

A COMPARISON OF MYRINGOPLASTY TECHNIQUES BY UNDERLAY AND OVERLAY

Rizwan Ahamad¹¹Associate Professor, Darbhanga Medical College & Hospital, Bihar, India

Received : 13/06/2023
 Received in revised form : 12/07/2023
 Accepted : 22/07/2023

Keywords:

Myringoplasty, temporal fascia,
 Tympanoplasty

Corresponding Author:

Dr. Rizwan Ahamad,

Email: drizwanahmad175@gmail.com

DOI: 10.47009/jamp.2023.5.4.172

Source of Support: Nil,
 Conflict of Interest: None declared

Int J Acad Med Pharm
 2023; 5(4); 851-855

**Abstract**

Background: The surgical technique is better is still matter of debate. The two classical techniques that have been developed are the "Underlay" and the "Overlay" procedures. The former is widely used and relatively simple to perform as the graft is placed entirely medial to the remaining drum and malleus. This technique is ideal to repair small and easily visualized perforations. **Materials and Methods:** It was a prospective randomised controlled study, the study was conducted in the department of ENT and Head-neck Surgery of Darbhanga Medical College & Hospital. Bihar, the period of April 2021 to October 2022. Aged between 20 -40 years. Total 40 cases with safe variety of chronic suppurative otitis media and dry central perforation irrespective of age and sex were selected randomly for this study. **Result:** In our study the number of females was more than the number of males and male: female ratio was 1:0.73. Mean pre-operative A-B gap by pure tone audiometry was 29.15 (\pm 5.56) dB. All patients had negative pre-operative Rinne test and none of the patients had reduced ABC test pre-operatively. Minor complications were prevalent more or less in both the techniques of myringoplasty. **Conclusion:** According to our results, underlay and overlay techniques of myringoplasty are equally effective in terms of graft success rate and hearing improvement, but in terms of complications underlay technique is superior to overlay technique. Underlay technique of myringoplasty is also relatively simple, technically easier to perform and takes less time as compared to overlay technique of myringoplasty.

INTRODUCTION

Myringoplasty is a performed to prevent infection and to improve hearing loss caused by tympanic membrane perforation, and was established for the first time by Berthold in 1879.^[1,2]

In 1956, Zöllner successfully used autologous fascia lata.^[3] Temporal muscle fascia in myringoplasty was suggested for the first time by Wullstein in 1957.^[4]

In myringoplasty, a graft taken commonly from temporalis fascia and sometimes from Tragal perichondrium, or cartilage,^[5] it can be placed either underlay or onlay.^[6] Since the underlay technique introduced by Shea in 1960 has most widely used and over 92% success rate.^[7-9] The excision of the perforation edge is an integral part of any myringoplasty procedure, whatever the approach, incision, or technique used.^[10]

Chronic otitis media is one of the commonest Otological problems among Sudanese, in both adult and children (43%) and they presented with perforation of ear drum and different degrees of hearing loss.^[11]

Underlay Technique

In this technique elevating the TM flap under the annulus gives entry to reach the middle ear cavity. After creating space above and bellow this point of entry to the middle ear, the fascia graft is placed under the TM remnant and the annulus which is elevated from annular groove to some distance anteroinferiorly. The middle ear cavity is covered with gel foam to support the fascia graft. After repositioning the TM flap antibiotic soaked gel foam was placed in the external canal to stabilize the graft.

Overlay Technique

The temporal fascia is harvested. An incision is made to raise medial meatal skin with tympanic membrane epithelium. The graft is placed on the outer surface of the tympanic membrane and a slit is made to tuck it under the handle of malleus. The ear is packed with gelfoam and antibiotics, and the incision is closed. Finally mastoid dressing is performed.

