



EFFICACY OF ENDOSCOPIC UNDERLAY TYMPANOPLASTY VERSUS OVERLAY TYMPANOPLASTY IN A TERTIARY CARE CENTRE

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ABSTRACT

BACKGROUND: This study was done to compare the efficacy of overlay and underlay techniques of tympanoplasty on the perforated tympanic membrane with the help of endoscope.

MATERIALS AND METHODS: This randomised prospective study was conducted in Malda Medical College and Hospital during September 2014 to September 2017. In this study 32 patients of chronic otitis media with dry central perforation for at-least 3 weeks were selected in two group of 16 each, one undergone overlay tympanoplasty and another overlay tympanoplasty by endoscope. The data was collected from above patients and statistically analysed regarding graft taken or rejected and hearing improvement.

RESULTS: Success rate regarding the drum closure in underlay technique is 75%, where overlay technique was 93.75%. Post-operative AIR BONE gap improvement also little better in overlay technique than underlay technique. In underlay technique one patients having medialisation of graft and in overlay technique one case of anterior blunting and another single case of lateralisation of graft.

CONCLUSION: Endoscopic overlay technique is better for closure of perforated tympanic membrane than endoscopic underlay technique but the limitation of this study was the small sample size.

KEYWORDS

Endoscopy, Overlay, Underlay, Tympanoplasty.

INTRODUCTION:

Perforations of the tympanic membrane are commonly the results of chronic middle ear diseases, however damage can also result from penetrating trauma, direct physical injury, burns, pressure effects and head injury. 80% iatrogenic perforations of tympanic membrane are due to ventilation tube insertion. Myringoplasty also known as type 1 tympanoplasty is a surgical procedure which is confined to the repair of tympanic membrane without manipulation of middle ear and its contents. Where tympanoplasty is a surgical procedure which includes repair of tympanic membrane with middle ear disease removal and or reconstruction of hearing mechanism. In 1878 Berthold's first do plastic repair of tympanic membrane¹. The term tympanoplasty was first used by Wullestein². Various graft materials and techniques used over the years to repair the perforation of tympanic membrane. There are wide ranges of techniques like overlay³, interlay techniques, underlay technique⁴, gelflim sandwich technique⁵, swinging door technique⁶ etc. The two most common techniques are overlay and underlay technique⁷.

Conventional tympanoplasty with post auricular incision and operating microscope is most widely used but having disadvantages like scar and post operative pain, to minimise these problems minimally invasive endoscopic otologic surgery recently developed. Endoscopic ear surgery first tried in 1990s⁸ has become popular with anatomic and physiologic concepts⁹. Advantage of endoscopic approach are 1) There is no need of external incision and tissue dissection 2) better visualisation of hidden area of middle ear cavity like , anterior and posterior epitympanic recess , sinus tympani , facial recess and hypotympanum, endoscopic otological surgery decreases residual cholesteatoma and recurrences of cholesteatoma surgery^{10,11,12}.

There has been lack of reliable data regarding the efficacy and outcome of endoscopic tympanoplasty by underlay and overlay technique. In this study we evaluates and compare the result of hearing outcome ,post operative pain assessment ,operation time and graft success rate.

MATERIALS AND METHODS

This randomised prospective study was conducted at the department of ENT and HEAD NECK SURGERY of a tertiary care centre of West Bengal from se September 2014 to September 2017. It included 32 patients in between 16-- 45 years of age group with dry perforation for at-least 3 weeks with no focus of infection in ear nose and throat . The above patients divided into two groups with 16 in each groups. The data also calculate and analysed statistically in respect to decrease in Air Bone (AB) gap, whether graft was accepted and rejected and complications.

INCLUSION CRITERIA:

1. Dry ear or absence of ear discharge for at-least 3 weeks.

2. Age between 16-45 years.
3. Patient having central perforation.
4. Demonstrable conductive deafness below 40 decibels.

