

A Comparartive Study on Endoscopic Underlay versus Interlay Technique of Type I Tympanoplasty

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ABSTRACT

Introduction

Tympanoplasty by underlay method is the commonly employed technique to repair perforated tympanic membrane and is conventionally done using a microscope. Aim of this study was to compare the results of underlay and interlay technique of endoscopic tympanoplasty between two groups.

Materials and Methods

A total of 100 patients were included in the study, with in a period of two years. All of them underwent type I endoscopic tympanoplasty, 50 patients in group 1 by interlay and 50 patients in group 2 by underlay method. All of whom were followed up for 6 months. Patients were evaluated and compared in terms of graft uptake, improvement in hearing and rate of complications

Results

In the present study, Group 1 patients have recorded a graft uptake rate of 100% where as in group 2 it was 94%. 88% of the patients in group 1 and 84 % in group 2 reported a complete ABG closure at the end of 6 month.

Conclusion

Endoscopic tympanoplasty, by interlay technique gives a very good success rate both in terms of graft uptake and air-bone gap closure when compared to underlay method.

Keywords

Endoscopic Tympanoplasty; Interlay; Underlay

Tympanoplasty is the surgical technique used to repair perforated tympanic membrane, which is done commonly by underlay technique. Various other techniques like overlay, interlay, overlay-underlay and sandwich method have been employed by many otologists since ages. Interlay tympanoplasty is done by placing the graft between the fibrous layer and the mucosal layer of the remnant tympanic membrane, whereas in underlay method graft is placed below the mucosal layer.¹ Interlay technique however is not very commonly done by surgeons because of its technical difficulty in elevating the flap and to add on doing it endoscopically limits the surgeon with one hand usage.¹ Conventionally tympanoplasty is done under the guidance of microscope, which allows bidexterity to the surgeon.

As there is a trend towards minimally invasive intervention in the field of otology endoscopes are having its implications in ear surgeries. It gives a closed and wide angled visualization of middle ear structures,² also smaller incisions can be used.² Many otologists are preferring endoscopes over microscopes in recent times. In the present study, we are comparing the results of endoscopic

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tympanoplasty done by two different methods, interlay and underlay, using temporalis fascia as graft.

Materials and Methods

The present study comprises of a total of 100 patients, who were grouped by simple randomization technique (odd and even method) into two equal groups of 50 each. One group was operated by underlay and the other by interlay method. The study was conducted within a period of two years (Dec2019 – Jan 2022) at our institution. All of them underwent type I endoscopic tympanoplasty. Study design was a prospective and comparative study. Inclusion criteria was patients diagnosed with chronic otitis media, mucosal type with dry central perforation and patients with active ear disease, any ossicular necrosis, tympanosclerosis or any co morbidities were excluded from the study. Detailed clinical history and examination was done in all cases, necessary laboratory investigations, otoendoscopy, pure tone audiometry and radiological investigations were performed. Informed consent was obtained from all patients. All the cases underwent surgery under local anesthesia.

