

Original Article

Outcomes of Underlay Versus Over-Underlay Technique myringoplasty

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Abstract:

Objective: In this study, the two methods of myringoplasty (underlay and over-underlay technique) were compared.

Methods: Total 100 patients of COM (inactive mucosal variety) were studied for 06 months duration from 1st Oct 2015 to 31st March 2016 in the Dept of ENT & Head Neck Surgery, CMH Dhaka. The diagnosed cases of COM patients were selected according to the eligibility criteria's by purposive sampling. 100 patients were equally divided into two groups. Patients in group 1 underwent underlay method and patients in group 2 underwent over-underlay technique of myringoplasty. Patients were followed up for 6 months.

Results: Graft uptake and hearing improvement was compared in both groups. In group 1 (underlay myringoplasty) graft taken rate was 92% and graft failure rate was 8%. In group 2 (Over-underlay myringoplasty) graft taken rate was 94% and failure rate was 6%. Graft uptake was 2% lower in the group 1 than group 2. The gain in hearing threshold (gain in A-B gap) in the group 1 (underlay myringoplasty) was (23.74 dB ± 3.97) and in group 2 (over-underlay myringoplasty) was (23.64 dB ± 4.03)

Conclusion: The present study emphasizes the fact that there is no significant difference in short term results between the two techniques (underlay and over-underlay).

Key words: Myringoplasty, underlay Technique, Over-underlay Technique, Graft taken rate, Pure Tone audiometry, Air Bone Gap (AB Gap).

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Background:

Myringoplasty is the term used for repair of perforated tympanic membrane and to improve hearing level¹. Perforation of the tympanic membrane primarily results from middle ear infections, or trauma. Up to 80% of these perforations heal spontaneously². For the remaining Myringoplasty is usually performed. Benefits to myringoplasty include prevention of ear infections, aural discharge, improvement in hearing and protection against long-term middle ear damage by preventing the ossicular pathology, the migration of squamous epithelium around the margins of perforation³.

The over-underlay technique has several advantages as it is ideal for perforations of all sizes in all quadrants, has good exposure to the anterior middle ear, no blunting, it prevents adhesions between drum and middle ear. Again total elevation of the drum remnant of the malleus provides additional advantages like, increased overlap of the graft and drum remnant, better preparation of the graft bed, excellent medial support by the malleus handle. On the other hand the underlay technique is generally more recommended for posterior perforations. It has less risk for lateralization and less chance of squamous epithelial migration⁴.

This cross sectional prospective study conducted for a period of 06 months. It included 100 patients of COM (inactive mucosal variety) who reported to the Otolaryngology department and they were allocated into two groups. In group 1, the temporalis fascial graft was placed medial to the handle of malleus (underlay technique), in group 2 the graft was placed lateral to the handle of malleus but medial to the remnants of the tympanic membrane or fibrous annulus (over-underlay technique). The two groups were followed up for 06 months post operatively. Pre-operative and post operative conventional audiometric evaluation (PTA) were done.

Methods:

This is a Prospective cross sectional study. Total 100 patients of COM (inactive mucosal variety) were studied for 06 months duration from 1st Oct 2015 to 31st March 2016 in the Dept of ENT & Head Neck Surgery, CMH Dhaka. The diagnosed cases of COM patients were selected according to the eligibility criteria's by purposive sampling. 100 patients were equally divided into two groups. Patients in group 1 underwent underlay method and patients in group 2 underwent over-underlay technique of myringoplasty. Patients were followed up for 6 months.

Inclusion Criteria were age 15-50 years and COM with dry central tympanic membrane perforation. Exclusion were cases of chronic suppurative otitis media of atticofurrow type, cases of chronic suppurative otitis media with ossicular discontinuity, patient with Sensorineural hearing loss and mixed hearing loss, patients below 15 years and above 50 years, discharging ear and previous history of ear surgery.

