Volume-12/Issue-I/June 2024/ISSN No.-2321-3450
ORIGINAL RESEARCH ARTICLE
DOI: http:/doi.org/10.36611/upjohns/volume12/Issue1/1
Date received: 12.4.2024 / Date Published : 30.6.2024

COMPARATIVE STUDY OF SURGICAL OUT COME OF INTERLAY TYMPANOPLASTY AND UNDERLAY TYMPANOPLASTY IN TERMS OF HEARING IMPROVEMENT AND GRAFT UPTAKE

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ABSTRACT

Introduction: Perforation of the tympanic membrane primarily results from middle ear infections, trauma or iatrogenic causes. Up to 80% of these perforations heal spontaneously; for the remaining, surgical repair, known as myringoplasty, is usually proposed. The principal indications are recurrent otorrhea, the desire to swim without having to waterproof the ear and to improve conductive hearing loss. Several factors may affect surgical outcome such as the surgical approach (endaural, postaural) and technique (underlay vs. overlay), site of perforation and type of graft utilized.

MATERIAL & METHODS

This study was carried out from January 2018 to October 2019. Detailed history and examination were carried out the patient of Chronic Otitis Media with Inactive mucosal disease in large central perforation. Out of 50 patients, 25 patients were operated by underlay technique and rest 25 patients were operated by interlay tympanoplasty. In both the techniques of myringoplasty post auricular approach and temporalis fascia was used as a graft material and operated under general or local anesthesia.

CONCLUSION

Thus in present study as far as resolution of air bone gap is concerned, Interlay technique showed a statistically better outcome as compared to the underlay group. The findings in present study showed a better graft up take in Interlay method which coupled with a better postoperative air bone gap provided a better overall outcome.

Key words: Tympanoplasty , Interlay Tympanoplasty, Underlay Tympanoplasty, CSOM,

INTRODUCTION

Perforation of the tympanic membrane primarilyresults from middle ear infections, trauma oriatrogenic causes. Up to 80% of these perforations heal spontaneously[1]; for the remaining, surgical repair, known as Myringoplasty. Myringoplasty was introduced long back in 1878 by BERTHOLD[2] and included the surgical closure of tympanic membrane perforation including removal of epithelium and grafting with skin. In 1950s, ZOLLNER[3] and WULLSTEIN[4] reintroduced Myringoplasty.

It has been reported in the literature that the final results of tympanoplasty in terms of uptake rate[5] of the graft varies between 74% to 97%, depending

upon surgical skill, technique used, and the site and size of perforation.

Many techniques of Myringoplasty are described as Underlay technique[6], Overlay technique[7], Interlay technique, "Gelfilm sandwich" technique[8], "Swinging door" technique[9], triple "c" technique[10], double breasting technique[11] etc. Out of these, the three most universally accepted techniques for graft positioning are "UNDERLAY", "OVERLAY" and "INTERLAY".

The present study is an attempt to compare the two commonly used Myringoplasty procedures, Underlay and Interlay in cases of Chronic Suppurative Otitis Media in central perforation.

AIM AND OBJECTIVES

To compare surgical outcome of INTERLAY MYRINGOPLASTY and UNDERLAY MYRINGOPLASTY in cases of chronic suppurative otitis media with inactive mucosal disease in large central perforation.

1. To compare change in air bone gap between two groups of interlaymyringoplasty and underlay myringoplasty.
2. To compare outcome of graft uptake between two groups of interlaymy ringoplasty and underlay myringoplasty.

MATERIAL AND METHODS

This study was carried out in department of ENT, GSVM Medical college, Kanpur, UP, India, from January 2018 to October 2019. Detailed history and examination were carried out the patient of Chronic Otitis Media with Inactive mucosal disease in large central perforation.

Out of 50 patients, 25 patients were operated by underlay technique and rest 25 patients were operated by interlay tympanoplasty.In both the techniques of myringoplastypost auricular approach and temporalis fascia was used as a graft material and operatedunder general or local anesthesia.

INCLUSION CRITERIA

- Cases of Chronic Otitis Media with Inactive mucosal disease with pure conductive hearing loss.
- Both males and females in the age group of 15-50 years were included in the study.

