

Endoscopic Type I Tympanoplasty In Medium Sized Tympanic Membrane Perforation: Our Experience In Tertiary Care Center

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Abstract:

Introduction: Type I Tympanoplasty or Myringoplasty is commonly done under microscopy. But when performing transcanal myringoplasty under a microscope, the total circumference of the perforation can be difficult to confirm in patients where the external ear canal is narrow and/or protruded. This article discusses the experience of the authors in performing myringoplasty using endoscope.

Material and Method: Transcanal endoscopic myringoplasty was performed on 35 ears in 21 patients with chronic otitis media and rest having dry central perforation.

Results: Endoscopic views revealed the entire tympanic membrane in a single field with clear visualization of the perforation edges even when the ear canal was curved. This clear visualization facilitated reliable refreshing of the perforation edges and grafting.

Conclusion: Transcanal endoscopic myringoplasty does not require surgical exposure such as a retroauricular skin incision to get an anterior view. Our results demonstrated that transcanal endoscopic myringoplasty can be performed, regardless of the perforation size and the narrowness and/or protrusion of external ear canal.

Keywords: Endoscopy, Myringoplasty, Perforation and Tympanic membrane.

I. Introduction

Myringoplasty is a surgical procedure performed to close tympanic membrane perforations. The advent of operating microscope results of myringoplasty started showing dramatic improvements¹. The introduction of the operating microscope has significantly enhanced the outcome of myringoplasty by improving the accuracy of the technique. A simple underlay myringoplasty (SUM) using fibrin glue was introduced in 1992 by Yuasa et al.² Major disadvantage of operating microscope is that it provides a magnified image along a straight line³.

Minimally invasive surgery is becoming standard in many fields. The endoscope is a useful tool and has been incorporated into otologic surgery^{4,5,6}. Middle ear endoscopy was first introduced by Mer et al. in 1967, but endoscopes have mainly been used for diagnostic and photographic rather than surgical purposes until the last decade⁷. Middle ear surgeries, which were traditionally performed under a microscope, are now increasingly being done endoscopically⁸. El-Guindy has contended that the otoendoscope could replace the operation microscope⁹. An endoscope provides visibility to the tympanic membrane in patients with a narrow and/or protruded ear canal. Success of myringoplasty should be assessed both subjectively and objectively.

Subjective indicators include:

1. Improvement in hearing acuity
2. Absence of ear discharge
3. Absence of tinnitus

Objective indicators are:

1. Healed perforation as seen in otoendoscopy
2. Improvement in hearing threshold demonstrated by performing puretone audiometry

II. Materials And Methodology

The present study was conducted in the Department of ENT, Rajendra Institute of Medical Sciences, Ranchi. Before surgery, all subjects underwent a CT scan to evaluate the status of the tympanic cavity and the mastoid cavity. Mean hearing levels and air-bone gap (ABG) for each patient were determined by averaging the hearing thresholds at 0.5, 1, 2, and 3 kHz, yielding a 4-tone average based on the criteria of AAO-HNS. We used 0-, 30- or 70-degree angled rigid endoscopes with 2.7-mm outer diameter (Maxwell) together with a high-definition video system. Surgery was performed with the endoscope held in one hand and the surgical instruments in the other hand. We primarily used the 0-degree angled endoscope with the 30- or 70-degree

angled endoscopes used to more precisely observe the ossicular chain and tympanic cavity through the perforation of the tympanic membrane, taking care to avoid trauma to the ear canal or middle ear structures.

Endoscopic Simple Underlay Myringoplasty

Temporalis fascia graft is harvested under local anesthesia conventionally and allowed to dry. The external auditory canal is then anesthetised using 2 % xylocaine mixed with 1 in 10,000 adrenaline injection. About 1/2 cc is infiltrated at 3 - o clock, 6 - o clock, 9 - o clock, and 12 - o clock positions about 3mm from the annulus. The patient is premedicated with intramuscular injections of 1 ampule fortwin and 1 ampule phenergan.

Step I: Freshening the margins of perforation - In this step the margins of the perforation is freshened using a sickle knife of an angled pick. This step is very important because it breaks the adhesions formed between the squamous margin of the ear drum (outer layer) with that of the middle ear mucosa. These adhesions if left undisturbed will hinder the take up of the neo tympanic graft. This procedure will in fact widen the already present perforation. There is nothing to be alarmed about it.