Procedures of data collection, data analysis and interpretation:

At first, detailed history, physical examination and clinical investigations for GA fitness were done along with pre-operative pure tone audiometry & tympanometry in those patients who were admitted and who met the inclusion criteria. Informed written consent was obtained from the patient or guardians after full explanation of the details of the disease process and the purpose of the study. All operations were done by experienced senior ENT surgeon of CMH Dhaka with operating microscope Carl Zeiss, model: Vario S-8. The patients were followed up for a period of 06 months. Follow up schedules were at 2nd week, 4th week, 3rd months and 6th month. At each visit the ear was examined with otoscope and tuning fork test performed. Post operative pure tone audiometry & tympanometry were performed at 6th month. The patient or the attendant was interviewed by the investigator using the case record form. All data was processed manually and analyzed with the help of SPSS (Statistical package for social sciences) Version 21.0. Quantitative data was expressed as mean and standard deviation and comparison was done by [Z] test. Qualitative data was expressed as frequency and percentage and comparison was done by chi-square (χ^2) test.

Results

Table-I
Sex distribution of the study patients (n=100)

Group	Sex	n	Percentage
Group 1 (Underlay Method)	Male	29	58%
	Female	21	42%
Group 2 (Over underlay Method)	Male	30	60%
	Female	20	40%

Our study included 100 patients who were divided randomly into 02 groups; Group 1 (underlay method) included 50 patients, where 29 were males and 21 were females. Group 2 (over underlay method) also included 50 patients, where 30 were males and 20 were females.

Table-II
Age distribution of the study patients (n=100)

Group	Age group (years)	n	Percentage
Group 1 (Underlay Method)	15-25	12	24%
	26-35	27	54%
	36-45	11	22%
Group 2(Over underlay Method)	15-25	6	12%
	26-35	34	68%
	36-45	10	20%

Most of the patients were in the age group of 26–35 years (61%), 21% of patients were in age group of 36–45 years, and the rest 18% were in age group of 15-25. Mean age of patients is 30±5 years.

The most common presenting symptoms of these patients were otorrhoea (100%) and hearing loss (80-90%).

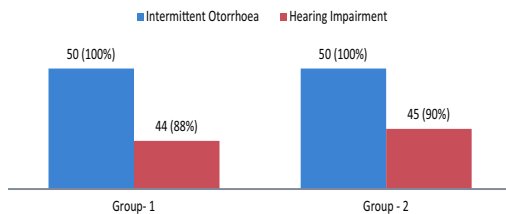


Fig 1: *Distribution of the patients by common presentation (n=100)*

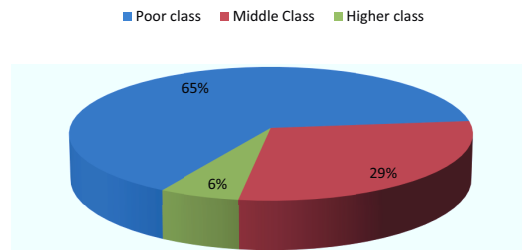


Fig - 2: *Socio-economic Group (n=100)*

Majority (65%) of the patients belongs to low socioeconomic group.

Table -III
Distribution of the study patients by site of perforation (n=100)

Group	Site of perforation	n	P value
Group 1 (Underlay Method)	Anterior	22	0.625 ^{ns}
	Posterior	13	
	Subtotal	15	
Group 2 (Over underlay Method)	Anterior	21	0.301 ^{ns}
	Posterior	8	
	Subtotal	21	

While considering the site of perforation 22 (44%) were anterior perforation and 13 (26%) were posterior perforation in Group 1. In Group 2 anterior perforation were 21(42%) and 8 (16%) were posterior perforation.

Perforations are divided according to size into small, medium and large. In our study, the maximum no of patients 58 (58%) had

medium perforations and 24 (24%) had small central perforations while rest 18(18%) had large perforation. 31 (62%) cases in Group 1 had medium perforation followed by large perforation 7(14%) and small perforation 12(24%). 27 (54%) cases in Group 2 had medium perforation followed by large perforation 11 (22%) and small perforation 12(24%).