EXCLUSION CRITERIA:

1. Discharging ear.
2. Children below 16 years and adult above 45 years.
3. Revision tympanoplasty.
4. Patient having sensorineural hearing loss.
5. Attic perforation.
6. Evidence of cholesteatoma and granulation tissue.

SURGICAL PROCEDURE:

After proper haematological, radiological, audiometric and endoscopic assessment patients were divided into two groups. Group-A & Group-B and planned for surgery under local anaesthesia. Group A undergone type 1 endoscopic tympanoplasty by underlay technique and group B undergone type 1 endoscopic tympanoplasty by overlay technique. 0 degree 4 mm rigid endoscope was used through transcanal route. In both these techniques temporalis fasciagraft used as a graft material. In underlay technique at first margin of the perforation was freshened after harvesting temporalis fascia graft. Rosen Incision was made 6-8 mm lateral to the tympanic annulus in the posterior part of external auditory canal from 6 o'clock to 12 o'clock position. Middle ear cavity was visualised after elevation of tympanomeatal flap. After checking ossicular integrity temporalis fascia graft was placed medial to the tympanic annulus . Gelfoam was placed in the middle ear cavity to prevent medialisation of graft. Gelfoam was also put in the external canal lateral to the graft. After completion of the procedure mastoid bandage was applied.

In overlay method margin of the perforation was freshened. A incision was made in external auditory canal 6-8 mm lateral to tympanic annulus extending from 1 o'clock to 11 o'clock position. Tympanomeatal flap elevated upto annulus then epithelial layer of tympanic membrane elevated 360 degree leaving behind fibrous layer of tympanic membrane making superior based flap. Temporalis fascia graft placed over the fibrous layer and tympanomeatal flap repositioned. Gelfoam was placed in the external auditory canal to prevent lateralisation. After completion of the procedure mastoid bandage applied. In Post operative period antibiotics ,analgesic, antacid and antihistaminics were prescribed and patient were advised to avoid nose blowing, sneezes with open mouth , avoidance of heavy weight lifting , and avoid cold. Post operatively ear drop was started after 3 weeks, gelfoam was removed and audiometric evaluation was done after 3 month and 6 month.

STATISTICAL ANALYSIS:

Chi-square test was applied and considered significant at $p < .05$.

Collected data were analysed and statistical tests were done with the help of Microsoft excel and Epi – info(5) soft ware. Preoperative and post operative audiometric data were compared using pair- t test.

RESULTS AND ANALYSIS:

From September 2014 to September 2017 total 32 patients underwent type 1 tympanoplasty. Group A comprised of 16 patient (50%, 6 male and 10 females) and group B also comprised of 16 patient (50 %, 9 males and 7 females). Total number of male patient was 15(46.9%) and 17 (53.1%) was female as shown in

TABLE 1. TABLE 1 : SEX DISTRIBUTION

SEX	UNDERLAY	OVERLAY	PERCENTAGE
MALE	6	9	15(46.9%)
FEMALE	10	7	17(53.1%)

Right ear was involved in 10 patients and left ear was involved in 6 patients in case of group A (underlay method).Whereas in group B (overlay method) 7 patients having right ear involvement and 9 patients with left ear involvement. A total number of 17 patients having right ear involvement and 15 patients with left ear involvement shown in TABLE 2.

TABLE 2: LATERALITY OF EAR

LATERALITY	UNDERLAY	OVERLAY	TOTAL(%)
RIGHT	10	7	17(53.2)
LEFT	6	9	15(46.8)

Data of TABLE 3 describe that In group A patients preoperative A-B gap< 10 dB were nil, between 11-20 dB in 3 patients, 21-30 dB in 7 patients and 31-40 dB in 6 patients. Where as in group A post operative A-B gap less than 10 dB was in 10 patients, 11-20 dB in 2 patients, 21- 30 dB in 3 patients and in single patient it was 31-40 dB.