MATERIALS AND METHODS

It was a prospective randomized controlled study, the study was conducted in the department of ENT and Head-neck Surgery of Darbhanga Medical College & Hospital, Bihar, the period of April 2021 to October 2022. Aged between 20 -40 years. Total 40 cases with safe variety of chronic suppurative otitis media and dry central perforation irrespective of age and sex were selected randomly for this study

Inclusion Criteria

- Age: Between 20- 40 years
- Patients with central perforation of pars tensa with the following criteria:
- Dry ear free from any discharge for six weeks or more
- Good cochlear reserve
- Normal Eustachian tube function
- Intact and mobile ossicular chain

Exclusion Criteria

- Patients with age less than 15 and more than 40 years.
- Patients with failed myringoplasty
- Patients with Diabetes mellitus, malignancy or any other chronic debilitating disease.
- Known Eustachian tube dysfunction.
- Unsafe variety of COM or associated with mastoiditis.

Cases selected for study were subjected to detail history taking including patients particulars, chief complaints, present and past medical and surgical history, personal history, family history etc. Detailed clinical examination was then done by local examination, aural speculum examination, otoscopic examination, Siegel's pneumatic speculum examination and finally by examination under microscope. Then auditory function test was done specially the tuning fork test including Rinne test, Weber test and ABC test. Patients were then subjected to various vestibular function tests, Eustachian tube function test and facial nerve function test. Examinations of nose, throat and other systemic examinations were done to rule out any potential source of infection.

Cases were then investigated as follows

- (a) X-ray B/L mastoid lateral-oblique view or Schuller's view
- (b) Pure tone audiometry
- (c) Routine blood tests- CBC, BT, CT, RBS
- (d) HIV, HBsAg and HCV viral markers

Preoperative preparation

- Patients were prepared for surgery under local anaesthesia.
- Lignocaine sensitivity testing was done by injecting 0.1 ml of 2% lignocaine intradermally on the ventral aspect of forearm.
- Written consent of the patient, parents or guardian was taken after proper counseling regarding the advantages and risks of anaesthesia and surgery.

- Shaving of the mastoid area including 2-3 cm above and behind the ear was done.
- The patients were advised to be nil per mouth for 6 hours prior to surgery.

Premedication

- Intravenous Ceftriaxone (25mg/kg) was given 30 minutes prior to the surgery after proper skin sensitivity test.
- Intravenous Ondansetron and Pentazocine was given just prior to the surgery.
- Intramuscular Glycopyrrolate and Promethazine was given 30 minutes prior to the surgery.
- Tab Diazepam was given one night before the surgery

Anesthesia

We used local anaesthesia with sedation in all the cases.

For this purpose 2% Lignocaine with 1:100000 Adrenaline was used. The drug was infiltrated in the post-auricular area and the tragus. Also the four quadrants of junction of the bony and cartilaginous part of the EAC were infiltrated with the local anaesthetic drug. Intravenous cannula was inserted and intravenous infusion of Ringer Lactate was started.

RESULTS

In our study the youngest patient was of 20 years age and the oldest was of 40 years of age. The mean age was 27.50 (± 6.65). The mean ages of patients who underwent overlay and underlay techniques Myringoplasty were 28.50 and 26.56 respectively. Most of the patients' ages were from 20-30. [Table 1]

In our study 42.5 % (n=17) were females and 57.5 % (n=23) were males. Male: female ratio was 1:0.73. The sex ratio did not have statistical significance among the two groups. [Table 2]

In our study commonest symptom were discharge per ear with hearing loss found in 65% cases (n=26). Other symptoms were discharge per ear alone, 52.5% (n=21), hearing loss alone, 42.5% (n=17) and others, 5% (n=2). There were negligible variation of symptomatology among the two groups. [Table 3]

In our study the mean pre-operative air-bone gap measured by pure tone audiometry was within the range of 25-48 and the overall mean value was 29.15 (± 5.56). The mean values pre-operative A-B gap among the two groups did not vary significantly. [Table 4]