EXCLUSION CRITERIA

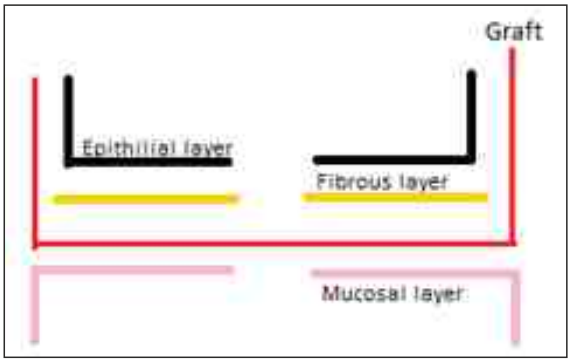
- Patients below 15 years and above 50 years were excluded from the study.
- Patient with Sensorineural hearing loss and Mixed hearing loss.
- Chronic Suppurative Otitis Media Squamosal disease with or without complications.
- Discharging ear, previous history of ear surgery, Ossicular chain necrosis, Otitis externa.
- Comorbid systemic diseases like Hypertension, Diabetes or any chronic infections.
- Active focus found in nose, throat, oral cavity and history of allergy.
- Patients having immunocompromised status.

SURGICAL PROCEDURE

In both group myringoplasty was done by post auricular approach using temporalis fascia as a graft material under general and local anesthesia.

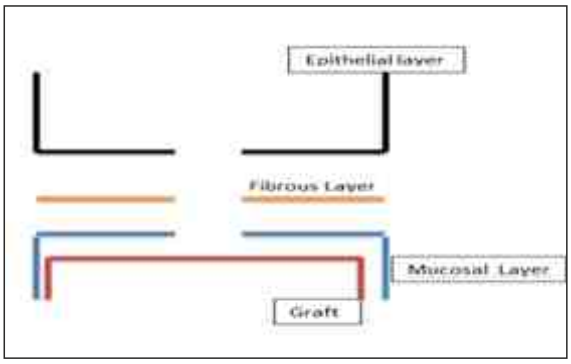
Interlay technique was done in 25 patients having dry ear. The remnant tympanic membrane along with the annulus was elevated leaving behind the mucosal layer. Temporalis fascia graft was placed between the fibrous layer and endothelial (mucosal) layer and the drum remnant.(fig-1)

Fig-1 (Interlay tympanoplasty)



Underlay technique was done in 25 patients having dry ear done by conventional method and temporalis fascial graft was placed under the membrane remnant including the flap after elevating the tympanomeatal flap elevated along with annulus.(fig-2)

Fig-1 (Underlay tympanoplasty)



Follow up of patient done weekly in first operative month, biweekly for for next 2 months. On follow up at 1 month, 3 month and 6 month patient were examined under microscope to check the graft uptake and complication. Post operatively tuning fork test and pure tone audiogram performed.

RESULTS

Out of 50 cases enrolled in the study, 25 patients were taken for underlay (group-1) and 25 were taken for interlay tympanoplasty (group-2). Age of patient ranged from 15 to 50 years.(Table-1)

Table – 1: AGE DISTRIBUTION

SI NO.	AGE GROUP (yrs)	UNDERLAY (group-1)		INTERLAY (group-2)		TOTAL	
		NO. OF CASES	%	NO. OF CASES	%	NO. OF CASES	%
1.	15-20	8	32	8	32	16	32
2.	20-25	6	24	8	32	14	28
3.	25-30	2	8	2	8	4	8
4.	30-35	2	8	1	4	3	6
5.	35-40	4	16	1	4	5	10
6.	40-45	1	4	3	12	4	8
7.	45-50	2	8	2	8	4	8
TOTAL		25	100	25	100	50	100

In the study, 36% were male and 64% were female.(Table-2)

Table – 2 : SEX DISTRIBUTION

SI NO.	SEX	UNDERLAY (group-1)		INTERLAY (group-2)		TOTAL	
		NO. OF CASES	%	NO. OF CASES	%	NO. OF CASES	%
1.	Male	8	32	10	40	18	36
2.	Female	17	68	15	60	32	64
TOTAL		25	100	25	100	50	100

Pre-operative mean air bone gap in group-1 was 29.8±6.89db and in group-2 was 30±6.55db (Table-3)

Table–3 : AUDIOLOGICAL STATUS (PRE-OPERATIVE)

