 years.

Exclusion Criteria

- Patients with active discharge.
- Patients with mastoiditis.
- Patients with cholesteatoma.

Method of Measurement

On follow up of patients at 1, 6 and 12 weeks postoperatively following investigations are carried out

Objective Parameters

1. For the hearing assessment, pure tone audiogram was done seven days prior to operation and then 12 weeks after the operation. The audiological results were reported according to Pure tone audiometry
2. Healed perforations /residual perforations were seen by Otomicroscopy/ Otoendoscopy

Subjective Parameters

1. Postoperative pain evaluated on visual analogue scale.
2. Postoperative paraesthesia and anaesthesia of the pinna and post aurial area. Absent/ Present.
3. Cosmesis in terms of - No scar / visible scar/ugly scar.
4. Scar related complications- Present / Absent.

Surgical Technique

Patients with dry Pars tensa perforation were counselled for Surgery. After a preoperative evaluation, preanaesthetic checkup, patient was taken under GA. In Endoscopic technique- temporalis fascia graft was harvested from a small incision above hairline in the temporal region. In Microscopic technique- Postaural infiltration was done with 2% Xylocaine adrenaline solution, postaural incision was taken and temporalis fascia graft was harvested, followed by which procedure was same for both techniques which was

in the following order - infiltration of external auditory canal was done with 2% xylocaine and adrenaline (1 in 2,00,000 dilution), freshening of the margins of perforation, elevation of Tympanomeatal flap followed by which, fibrous annulus was enucleated from the bony annulus, attempts were made to enter middle ear between fibrous and mucosal layers. Placement of graft (interlay technique) was done followed by repositioning of tympano meatal flap. Gel foam were placed on margins of perforation and ear canal. Small antiseptic soaked ribbon gauze placed in lateral aspect of external auditory canal. Graft incision sutured in layers.

Statistical Analysis

Statistical data analysis was carried out with the help of SPSS (Statistical package for social sciences) version 20.0 for Windows package (SPSS Science, Chicago, IL, USA). Quantitative data variables expressed by using descriptive statistics (Mean, Sd etc.) Qualitative data variables expressed by using frequency and percentage (%) 2 independent sample t-test / Mann-Whitney U test used to find the significance between 2 independent groups for quantitative data variables. Chi-square test / Fisher’s exact test used to compare the qualitative data variables in 2 groups. p-value <0.05 considered as significant.

RESULTS

There were total of 66 patients for tympanoplasty included in this prospective randomized study. The study included two groups of patients:

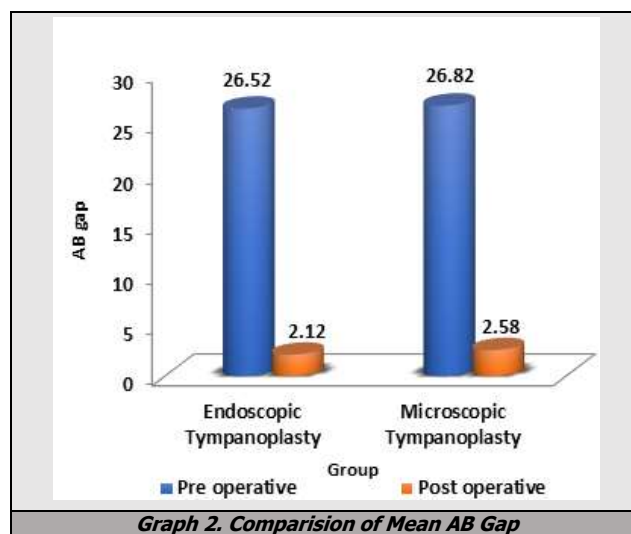
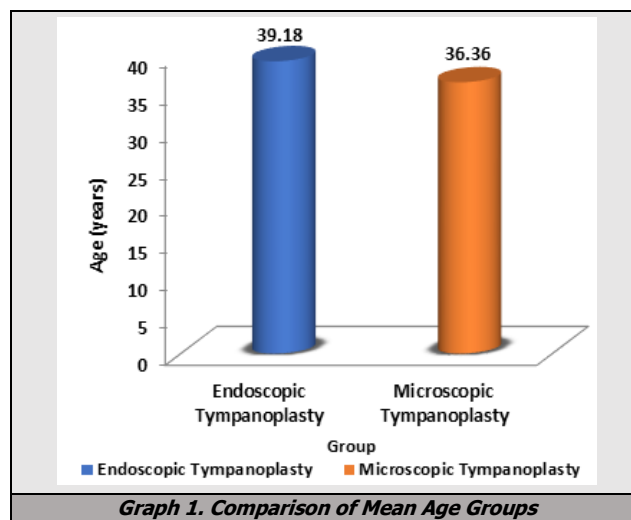
- Group 1- included patients who underwent endoscopic tympanoplasty.
- Group 2 included patients who underwent microscopic tympanoplasty.

