ENDOSCOPIC MYRINGOPLASTY

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Abstract: With the introduction of the endoscope into other branches of surgery, there have been attempts at its utilization in otology. Endoscope assisted myringoplasty was carried out in 50 patients aged 18–45 years using the temporalis fascia graft. The middle ear was examined through perforation in order to exclude cholesteatoma. The overall success rate of the graft uptake and improvement in conductive deafness as air-bone gap closure was achieved in 80 percent of cases. Endoscopic myringoplasty was found to be equally effective, less morbid and very cost effective in small central perforations. However, it is not applicable in all cases, especially in those with large perforations

INTRODUCTION:

The introduction of the operating microscope has significantly enhanced the outcome of myringoplasty by improving the accuracy of the technique. The operating microscope provides a magnified image in a straight line, hence the surgeon cannot visualize the deep recesses of the middle ear in a single operating field.[1] In the beginning, the microscopic tympanoplasty was a permeatal overlay; however presently, the postaural underlay technique has become more popular as the permeatal approach has its limitations. These limitations are addressed of in endoscopic permeatal myringoplasty. [2]

The use of a 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 provi-des a magnified vision and hence enables the surgeon to change rapidly from a close-up to a wide angle view, just by going closer or by withdrawing the scope.

Further, it provides an all-round vision to the surgeon, who can rotate the angled endoscope to visualize the deep anterior canal wall, anterior recess, anterior marginal perforations, sinus tympani, fascial recess, hypotympanum and the attic.[2] Endoscopic tympanoplasty follows the principles of minimal invasive surgery as the tympanomeatal flap is not raised, hence there is no trauma to the canal wall, but the surgeon is still able to examine the middle ear and exclude a cholesteatoma.[3]

METHODS

There were a total of 25 patients in the 16–45-year age group suffering from the safe type of chronic suppurative otitis media, all under general anaesthesia. The inclusion criteria were a dry or non-discharging ear for at least three weeks, age between 18 and 45 years, and a central perforation of size less than 5 mm, and a demonstrable conductive deafness. The exclusion criteria were wet ears, large perforations as subtotal and total, revision myringoplasty and sensorineural hearing loss. The cases were randomly selected using a periodic random number to avoid a bias in the selection of cases. All the selected patients were operated on using the endoscope-assisted myringoplasty technique. Pre- and postoperative pure tone audiometry was performed. The air bone gap of each patient was calculated at the frequencies of 500 Hz, 1,000 Hz and 2,000 Hz both pre- and postoperatively, and the average of the three was taken as the average air-bone gap as the three frequencies fall in the speech range. Although we did not compare the results of endoscope-assisted myringoplasty versus conventional myringoplasty, the results of the two are similar in our institute. The success rate of microscopic myringoplasty has been reported to be 85%–90% or better. [4, 5]

All the patients were operated on under general Anaesthesia. The temporalis fascia graft was harvested above the hairline using a suprauricular incision. It was then spread on a glass slide and dried. Rigid endoscopes 1.7 mm in diameter, 100 mm in length and with 0°, 30° and 90° angles of view were used. Endoscopy was begun with a 0° and/or 30° endoscope to visualize the middle ear cavity, and a 90° endoscope was required to visualize the medial surface of the tympanic membrane. The otoendoscope was introduced into the ear canal. If the perforation was big enough, the endoscope was passed through the perforation into the tympanic cavity. Otherwise, the endoscopy of tympanic cavity was done after the epidermis of the edges of the perforation was removed. Possible epithelial migration into the middle ear cavity or to the ossicles was visualized with endoscopes and was extirpated. If the perforation is too small to pass an endoscope through, the rim of the perforation is first removed; in most cases the endoscope is then readily introduced into the middle ear. If the perforation is situated in the anteroinferior quadrant of the tympanic

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membrane and if the ear canal is more curved, then the surgeon must perform most of the operation with tympanoscopic guidance. If the ear canal is too curved to enable the perforation to be reached, an additional incision of the tympanic membrane will be needed. The incision is made from the edge of the perforation straight to the site of possible introduction of the endoscope. Now the situation can be dealt with as a larger perforation, where the entire medial surface areas can be inspected endoscopically using a serrated circular knife, the mucosa of the medial surface of the tympanic membrane remnant in the vicinity of the perforation was carefully sacrificed to prepare a bed for the graft. The middle ear was filled with gel foam through the perforation; it usually required a single piece of medicated gel foam 2–4 mm2 in size, which was pushed through the perforation to support the graft, and the temporalis fascia graft of the appropriate size was inserted through the perforation to overlap with the medial surface of the drum remnant (The recipient site) by at least 2 mm from the margin of perforation. The meatus was packed with gel foam soaked in an antibiotic solution.

All these steps were performed under endoscopic vision. Patients were administered with oral antibiotics and antihistaminics. Analgesics were administered only when required. Patients were discharged the same day.