Table-IV
Distribution of the study patients by size of perforation (n=100)

Group	Size of perforation	n	P value
Group 1 (Underlay Method)	Small	12	0.075 ^{ns}
	Medium	31	
	Large	7	
Group 2 (Over underlay Method)	Small	12	0.141 ^{ns}
	Medium	27	
	Large	11	

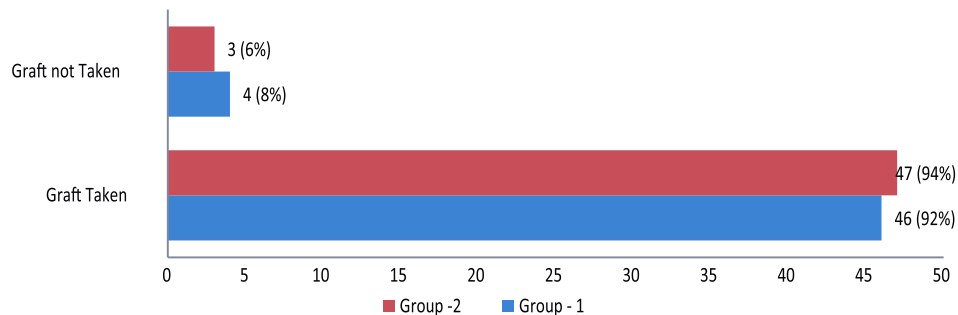


Fig - 3: *Distribution of the study patients by graft taken rate (n=100)*

Graft taken rates in Group 1 were 46 (92%) and in Group 2 were 47 (94%).

Table-V
Distribution of graft taken rate as per site of perforation (n=100)

Group	Site of perforation	No	Final outcome of Graft		P value
			Taken	Not Taken	
Group 1 (Underlay Method)	Anterior	22	21(95.5%)	1(4.5%)	0.625 ^{ns}
	Posterior	13	12(92.3%)	1(7.7)	
	Subtotal	15	13(86.7%)	2(13.3%)	
Group 2 (Over underlay Method)	Anterior	21	21(100%)	0(0.0%)	0.301 ^{ns}
	Posterior	8	7(87.5%)	1(12.5%)	
	Subtotal	21	19(90.5%)	2(9.5%)	

While considering the anterior perforation graft taken rate was 21(95.5%) in group 1 and 21(100%) in group 2. In case of posterior perforation graft taken rate was 12(92.3%) in Group 1 and 7(87.5%) in Group 2.

Table-VI
Distribution of graft taken rate as per size of perforation (n=100)

Group	Size of perforation	n	Final outcome		P value
			Success	Failure	
Group 1 (Underlay Method)	Small	12	12(100.0%)	0(0.0%)	0.075 ^{ns}
	Medium	31	29(93.5%)	2(6.5%)	
	Subtotal	7	5(71.4%)	2(28.6%)	
Group 2 (Over underlay Method)	Small	12	12(100%)	0(0.0%)	0.141 ^{ns}
	Medium	27	26(96.3%)	1(3.7%)	
	Subtotal	11	9(81.8%)	2(18.2%)	

In both groups graft taken rate were 100% in case of small perforation. For medium perforation graft taken rate was 29(93.5%) in Group 1 and 26(96.3%) in Group 2. In case of subtotal perforation graft taken rate was 5(71.4%) in Group 1 and 9(81.8%) in Group 2.

Table -VII
PTA pre and postoperative in an average (n=100)

PTA	Group 1	Group 2	P value
	(Underlay Method) (n=50) Mean±SD	(Over underlay Method) (n=50) Mean±SD	
Preoperative	35.38±3.12	35.60±3.09	0.724 ^{ns}
Postoperative	23.74±3.97	22.85±4.03	0.901 ^{ns}

Based upon Pure Tone Audiogram (PTA) in the study, preoperative average AB gap in Group 1 was 35.38 dB whereas in Group 2 it was 35.6 dB. Postoperative (after 6 months) average AB gap in Group 1 was 23.74 dB whereas in Group 2 it was 23.64 dB.