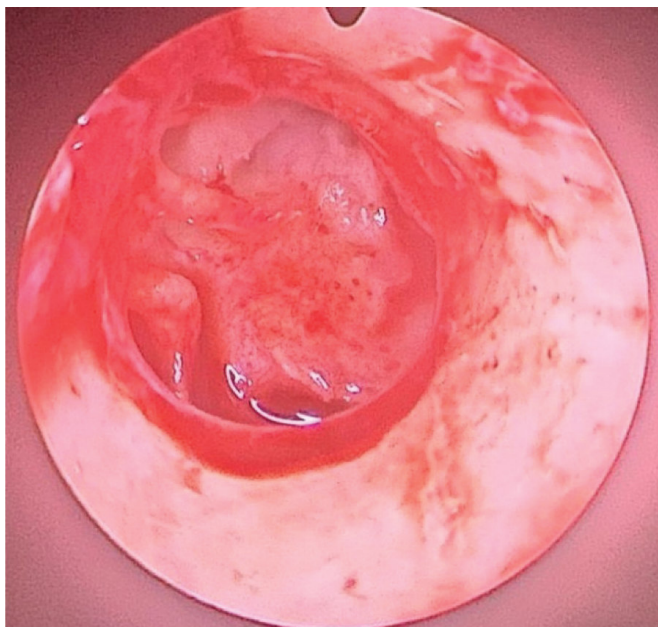


Fig. 1. Tympanomeatal flap elevated by interlay technique

Temporalis fascia was the graft used in all cases, which was harvested by a small 2cm incision in temporal region. In the group with interlay technique, under endoscopic guidance transcanal incision was put and tympanomeatal flap was elevated circumferentially except at the lateral process of malleus region. Once the level of annulus was reached the fibro squamous layer alone was lifted up leaving behind the mucosal layer using a curved blunt hook. Middle ear was then inspected for ossicular continuity, Eustachian tube orifice and round window reflex was confirmed. Malleus was skeletonised, Temporalis fascia was then grafted in such a fashion that it rested on the mucosal layer of tympanic membrane under the handle of malleus. Tympanomeatal flap was then repositioned. In the second group, grafting was done by conventional underlay method.

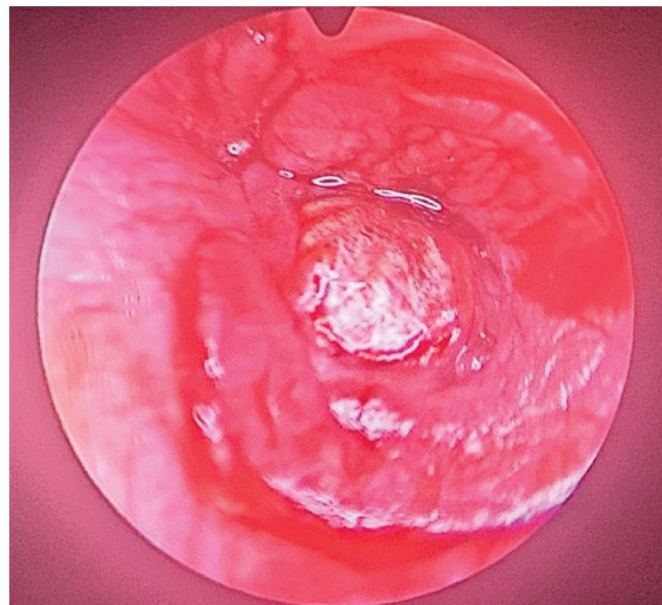


Fig. 2. Tympanic membrane grafting done by interlay method

Results

A total of 100 patients with mucosal type of chronic otitis media were included in the study, they were randomly grouped into two groups 1 and 2 of 50 patients each. Group 1 patients were operated by interlay method and group 2 by underlay method. The age of the patients ranged from 15 to 57 years, with the mean age being 33.6 years.

Table I: Pre-operative air-bone gap

PREOPERATIVE ABG	NUMBER OF PATIENTS		PERCENTAGE	
	1	2	1	2
11 - 20	35	34	70	68
21 - 30	11	12	22	24
31 - 40	4	4	8	8
Total	50	50	100	100

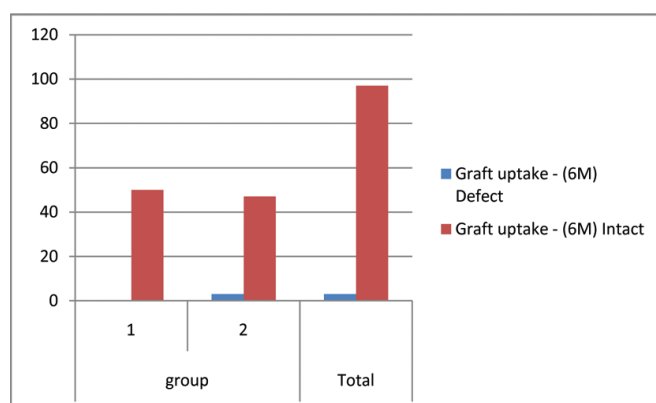
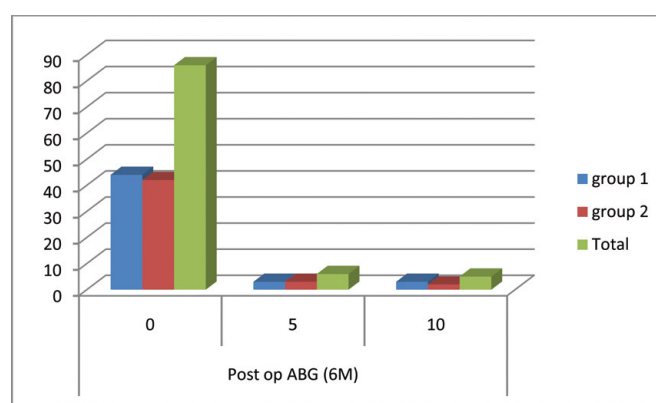
All patients gave history of ear discharge at some point of life, but were dry for the past three months prior to surgery. Maximum number (66 %) of patients had complaints of both ear discharge and hearing loss followed by tinnitus, vertigo and other miscellaneous symptoms.