SL NO.	AB gap (dB)	UNDERLAY (group -1)		INTERLAY (group -2)		Total	
		NO. OF CASES	%	NO. OF CASES	%	NO. OF CASES	%
1.	<20db	3	12	2	8	5	10
2.	20-30db	10	40	9	36	19	38
3.	30-40db	10	40	12	48	22	44
4.	40-50db	2	8	2	8	4	8

and post-operative mean air bone gap in group-1 was 18.04±7.86db and in group-2 was 13.8±7.69db. (Table-4)

Table–4: AUDIOLOGICAL STATUS (POST-OPERATIVE)

SL NO.	AB gap (dB)	UNDERLAY (group-1)		INTERLAY (group-2)		Total	
		NO. OF CASES	%	NO. OF CASES	%	NO. OF CASES	%
1.	<20db	12	48	17	68	29	58
2.	20-30db	11	44	6	24	17	34
3.	30-40db	1	4	2	8	3	12
4.	40-50db	1	4	0	0	1	2

Mean reduction of air-bone gap was observed in group-1, 11.76+6.09 dB (39.46%) and mean reduction of air bone gap was observed in group 2, 16.2+7.27 dB 54%.(Table-5)

Table–5 : CHANGE IN AIR BONE GAP (IN dB)

Group	Pre-operative (dB)		Post-operative (dB)		Change (dB)		% change
	Mean	SD	Mean	SD	Mean	SD	
Group-1	29.8	6.89	18.04	7.86	-11.76	6.09	39.46
Group-2	30	6.55	13.8	7.69	-16.2	7.27	54

Mean reduction in group was better than mean reduction in group 1.

Out of 50 cases, graft failure was observed in 5 cases (10%), a success rate of 90% observed in present study. Success rate was 88% in group-1 (underlay tympanoplasty) and 92% in group-2 (interlay tympanoplasty) was observed. 12% graft failure observed in group-1 (underlay tympanoplasty) and 8% graft failure observed in group-2 (interlay tympanoplasty).(Table-6)

TABLE-6: OUTCOME GRAFT ACCEPTED OR REJECTED (AT LAST FOLLOW-UP)

Parameter/variable	UNDERLAY (group - 1)		INTERLAY (group-2)		Total	
	No. of cases	%	No. of cases	%	No. of cases	%
Accepted/successful	22	88	23	92	45	90
Rejected/failed	3	12	2	8	5	10

DISCUSSION:

CSOM, one of the most common causes of preventable hearing loss, particularly in developing countries like India (which according to WHO reports is among the nations with the highest burden), needs tympanoplasty for its correction.

Tympanoplasty has come a long way after it was first introduced by Wullstein[4] and Zollner[3] in the early 1950s as there was a constant desire to improve the technique as well as outcomes.

In the past few years, interlay technique of tympanoplasty has gained a lot of popularity and has emerged as the preferred approach because of its low incidence of complications and promising results.

In our study mean age of group-1 was 26.52±9.32 years with 32% male and 68% female and mean age of group-2 was 25.8±10.1 years which ranged between 15-50 years with 36% male and 64% female, which was comparable with other studies. (Table-7 & 8)

Table-7 : Mean age comparison in different studies

Different studies	Mean age (in years)
Kawatra et al.(2014)	Group-1(overlay) 29.43±7 Group-2(underlay) 28.67±9.72 Group-3(interlay) 29.7±8.80
Patil et al.(2014)	31.86±10.53
Jain S. et al.(2017)	31.23±10.54
Razzak M.A. et al.(2018)	26.32±9.59
Sharma N. et al.(2019)	Group-1 (underlay) 33.12±10.29 Group-2 (interlay) 31.86±10.11
Our study (2020)	Group-1 (underlay) 26.52±9.32 Group-2 (interlay) 25.8±10.1

Table-8: Gender comparison in different studies

Different studies	GENDER
Sharma N. et al.(2019)	Group-1 (underlay) 52% male and 48% female Group-2(interlay) 58% male and 42% female
Kawatra et al.(2014)	Group-1 (overlay) 29.43±7 Group-2 (underlay) 28.67±9.72 Group-3 (interlay) 29.7±8.80
Jain S. et al.(2017)	71.8% male and 28.2% female
Patil et al.(2014)	42% male and 58% female
Our study (2020)	Group-1 (underlay) 32% male and 68% female Group-2 (interlay) 36% male and 64% female

In the present study, we have recorded the graft uptake rate to be 88% in underlay tympanoplasty & 92% in interlay tympanoplasy and Mean reduction in interlay tympanoplasy (16.2±7.27) was more than underlay tympanoplasty (11.76±6.09).