TABLE 3: PRE & POST OPERATIVE AIR BONE GAP (A-B) GAP IN GROUP A PATIENTS

AVERAGE A-B GAP(dB)	PRE-OPERATIVE	POST-OPERATIVE
< 10	0	10
11-20	3	2
21-30	7	3
31-40	6	1

in group B preoperative A-B gap,<10 dB hearing loss in none,11-20 dB loss in two patients, 21-30 dB loss in 9 patients and 31-40 dB in 5 patients. Where as In group a post operative A-B gap less than 10 dB hearing loss in 11 patients, 11-20 dB loss in two patients, 21-30 dB in 2 patients and 31-40 dB hearing loss in single patient shown in TABLE 4

TABLE 4: PRE & POST OPERATIVE AIR BONE GAP (A-B) GAP IN GROUP B PATIENTS

AVERAGE A-B GAP(dB)	PRE-OPERATIVE	POST-OPERATIVE
<10	0	11
11-20	2	2
21-30	9	2
31-40	5	1

In this study, in case of group A, drum closure was in 12 patients out of 16 patients and in case of group B drum closure was in 15 cases out of 16 cases. In statistical analysis p value is 0.144 and OR=0.20 and RR=0.80.

also in case of group A medialisation of graft was in a single patient and there was no lateralisation or anterior blunting of graft. And in case of group B one anterior blunting of graft was seen, in one patient has lateralisation of graft described in TABLE 5

TABLE 5: POST OPERATIVE RESULTS AND COMPLICATIONS

POST-OPERATIVE ASSESSMENT	UNDERLAY(GROUP A)	OVERLAY(GROUP B)
DRUM CLOSURE	12	15
PERFORATION	4	1
MEDILISATION	1	0
LATERALISATION	0	1
ANTERIOR BLUNTING	0	1

p value is 0.144 and OR=0.20 and RR= 0.80.

DISCUSSION

The primary goal of tympanoplasty is to produce a neo tympanic membrane,which is physiologically and anatomically as close as possible to original tympanic membrane and thus to give patient a dry ear and improved hearing level.

Endoscope has been established by Tarabichi, Usmani et al., and with adjunct to microscope for examination of middle ear now have the world wide acceptance^{13,14}. There are many advantages of endoscopic technique but still it has some limitations like, one handed surgery by endoscope having difficulty in removal the blood from the operative field and the heat generated from endoscope during surgery can damage external auditory canal and middle ear structures. However recently two handed endoscopic technique innovated by

Khan et al.¹⁵. To minimised heat related damage Kozin et al.¹⁶ recommended using sub maximal light intensity and frequent repositioning of endoscope.

Most commonly used techniques for grafting of perforated tympanic membrane are underlay and overlay technique. Overlay technique is older technique than underlay. In this technique surface epithelium removed from remnant of tympanic membrane and graft placed over the fibrous layer of tympanic membrane. Advantages of this technique are graft remains vascularised and middle ear spaces not obliterated and the disadvantages like difficult technique, chances of cholesteatoma formation and lateralisation of graft and anterior blunting.Underlay technique was first introduced by Shea. This technique is easy to perform and most widely performed technique for repair of perforated tympanic membrane. In underlay technique there are chances of graft medialisation and adhesion of graft with the promontory.

In our study the outcome in terms of drum closure in case of underlay technique (75%) is slight lower in compare to overlay technique (93.75%).

The result of our study can be compared with the study of Yadav SPS and et al¹⁷, where a graft uptake rate was 80% reported in underlay technique and with the study of Tarabichi M¹⁸, where graft uptake was 97.8% in a 46 cases with overlay technique.

Complications rate in our present study was very low , only single case of medialisation of graft in underlay technique and there is one case of lateralisation of graft and one case of anterior blunting in overlay technique.