In our study the size of perforation was divided into two groups for simplicity, the first, large perforation having perforation size of more than 50% of TM area and the second, small perforation having perforation size less than 50% of TM area. Size of perforation was small in 65% (n=26) cases and was large in 35% (n=14) cases. Differences in the size of perforation among the two groups were not significant (>0.05) statistically. [Table 5]

In our study pre-operative status of middle ear was normal in 87.5% cases (n=35) and abnormal (like mildly oedematous or mildly polypoidal middle ear mucosa) in 12.5% cases (n=5). Variations in the status of middle ear mucosa among the two groups were negligible. [Table 6]

Post Operative Follow Up for Anatomical Success Graft taking was observed at 6 weeks. In our study overall 80% (n=32) patients had successful graft take up while only in 20% (n=8) patients the grafts were failed. Graft take up rate among the two groups were comparable. [Table 7]

The cases were assessed for hearing improvement by Rinne test with 512 Hz tuning fork 6 weeks or later after the operation. In our study overall 77.5%

(n=31) patients had improved hearing as indicated by Rinne test. [Table 8]

For assessing the post operative sensory neural hearing status Absolute bone conduction tests were done among the patients 6 weeks or later after the operation. In our study overall 12.5% (n=5) patients had reduced ABC test indicating poorer bone conduction. [Table 9]

At the end of 6 months overall success, that is patients with both anatomical closure of TM defect and hearing improvement were also counted. In our study overall success was found in 82.5% (n=33) patients. Overall success among the two groups is shown in table no-10. Overall success rate among the two techniques did not vary significantly. [Table 10]

Table 1: Age distribution

Technique	No of Patients	Mean	SD
Overlay	20	28.50	7.14
Underlay	20	26.56	6.04
Total	40	27.50	6.65

Table 2: Sex distribution of two groups

Technique	Male	Female	Total
Overlay	12	08	20
Underlay	11	09	20
Total	23	17	40

p = 0.841 (>0.05) Pearson's Chi Square Test (0.704).

Table 3: symptoms

Symptoms	Overlay	Underlay	Total
Discharge + Hearing Loss	14	12	26
Discharge only	11	10	21
Hearing loss alone	8	9	17
Others	1	1	2

P= 0.854, 0.512, 0.435 and 0.819 respectively for different symptom types.

Table 4: distribution of pre-operative A-B gap (dB)

Technique	Minimum	Maximum	Mean	SD
Overlay	25	45	28.78	6.25
Underlay	25	48	29.18	5.34
Total	25	48	29.15	5.56

P = 0.781, ANOVA, one way analysis of variance, (F= 0.249)

Table 5: Size of perforation

Technique	Small	Large
Overlay	14	06
Underlay	12	08
Total	26	14

p = 0.824 (>0.05), Pearson's Chi Square test (0.038)

Table 6: Status of middle ear mucosa among the two groups

Technique	Normal	Abnormal
Overlay	17	3
Underlay	18	2
Total	35	05

p = 0.745 (>0.05) Pearson's Chi square test (0.321)

Table 7: Post Operative Follow Up for Anatomical Success

Technique	Yes	No
Overlay	15	5
Underlay	17	3
Total	32	8

P = >0.05 (0.452) by Fisher's exact test two tailed P value and by comparing two groups at a time.

Table 8: Post operative Rinne test

Technique	Positive	Negative
Overlay	14	6
Underlay	17	3
Total	31	9

p = 0.95 (>0.05) Pearson's Chi Square test (0.102) DF=2

Table 9: Post operative ABC test

Technique	Reduced	Not Reduced
Overlay	2	18
Underlay	3	17
Total	5	35

Table 10: Overall success rate

Technique	Yes	No
Overlay	16	4
Underlay	17	3
Total	33	7

p = >0.05 (0.325) by Fisher's exact test two tailed p value, comparing two groups at a time.