Step II: This step is otherwise known as elevation of tympano meatal flap. Using a drum knife a curvilinear incision is made about 3 mm lateral to the annulus. This incision ideally extends between the 12 - o clock, 3 - o clock, and 6 - o clock positions in the left ear, and 12 - o clock, 9 - o clock and 6 - o clock positions in the right ear. The skin is slowly elevated away from the bone of the external canal. Pressure should be applied to the bone while elevation.

Step III: Elevation of the annulus and incising the middle ear mucosa. In this step the annulus is gradually lifted from its rim. As soon as the annulus is elevated a sickle knife is used to incise the middle ear mucosal attachment with the tympano meatal flap. This is a very important step because the inner layer of the remnant ear drum is continuous with the middle ear mucosa. As soon as the middle ear mucosa is raised, the flap is pushed anteriorly till the handle of the malleus becomes visible.

Step IV: Freeing the tympano meatal flap from the handle of malleus. In this step the tymano meatal flap is freed from the handle of malleus by sharp dissection of the middle ear mucosa. Sometimes the handle of the malleus may be turned inwards hitching against the promontory. In this scenario, an attempt is made to lateralise the handle of the malleus. If it is not possible to lateralise the handle of the malleus, the small deviated tip portion of the handle can be clipped. The handle of the malleus is freshened and stripped of its mucosal covering.

Step V: Placement of graft (underlay technique). Now a properly dried temporalis fascia graft of appropriate size is introduced through the ear canal. The graft is gently pushed under the tympano meatal flap which has been elevated. The graft is insinuated under the handle of malleus. The tympano meatal flap is repositioned in such a way that it covers the free edge of the graft which has been introduced. Bits of gelfoam are placed around the edges of the raised flap. One gel foam bit is placed over the sealed perforation. This gelfoam has a specific role to play. Due to the suction effect created it pulls the graft against the edges of the perforation thus preventing medialisation of the graft material.

III. Results

Perforation Closure: The overall success rate for perforations was 85.7% (30/35). A small perforation recurred in 4 ears (11.4%). One case lost during follow up period.

First week after surgery: 25 patients out of 35 had intact ear drum

4th week after surgery: 30 patients out of 35 had intact ear drum

Hearing improvement:

Pre op audiometry showed:

27 patients -30-35 dB hearing loss

8 patients – 35-40 dB hearing loss

Advantages of endoscopic myringoplasty:

1. This surgical procedure fulfils the criteria of minimally invasive surgical procedure 9.
2. Equipment is portable
3. It is cost effective

Disadvantages:

1. Since the non-dominant hand is used to hold the endoscope only one hand is available of surgery
2. Learning curve is very steep

IV. Discussion

Endoscopic surgery, in contrast, is based on 2D images. These 2D images make depth perception difficult¹⁰, and thus, the surgeon has to carefully ascertain whether the graft has been sufficiently lifted to make contact with the edge of the perforation. However, advances in full HD camera systems provide much clearer and contrasted endoscopic views and has greatly minimized the drawbacks of 2D images. One of the main shortcomings with an endoscopic approach is the need for “one-handed” surgery. The operator has to use one hand to hold the endoscope and the other hand to perform the actual surgery. However, one-handed surgery does not really constitute a shortcoming in transcanal endoscopic myringoplasty. A simple procedure such as myringoplasty can be easily performed using a one handed procedure without any increased risk or difficulties. Another shortcoming of endoscopic surgery is that hematomas can result if the endoscope makes contact with the external auditory canal. However, the endoscope’s wide field of view allows observation of the entire circumference of the perforation and approaching the edge of the perforation reveals the under surface of the tympanic membrane.

According to the principles of minimally invasive surgery, minimal trauma of healthy tissue is produced with the result of minimizing local and general postoperative adverse reactions. Transcanal endoscopic myringoplasty is a minimally invasive technique. Transcanal endoscopic myringoplasty offers a number of advantages in comparison to the retroauricular microscopic approach including less invasiveness (no skin incision and no canalplasty), superior visualization, and no hair loss.

V. Conclusion

We conclude that the results of endoscopic myringoplasty are comparable with that of microscope myringoplasty. Even though the learning curve is a little steep it is worthwhile exploring this option due to the obvious advantages.

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