The preoperative airborne gap was as follows, given in the table. Maximum numbers of patients were in a range of 11 to 20 dB in both groups.

In group 1, all patients had a normal tympanic membrane at the end of 6 months, with a graft uptake rate of 100%. where as in group 2, 3 patients had residual perforation at the end of 6 months and 47 patients had a normal tympanic membrane. Out of these 3 patients, one

patient had developed an upper respiratory tract infection 15 days post operatively and other two had an uneventful postoperative period, but found to have a residual perforation in the tympanic membrane anteriorly at the end of 2 months.

The mean pre-operative air bone gap (ABG) in group 1 was 19.5dB and in group 2 was 20 dB. The post operative ABG closure at the end of 6 months in group 1 was as follows. In the 6th month 44 (88 %) cases had complete AB gap closure, 3 (6%) cases had a residual AB gap of 5 dB and 10 dB each, all of which were statistically significant. Group 2 also had complete AB gap closure in 42 patients out of 50. PTA was not done in 3 patients of group 2, who had graft failure post operatively.

**Fig. 3. Graft uptake****Fig. 4. Post operative air-bone gap**

Discussion

The optimal technique of tympanoplasty is still a debate and it varies from surgeon to surgeon and also on their skill. Whichever method of reconstruction we use, an ideal healed membrane should look near normal to the original with a good effective vibrating area and function. Endoscopic ear surgery has emerged in recent past with promising results. It has merits in terms of better cosmesis, less invasiveness, less postoperative pain and stay, also better compliance with patients unlike microscopes.

In the present study, we have reported a graft uptake of 100% in the group operated by interlay method compared to underlay, which showed a graft uptake rate of only 94%. Three patients in group 2 had graft failure, one of which had developed upper respiratory tract infection 15 days postoperatively. Other two patients had residual perforation in the tympanic membrane anteriorly at two month follow up.

Patil BC et al reported in their study of 100 cases, operated by interlay method, with a graft success rate of 96% and they conclude interlay tympanoplasty as a safe and effective method of graft placement for large central perforation.³

Jain et al studied 500 cases of csom, operated by interlay method and reported a graft uptake rate of 96.6%, which is almost comparable with our study. They also recommend interlay technique as an excellent method for tympanic membrane reconstruction.⁴ The graft uptake rate in a study conducted on 100 patients by Sharma et al. was found to be 96% and 90% respectively in interlay and underlay groups, which is slightly lower compared to our study.⁵

In the present study, 88% achieved complete post operative air-bone gap closure at the end of 6 month in group 1 and 84% in group 2. PTA was not done in 3 patients of group 2, who had graft failure post operatively. There was no statistically significant difference, however PTA averages improved postoperatively in both groups.

Raj et al, in their study reported 90% graft uptake rate in endoscopic group as compared to 85% in microscopic group. Their results of endoscopic

myringoplasty were comparable to the conventional myringoplasty done under operating microscope and there was no significant difference between the gain in A-B gap in either group.⁶ Sergi et al by underlay technique reported mean post op ABG as 9.9 dB. 56 % achieved complete ABG closure.⁷ Takahashi M et al in their study on 51 cases reported, the mean postoperative AB gap as 4.0–18.1 dB (mean, 10.8 dB), and 77–100% (average, 90.8%) of the cases with a postoperative AB gap, were within 20 dB.⁸ Hay et al studied 116 patients were operated by interlay myringoplasty and the overall tympanic membrane perforation closure rate in all cases was 91% (105/116) and a mean hearing threshold improvement of 9.98 dB (SD 9.63, range 43.8 dB improvement to 20 dB loss) was seen.⁹ Our results were better than these studies.

Conclusion

The interlay method of doing type I tympanoplasty has high success rate both in terms of graft uptake as well as ABG closure. Complications are less as compared to other techniques, also endoscopic approach to middle ear and tympanoplasty has given a new perspective to otologists. Endoscopic interlay tympanoplasty though a challenging surgical skill is a promising and rewarding technique of tympanoplasty.

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