RESULTS

With regard to tympanic membrane continuity, 20 out of the 25 patients had an intact tympanic membrane in the eighth postoperative week, accounting for an 80% success rate. Pure tone audiometry was used to assess the average air-bone gap preoperatively and post-operatively, including the failed cases. None of the patients had an air-bone gap < 10 dB prior to surgery, but postoperatively at eight weeks, 17 patients had an improved air-bone gap < 10 dB and 6 were in the range of 11–20 db. Preoperatively, 17 patients had an air-bone gap in the range of 21–30 dB, whereas the same level was found in two cases postoperatively. In the eighth week, 47 patients had an air-bone gap < 20 dB **(Table I).**

Average air-bone gap (dB)	Pre-operative No. of patients	Post-operative No. of patients
>10	o	17
11-20	5	6
21-30	17	2
<30	3	0

Table I: Comparisons of pre- and postoperative air-bone gap on pure tone audiometry.

Thus, out of the patients with a healed perforation, 80% showed an air-bone gap below 10 dB in the eighth postoperative week and 16% had an air-bone gap in the range of 11–20 dB, while 4% still had an air bone gap in the range of 21–30 dB **(Table II)**. In successful candidates, the air-bone gap calculations revealed a marked improvement of 21.66 dB in one patient. The maximum number of patients [15] had an improvement of the magnitude ranging from 11 to 20 dB, whereas a 0–10 dB improvement was seen in nine of the successful patients. Although cases were followed up for even longer, an eight-week follow-up time was chosen to avoid lost cases, as most of our cases came from the countryside.

Average postoperative air-bone gap (dB)	No. (%) of healed cases
< 10	10 (80)
11-20	3 (15)
21-30	1 (5)
> 30	0

Table II: Air-bone gap distribution in postoperatively intact tympanic membranes.

DISCUSSION

Myringoplasty is one of the most common forms of surgery in otology. It yields very satisfying results for both to the patient and the surgeon. The results are usually expressed in terms of the take-up rate of the graft and hearing improvement, which is assessed subjectively as well as objectively. In the present study of 25 patients, 20 (80%) patients had a successful closure of the tympanic membrane perforation. The take-up rates are less than those described by el-Guindy,[6] and Raj and Meher,[7] but better than those reported by Karhuketo et al.,[3] and Usami et al.,[8] When we evaluated the preoperative and postoperative air bone gap, there was an upward shift in the groups **(Table I).** Compared to ten patients preoperatively, 23 patients had an air-bone gap < 20 dB postoperatively (94%). Postoperatively, an air-bone gap with intact tympanic membranes, i.e. where the graft was taken up by 80% of the patients, who had an air-bone gap below 10 dB, and 15% who had a gap in the range of 10–20 dB **(Table II).** Tympanoscopic myringoplasty, which is a new tool in the otologist's basket, produced results that are comparable to others in the literature. We used the otoendoscope for the inspection of the medial surface of the tympanic membrane, as well as for the status of the ossicular chain. With the aid of the endoscope and curved instruments, it was possible to remove the epithelial ingrowth from the medial surface of the remnants of the tympanic membrane. The importance of this inspection of the medial surface of the residual tympanic membrane was emphasized by Somers et al in their study. [9] We observed that in 30% of cases, the mucoepithelial junction

was at a medial position instead of the margin of the perforation. Thus, the endoscope was helpful in excluding and treating the possible unwanted presence of the epithelium in the middle ear, which is almost impossible to do in conventional microscopic myringoplasty. Karhuketo et al have emphasized that endoscopic myringoplasty fulfills the criteria of minimally invasive surgery, with the least trauma to normal tissue and that almost excludes pre- and postoperative complications. [3] As no tympanomeatal flap is raised during endoscopic myringoplasty, there is practically no trauma to the middle ear mucosa, in spite of the middle ear being adequately examined and cholesteatoma excluded. Since we did not encounter any postoperative cholesteatoma in our cases during follow-up, we believe that the endoscopical examination of the tympanum allows one to repair the perforation without any possibility of an iatrogenic cholesteatoma, in contrast to conventional myringoplasty. If potential epidermis migration or cholesteatoma is discovered, it is removed endoscopically to foreclose the possibility of postoperative cholesteatoma. However, if it is not manageable, then major tympanomastoidectomy with tympanoplasty is performed using the microscope. 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, and helps in the inspection of the middle ear to exclude cholesteatoma. However, the endoscope cannot be employed in every case as one hand is blocked while the surgeon holds the endoscope, and the space becomes crowded because of the endoscope and the instrument being used. There may be fogging of the endoscope, especially in cold climates, which requires repeated withdrawal, and the magnification is less than the microscope; however, this drawback can be overcome by using a monitor. Furthermore, as this technique requires a definite expertise, this procedure is recommended for surgeons who regularly perform functional endoscopic sinus surgeries (FESS), and should not be attempted by a first-timer.

CONCLUSION

Tympanoscopy, with its visualization of hidden corners, justifies myringoplasty via a tympanic membrane perforation in selected cases with comparable improved results in the literature. Furthermore, the cost of the endoscope is much less than the operating microscope.

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