Rahul Kawatra et al.[12] (2014) reported graft uptake rate of 86.7% in underlay tympanoplasty and 93.3% in interlay tympanoplasy and mean reduction in interlay tympanoplasty (13.83) was more than underlay tympanoplasty (10.83).

Sharma N. et al.[13] (2019) reported graft uptake rate 90% in underlay tympanoplasty and 96% in interlay tympanoplasy and Mean reduction in interlay tympanoplasy (12) was more than underlay tympanoplasty (8.7).

Jain S. et al.[14] (2017) reported the success rate of graft uptake to be 96.6% in interlay tympanoplasy and mean ABG reducing to 10.12 ± 5.84 dB.

In our study, in Underlay technique graft rejected in 3 (12%) patients. Preoperative mean air bone gap was 29.8dB and postoperatively it came to be 18.04dB. Postoperatively there was an 11.76dB mean hearing gain after 6 months.

In interlay technique graft rejected in 2 (8%) patients. Preoperative mean air bone gap was 30 dB which comes to be 13.8dB. Postoperative there was change in 16.2dB mean hearing gain after 6 months.

The final success rate of graft uptake was 88% in Underlay and 92% in Interlay technique.

In our study graft uptake as well as hearing gain was better in the interlay technique than the underlay technique which was consistent with most of the studies. Jain et al.[14](2017) had graft uptake rate to be 96.6% in interlay technique and 95.4% of the patients, reported an improvement in terms of hearing. Sharma N. et al.[13](2019) and Kawatra et al.[12](2014) concluded Interlay technique has a significantly better

graft uptake and hearing improvement as compared to underlay technique. Komune et al.[15](1992) reported a 94.2% graft uptake rate. Guo et al.[16](1999) had a better graft uptake rate and hearing improvement in interlay technique than in underlay technique. Patil et al.[17](2014) had a graft uptake rate of 96% and a better hearing gain in interlay technique. (Table-9 &10)

Table-9: Success rate (graft take) for underlay and interlay technique as reported in different case series

Different studies	Graft uptake	
	Underlay technique	Interlay technique
Komune S et al. 1992	-	94.2%
Guo M et al. 1999	85.7%	96.2%
B. C. Patil et al. 2014	-	96%
Hay A, Blanshard J. 2014	-	91%
Kawatra R. et al. 2014	86.7%	93.3%
Gaurav Kumar et al. 2016	-	93.3%
Chandra Manish et al. 2017	-	98%
Sonawale S. et al. 2017	-	90%
Jain S. et al. 2017	-	96.6%
Sharma N. et al. 2019	90%	96%
Razzak A. et al. 2019	88%	-
Our study	88%	92%

Table-10: Mean air bone gap improvement in underlay and interlay technique as reported in different case series.

Different studies	Mean air bone gap improvement (in dB)	
	Underlay technique	Interlay technique
Hay A, Blanshard J. 2014	-	9.98
Kawatra R. et al. 2014	10.83	13.83
Gaurav Kumar et al. 2016	-	13.83
Jain S. et al. 2017	-	10.12
Sharma N. et al. 2019	8.7	12
Our study	11.76	16.2

CONCLUSION

Thus in present study as far as resolution of air bone gap is concerned, Interlay technique showed a statistically better outcome as compared to the underlay group. The findings in present study showed a better graft up take in Interlay method which coupled with a better postoperative air bone gap provided a better overall outcome.

DECLARATION

Ethics approval and consent to participate: The study was approved by Organizational Ethics committee.

Conflict of Interests- The authors declares that there are no conflicts of interest.

Funding: The study was self funded

Acknowledgement: None

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How to cite this article

Sainy N etal - Comparative study of surgical outcome of interlay tympanoplasty and underlay tympanoplasty in terms of hearing improvement and graft uptake. - UPJOHNS; June24; 12(1); page: 1-7