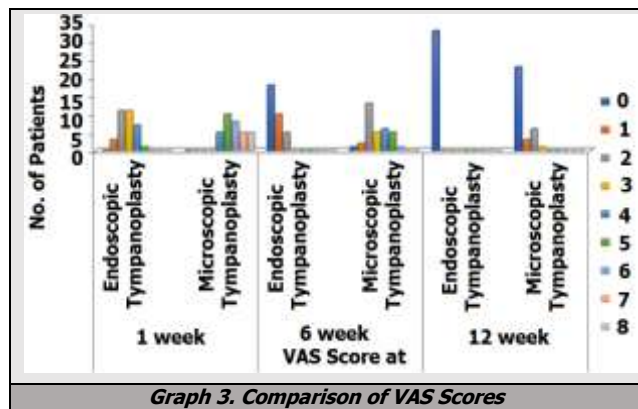
Both groups of patients had undergone tympanoplasty under general anaesthesia. Both objective & subjective parameters were assessed post operatively at 1, 6, 12 weeks. There was no significant difference in the mean age group or sex distribution in both the groups. (group 1- 38.2 yrs., group 2- 36.4 yrs.) (group 1- Male-25, females-8, group 2- male-26, females-8) as shown in graph 1.

The following parameters were assessed postoperatively and compared; the results are as follows:

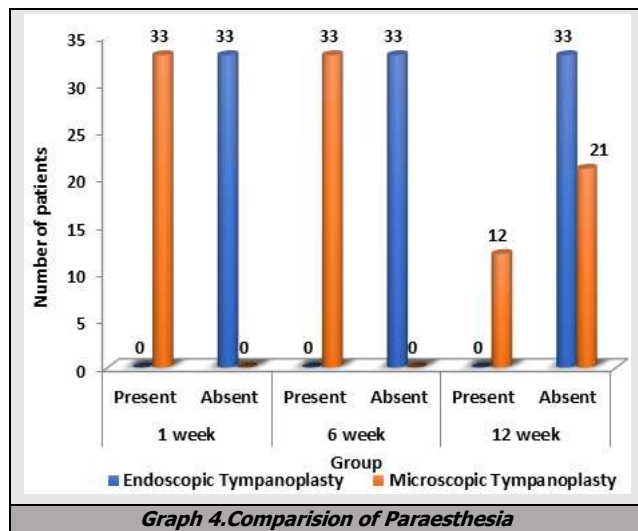
- 1) Graft uptake rate at 12 weeks was 93.9% in endoscopic tympanoplasty, 96.7% in microscopic tympanoplasty which had no statistically significant difference.
- 2) Preoperative mean air bone gap was almost equivalent in both groups i.e. 26.52 db in endoscopic group and 26.82 db in microscopic group. (as shown in graph 2)
- 3) Post-operative air bone gap studied at 12 weeks was completely closed in 67% patients in group 1 and 64% in group 2. It was 10 decibel or less in 27.2% patients in group 1 and 30% patients in group 2. (as shown in graph 2). For finding out whether there is any significant difference in the gain in air bone gap in the two groups,

- 2 independent sample t-test was used which demonstrates that there was no significant difference.
- 4) Subjective analysis of cosmesis was done on the basis of visible scar and invisible scar, cosmesis was excellent in patients in group 1 (100%) where there was no visible scar, while it was poor in group 2 where scar was visible.
- 5) Median Visual analogue score of postoperative pain in endoscopic group is 3, 0, 0 at 1, 6 and 12 weeks respectively. While it is 6, 3, 0 at 1, 6 and 12 weeks respectively in microscopic group.
- 6) Post-operative pain was evaluated on visual analogue scale at 1, 6 and 12 weeks in both the groups (as shown in graph 3), on comparing the data using Mann Whitney U test difference in pain was statistically significant, indicating less postoperative pain hence less morbidity in group 1.
- 7) On comparing postaural anaesthesia and paraesthesia of pinna and post aural area at 1, 6 and 12 weeks postoperatively using fisher’s exact test in both the groups, paraesthesia and anaesthesia of pinna and postaural area were significant in group 2 and absent in group 1. (as shown in graph 4)
- 8) There were no scar related complications in either of the group.