CONCLUSION

Endoscopic overlay technique is better for closure of perforated tympanic membrane than endoscopic underlay technique and endoscopy is now emerging as a useful tool for otologists. But the limitation of our study was the small sample size .A large scale randomized control study is necessary.



FIG: 1



FIG: 2

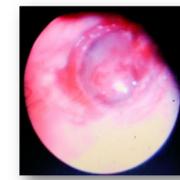


FIG:3



FIG:4

LEGENDS of Figures:

Fig1. Elevation of Tympanomeatal flap (overlay method).

Fig2: Elevation of Epithelial Layer from Fibrous Layer (Overlay method).

Fig3: 360° Elevation of Epithelial Layer from Fibrous Layer (Overlay method).

Fig 4: Closure of Perforation by Temporalis Fascia Graft (Overlay method).

References

1. Berthold E. Uebermyringoplastik. Wien Med BI 1878;1:1627.
2. Wullstein H. Die Tympanoplasticalsgeworverbessernde operation bei Otitis Media Chronica und ihrresultate. In: Proceedings of The Fifth International Congress of Otorhinolaryngology,1953.
3. Shea JJ Jr. Vein graft closure of ear drum perforations. J Laryngol,Otol . 1960;74:358-62.
4. House WF. Myringoplasty. AMAArch Otolaryngol 1960;71:399-404.
5. KarlanMS .Gelatin film in sandwich tympanoplasty. OtolaryngolHead Neck Surg .1979;87:86-7.
6. Sachwaber MK. Post auricular undersurface tympanic membrane grafting . Some modifications of "swing door technique". Otolaryngol and Head Neck Surg 1986;95:182-7.
7. Hung T ,knigt JR, sankar V. anterosuperior anchoring myringoplastytechnique for anterior and subtotal perforations. ClinOtolaryngol Allied Sci.2004;29:210-4.
8. Thomassin JM, Duchon-Doris JM, Imram B, Rud C, Conciatory J, Vilcoq P. Endoscopic ear surgery. Initial evaluation. Ann otolaryngolchircevicofac. 1990; 107(8):564-70.
9. Marchioni D, Alicandri-Cieufelli M, Genovese M, Presutti I. Inferior RetrotympanumRevisited:an Endoscopic Academic study. Laryngoscope.2010. sep;120(9):1880-6.
10. Ayache S , Tramier B,Strunski V. Otoendoscopy in Cholesteatoma Surgery of Middle ear: What Benefit Can Expected? Otol Neurootol.2008.Dec 29(8):1085-90.
11. Migirov I, Shapira Y, Horowitz Z,Wolf M. Exclusive endoscopic ear surgery for acquired cholesteatomas: Preliminary results. Otol Neurootol.2011Apr, 32(3):433-6.
12. Thomassin JM, Korchia D, Doris JM. Endoscopic-guided ear surgery in the prevention of recurrent cholesteatoma. Laryngoscope. 1993 Aug;103(8):939-43.
13. TarabichiM , Endoscopic trans canal middle ear surgery. Indin J of Otolaryngol Head Neck Surg.210;62:6-24.
14. UsamiS,ljima N, Fujita S, Takumi Y. Endoscopic- assisted Myringoplasty. ORL J OtorhinolaryngolRelat Spec .2011;63:287-90.
15. Khan MM, Parob SR. endoscopic cartilage tympanoplasty: A two handed- technique using an endoscope holder. The laryngoscope .2015;126:1893-8.
16. Kozin ED, Lehmann A, Carter M, Hight E, Cohen M, Nakajima HH et all. Thermal effect of endoscopy in a human temporal bone model: implications for endoscopic ear surgery. Laryngoscope 2014Aug;124(8):E332-9.
17. YadavSPS , Aggarwal N, Julaha M, Goel A. Endoscopic assisted myringoplasty . Singapore Med J 2009;50(9):510.
18. Tarabichi M. Endoscopic lateral graft tympanoplasty . Abstract otology 2000;A:12-6.