DISCUSSION

Chronic suppurative otitis media (CSOM) is the result of an initial episode of acute otitis media and is characterized by a persistent discharge from the middle ear through a tympanic perforation. It is an important cause of preventable hearing loss, particularly in the developing world. According to a WHO report, India is amongst the nations with highest burden of CSOM (WHO, 2004).^[12] Tympanoplasty and/or Mastoidectomy are frequently necessary to permanently cure CSOM and rehabilitate hearing loss patients. These procedures are readily available in tertiary centres with an otologic department, a standard service in all developed countries and is also recommended in national programme for deafness in our country. Tympanoplasty involves closure of the tympanic perforation by a soft tissue graft with or without reconstruction of the ossicular chain. Mastoidectomy involves removing the mastoid air cells, granulations, cholesteatoma and debris using bone drills and microsurgical instruments. Sequential destruction of the malleus, incus and stapes requires progressively more medially placed tympanic grafts. The extent of damage to the ossicular chain determines the specific types of tympanoplasty; Tympanoplasty is classified as type I, II, III, IV and V. Among these, Type I Tympanoplasty or Myringoplasty is the simplest operative procedure performed to repair the perforation in ear drum by repairing the tympanic membrane only. It is performed when only except for ear drum, the entire ossicular chain is intact (Wullstein, 1953).^[13] Myringoplasty is a beneficial procedure to protect the middle ear and inner ear from future deterioration and also gives improvement in hearing after surgery.^[14]

In our study the youngest patient was of 20 years age and the oldest was of 40 years of age. The mean age was 27.50 (\pm 6.65). The mean ages of patients who underwent overlay and underlay techniques

Myringoplasty were 28.50 and 26.56 respectively. Most of the patients' ages were from 20-30.

In our study commonest symptom were discharge per ear with hearing loss found in 65% cases (n=26). Other symptoms were discharge per ear alone, 52.5% (n=21), hearing loss alone, 42.5% (n=17) and others, 5% (n=2). There were negligible variation of symptomatology among the two groups.

In a study conducted by Fadl A Fadl (2003),^[16] the male: female ratio was 1:1.425. This result correlated with our study.

Male: female ratio was 1:1.5 in a study done by Ashfaque Ahmed Shaikh et al (2009).^[15]

In our study the mean pre-operative air-bone gap measured by pure tone audiometry was within the range of 25-48 and the overall mean value was 29.15 (\pm 5.56). The mean values pre-operative A-B gap among the two groups did not vary significantly.

Sheahan P et al (2001),^[17] in their study showed 74% and 69% patients of active mucosal disease had hearing loss and discharge per ear respectively. This finding correlated with our study in that the history of hearing loss and the ear discharge are the main symptoms of patients in chronic otitis media.

In our study the size of perforation was divided into two groups for simplicity, the first, large perforation having perforation size of more than 50% of TM area and the second, small perforation having perforation size less than 50% of TM area. Size of perforation was small in 65% (n=26) cases and was large in 35% (n=14) cases. Differences in the size of perforation among the two groups were not significant (>0.05) statistically.

In our study pre-operative status of middle ear was normal in 87.5% cases (n=35) and abnormal (like mildly oedematous or mildly polypoidal middle ear mucosa) in 12.5% cases (n=5). Variations in the status of middle ear mucosa among the two groups were negligible.

In a study by Shrestha S et al (2006),^[18] post operative hearing after tympanoplasty between 0-10

dB, 11-20 dB and 21-30 dB were found in 16%, 60% and 14% patients respectively.

Graft taking was observed at 6 weeks. In our study overall 80% (n=32) patients had successful graft take up while only in 20% (n=8) patients the grafts were failed. Graft take up rate among the two groups were comparable.

The cases were assessed for hearing improvement by Rinne test with 512 Hz tuning fork 6 weeks or later after the operation. In our study overall 77.5% (n=31) patients had improved hearing as indicated by Rinne test.

For assessing the post operative sensory neural hearing status Absolute bone conduction tests were done among the patients 6 weeks or later after the operation. In our study overall 12.5% (n=5) patients had reduced ABC test indicating poorer bone conduction.