Graph 3. Comparison of VAS Scores



Graph 4. Comparison of Paraesthesia

DISCUSSION

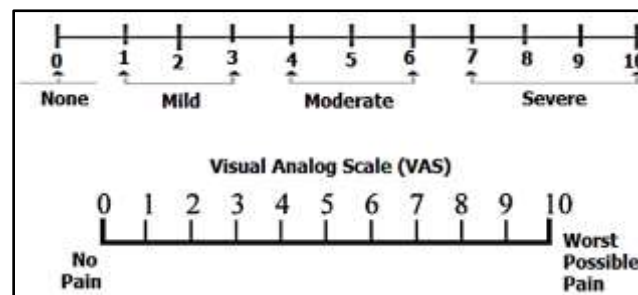
Chronic otitis media is a very common disease seen day to day by ENT Surgeons worldwide. The main objective in the treatment of COM is to achieve symptomatic relief, relieve drainage, rehabilitate hearing, and minimize complications to enhance communication and improve the patient’s overall quality of life. Chronic otitis media (COM) is a common disease that can have serious complications if treated incorrectly or inadequate. Tympanoplasty is a surgical procedure performed for eradication of infection and rehabilitation of hearing in patients with COM. The main purpose of tympanoplasty is to repair the perforation of tympanic membrane and rehabilitate the patient’s hearing. Various medical and surgical treatments are available for COM. However surgery is mainstay of treatment of COM. Tympanoplasty has been traditionally performed under an operating microscope. However, despite providing direct exposure, microscopy may be insufficient in the viewing of certain areas during surgery. The operating microscope provides a magnified image in a straight line, hence the surgeon cannot visualise the hidden areas of the middle ear in a single operating field. Although there are no exposure problems in the posterior and inferior areas, there may be exposure problems caused by EAC bony overhang. These limitations are addressed of in endoscopic permeal

myringoplasty. The use of a wide angle rigid endoscope for myringoplasty has a significant advantage as it is simple to use, not only for the examination, but also for the repair of the tympanic membrane perforation. This provides a magnified vision and hence enables the surgeon to change rapidly from a close-up to a wide angle view. Further, it provides an all-round vision to the surgeon, who can rotate the angled endoscope to visualise the otherwise hidden areas such as deep anterior canal wall, anterior recess, anterior marginal perforations, sinus tympani, facial recess, hypotympanum and the attic.²

Endoscopic tympanoplasty follows the principles of minimal invasive surgery as there is no trauma to the canal wall, but the surgeon is still able to examine the middle ear. In endoscopic tympanoplasty we use the rod lens scope, first developed by Hopkins, uses rod shaped glass lenses in the relay system, providing a wider viewing angle and exceptional resolution and brightness. This study was undertaken with the objective of determining the advantages and disadvantages of the endoscope when compared to the (postaural) operating microscope in myringoplasty surgery, in endoscopic tympanoplasty. Difference in graft uptake, improvement in hearing on audiological evaluation, was not statistically significant when compared using Fisher’s exact test in both the groups. (P-value >0.05). Our results were consistent with the studies by Anoop raj et al,³ Manish Kumar et al,⁴ M.N. Singh and his colleagues⁵ in respect to graft uptake and air bone closure where there is no statistically significant difference.

Similarly in our study, subjective analysis of cosmesis was done on the basis of visible scar and invisible scar, we found cosmesis was excellent in patients in group 1 (100%) where there was no visible scar, while it was poor in group 2 where scar was visible, as all the microscopic tympanoplasty were done by conventional method i.e. post aural approach. these results were statistically significant. There were no scar related complications in either of the groups, similar to the study by A.S. Harugop⁶

We have also evaluated post-operative pain on visual analogue scale in the two groups.



Based on the distribution of pain VAS scores in postsurgical patients who described their postoperative pain intensity as none, mild, moderate, or severe, the cut points on the pain VAS as shown above.

In our study pain on VAS was evaluated at 1, 6, 12 weeks postoperatively and compared in both the groups. On comparing the data using Mann Whitney U test in both the groups the P value <0.05 and hence difference in pain was

statistically significant, indicating less postoperative pain hence less morbidity in group 1. Similarly, YADAV S.P.S⁷ in his study mentioned the advantages of endoscope-assisted myringoplasty are that it is less traumatic, requires less operating time, is less expensive in terms of the cost of equipment, less morbid, results in less postoperative pain. Also, Harugop et al⁶ in their study found that in the endoscope group by avoiding the post aural incision there is less dissection of normal tissues, less intra operative bleeding, less incidence of post-operative pain and the cosmetic result is better. Similarly, in a study by Jaimini Patel et al⁸ in 2015 stated that endoscope group had relatively early wound healing and less morbidity in terms of postoperative pain and hospital stay as compared to microscopic group. Thirumaran N. S. et al⁹ in their study the pain score was assessed using the WILDA's pain assessment guide, and it was found that endoscope group had less postoperative pain and morbidity to patients, similar to our study.