Discussion:

Myringoplasty is a surgical technique used to restore the integrity of tympanic membrane and to improve hearing level⁵. Repair of eardrum by doing Myringoplasty may confer considerable benefits to patients with tympanic membrane perforation that include prevention of ear infections, aural discharge and improvement in hearing.

In underlay technique the graft is placed medial to the tympanic membrane remnant and handle of malleus⁶. On the other hand in over-underlay technique the graft is placed lateral to the malleus but medial to the remnants of the tympanic membrane or fibrous annulus⁶. The over-underlay technique has several advantages as it is ideal for perforations of all sizes in all quadrants. It gives good exposure to the anterior middle ear, no blunting, and prevents adhesions between drum and middle ear. Again total elevation of the drum remnant of the malleus provides additional advantages like increased overlap of the graft and drum remnant, better preparation of the graft bed, excellent medial support by the malleus handle^{4,7}. On the other hand the underlay technique is generally more recommended for posterior perforations. It has less risk for lateralization⁴.

Masoud et al stated that the success of the graft integration in children is slightly lower than in adults and that is due to the fact that children have persistent dysfunction of the Eustachian tube, recurrent infections of the respiratory tract with otorrhoea and lack of development of the immune system. The mean age of that study was of 34.07 ± 7.3 and

the tympanic membrane closure rate and hearing improvement was similar to other studies; therefore, indicating age is not a prognostic factors⁸. In our study, mean age of patients were 30 ± 5 years, showed no significant difference in graft uptake, which is consistent with above study. In our study we also found the same result (Table - 2). Gerard Kelly mentioned higher prevalence of COM in lower socioeconomic group⁹. Our study (Fig - 2) also revealed the same result.

Ian et al mentioned the main clinical presentations of inactive mucosal COM are hearing impairment and intermittent otorrhoea¹. Vineet et al also mentioned the above two symptoms as most common in case of inactive mucosal COM⁴. Our study is also consistent with above studies (Fig - 1).

The study of Jung mentioned that Underlay tympanoplasty is suitable for posterior TM perforation, and Over-underlay graft method is an excellent for the reconstruction of large anterior or subtotal TM perforation¹⁰. Our study showed the similar result (Table - 5).

A series of studies done in different centers comparing the outcome between underlay and over-underlay technique. They showed, in underlay technique graft taken rate was 90%-92% and failure rate was 8%-10%^{4,5,11,12}. They also showed graft take rate in over-underlay technique was 95%-97% and failure was 3%-5%^{4,5,10,13}. Graft take rate was more (5%) in over-underlay technique than underlay technique. Our study was nearly consistent with above studies. (Fig - 3, Table - 5, 6).

Different studies showed, the average gain in A-B gap was 14.5dB-16.55 dB in case of underlay technique and in case of over-underlay technique it was 16.96dB-18.75dB^{4,11}. Postoperative hearing gain was little bit better in over-underlay technique. In our study we also got almost similar result (Table - 7).

Conclusion

Myringoplasty is a safe and effective technique to improve the quality of life of the patients by giving them good hearing and avoiding the continuous infections thus protect the middle ear and the inner ear from future deterioration. The present study emphasizes the fact that there is no significant difference in short term results between the two techniques (underlay and over-underlay). We found both the myringoplasty techniques are safe, simple and easy procedure with low rate of graft failure with significant hearing improvement. But we found over-underlay technique shows a bit better result in case of graft uptake, and hearing gain than underlay method. Failure rate in graft uptake is also less in over-underlay technique. The result would be significant if we could do a broad base study. So we recommend to conduct this type of study in multiple specialized centers for long period.

Limitations of the study

Following limitations were faced and tried to overcome during conducting this study:

- a) This study was conducted over a limited period of time.
- b) Only entitled patients to get treatment facilities from Combined Military Hospital (CMH) were taken in this study. So, there was limitation to take all the group of population, specially poor class in this study.
- c) Number of study population was less, requires further broad base study to conclude

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