At the end of 6 months overall success, that is patients with both anatomical closure of TM defect and hearing improvement were also counted. In our study overall success was found in 82.5% (n=33) patients. Overall success among the two groups are shown in table no-10. Overall success rate among the two techniques did not vary significantly.

CONCLUSION

Myringoplasty is a safe and effective technique to improve the quality of life of patients, avoiding continuous infections and allowing them contact with water. According to our results, interlay and underlay techniques of myringoplasty are equally effective in terms of graft success rate and hearing improvement, but in terms of complications underlay technique is superior to overlay technique. Underlay technique of myringoplasty is also relatively simple, technically easier to perform and takes less time as compared to overlay technique of myringoplasty. Therefore, underlay technique of myringoplasty should be widely used, but the

overlay technique should be preferred in cases of anterior quadrant perforations.

REFERENCES

1. Frootko NJ. Applying the language of transplant to tympanoplasty. *Acta otolaryngology*.1985 ;(39): 377.
2. Zollner F. The principles of plastic surgery of the sound-conducting apparatus. *J Laryngol Otol*. 1955; 69: 637.
3. Zollner F. Panel of myringoplasty. Second workshop on reconstructive middle ear surgery. *Arch Otol*. 1963; 78:301.
4. Wullestin H. Theory and practice of tympanoplasty. *Laryngoscope*. 1956; 66: 1076-95.
5. Stenfors LE. Treatment of tympanic membrane perforation with hyaluronan in an open pilot study of unselected patients. *Acta otolaryngol*. 1987; (supp 442): 81-7.
6. Crovetto De La, Torro M. Myringoplasty in chronic otitis media, comparative analysis of underlay and overlay technique. *Acta ltorhinolaryngol ESP*. 2000; 51: 101-4.
7. Shea JJ. Vein graft closure of ear drum perforation. *Northwest Med*. 1960; 59: 770-2.
8. Shea JJ. Vein graft closure of eardrum perforations. *J Laryngol Otol*. 1960; 74: 358.
9. Black JH, Warmald PJ. Myringoplasty effects on hearing and contributing factors. *AFr. Med J* 1995; 85(1): 41.
10. Hussam K. El-KashlanLee A. Harker. Tympanoplasty and ossiculoplasty. *Cummings Otolaryngology—Head & Neck Surgery 4th edition*. 2005; 136: 1905-06-07.
11. Yagi H.I. the pattern of diseases of the ears in Sudanese patients. *Sudan medical journal, Sudan medical association*. 1989; 127(1-4):44-47.
12. World Health Organization. Chronic suppurative otitis media : burden of illness and management options. WHO Child and Adolescent Health Department: Prevention of Blindness and Deafness, Geneva, 2004.
13. Wullstein H. Theory and practice of myringoplasty. *Laryngoscope*. 1956; 66: 1076–93.
14. Hussain A, Yousaf N, Khan AR. Outcome of myringoplasty. *J Postgrad Med Inst*. 2004; 18: 693-6.
15. Ashfaque Ahmed Shaikh, Maisam Abbas Shiraz, Salman Matiullah Shaikh and Tarique Rafi. Outcome of tympanoplasty type I by underlay technique. *JLUMHS, Jan-Apr 2009, vol-08, no.- 01*.
16. Fadl A Fadl, FRCSI, DLO. Outcome of type I tympanoplasty. *Saudi Medical Journal*. 2003, vol-24, no.- 01.
17. Adnan Salem Umar, Jubair Ahmed. Anatomical and functional outcome following type I tympanoplasty in chronic tubotympanic SOM, Military Hospital, Rawalpindi. *March, 2008, issue – 01*.
18. Shrestha S, Sinha B K. Hearing results after Myringoplasty. *Kathmandu Medical College University Journal*. 2006, vol-04, no.-04, issue-16:455-459.