In our study we have also compared postaural anaesthesia and paraesthesia of pinna and post aural area at 1, 6 and 12 weeks postoperatively in both the groups, we found that due to absence of postaural incision in endoscopic tympanoplasty, paraesthesia and anaesthesia of pinna and postaural area were absent in group 1. The endoscope offers the following advantages it visualizes the whole tympanic membrane and the ear canal without having to manipulate the patient's head or the microscope. It extends the operative field in transcanal procedures into structures usually hidden under the microscope (anterior tympanic perforation, posterior pocket, facial recess, and hypotympanum). To visualize structures from multiple angles as opposed to the microscope's single axis along the ear canal. It provides extremely sharp image with high resolution. Some authors also mention the time duration of the surgery is reduced. The post-operative pain and morbidity is reduced. The average duration of hospital stay is reduced.⁹

There are many advantages of endoscope as mentioned above, however there are disadvantages as well. Disadvantages of the endoscope include the one-handed surgical technique, a loss of depth perception, limited magnification and the need for training. Discussing the demerits biggest disadvantage is that, endoscopic ear surgery is a one handed technique. Surgeon has to hold the scope in one hand during all the time while only other hand is free to operate. At time of excessive bleeding it becomes extremely difficult to operate as only one hand is free. Moreover blood and hair in external auditory canal soils the tip of microscope which obscures the surgical field. Thus tip of endoscope has to be cleaned frequently. Whereas in microscopic technique both hands are free to operate. Thus, procedure is easily performed in microscopic technique. Similar observation was made in studies of Tarabichi M^{10,11} and Karhuketo T. S, Ilomaki JH, Puhakka H. J.¹²

So, while performing endoscopic tympanoplasty meticulous haemostasis is must for doing smooth surgeries. This problem can be solved by developing a stand for a

endoscope, which can fix the scope in desired position so both hands are free to operate. Endoscopes provide monocular vision which leads to loss of depth perception. So one has to be extra careful, while close to vital structures and positioning of the graft. This difficulty may be overcome by experience. Savlon is used as a defogging agent for endoscopes. Studies on effect of Savlon on middle ear mucosa and inner ear are not sufficient, thus safety of Savlon is yet to be established. There are a few Important safety issues with endoscopic ear surgery like thermal injury, this is evident only when a Xenon light source is used. Because of the small size of the cavity, adequate illumination of the middle ear space which can be accomplished with a regular light source on lower settings without the need for a Xenon system. While the tip of the endoscope heats up quickly, it cools down quickly too. Secondly trauma can happen by the tip of the endoscope due to accidental head movement, the relatively large diameter of the endoscope (4 mm) and the anatomical configurations of the ear canal and middle ear space usually precludes the introduction of the endoscope beyond the tympanic ring. Also, we can't directly operate off the scope. For this, the camera had to be fixed to the scope. This increased the weight of the scope, thereby producing left hand fatigue (for a right handed surgeon). This disadvantage of the endoscope can also be solved by developing a stand for the scope. Therefore Mubarak M. Khan, Sapna R. Parab¹ designed and developed endoscope holder attachment gripping to microscope for two handed technique of endoscopic tympanoplasty. Incorporating the endoscope into the microscope stand with endoscope holder augments the advantages and applicability and allows alternate use of both. Hence results in our study conclude that graft uptake and air bone gap, improvement in hearing, absence of ear discharge are comparable in both the group being almost equivalent and statistically not significant, as seen in other studies like Harugop, M. N Singh and his colleagues.^{6, 5} Postoperative paraesthesia and anaesthesia were also negligible in endoscopic group due to absence of postaural incision. Despite of extensive literature search we could not find any studies to support this. However, when post-operative pain and cosmesis was compared it was better in endoscopic group, having less pain and better cosmesis as seen in studies by Thirumaran, Jaimini Patel and his colleagues.^{8,9}

CONCLUSIONS

The Endoscope due to its wide angled view as well as its ability to visualize the hidden areas of the tympanic cleft and to negotiate the EAC has overcome most of the disadvantages which were faced due to operating ear microscope. While comparing the success rates of endoscopic tympanoplasty and microscopic tympanoplasty, both surgical techniques showed equal success rates in terms of graft uptake, subjective hearing improvement as well as air bone gap closure on pure tone audiometry. Hence our conclusion is similar to other studies done in past.

However, in terms of cosmesis, and postoperative pain, endoscopic tympanoplasty does have better results which are statistically significant. Postoperative paraesthesia and anaesthesia of pinna and postaural area were significant in microscopic tympanoplasty. Even after extensive literature search, we could not found similar studies. However, endoscopic tympanoplasty does have its own disadvantages like it being a one-handed technique and loss of depth perception. Thanks to the advent of new endoscope holders due to which disadvantage of one-handed technique is nullified, hence making endoscopic tympanoplasty a better alternative to microscopic tympanoplasty.

Ethical Approval

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent

Informed consent was obtained from all individual participants included in the study.

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