

ORIGINAL RESEARCH

Assessment of hearing outcome in patients undergoing myringoplasty

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ABSTRACT

Background: Patients with a mucosal type of chronic otitis media (COM) usually have recurrent ear discharge and conductive hearing loss. It is characterized by the central perforation of the tympanic membrane. Myringoplasty is an operation performed to repair tympanic membrane perforation when there is no ossicular damage. **Aim:** The purpose of this study was to evaluate hearing outcome in tympanic perforation patients undergoing Tympanoplasty. **Methods:** A total of 80 patients who underwent underlay myringoplasty at Jaipur Golden Hospital, New Delhi over a period of 20 months were enrolled in this study. The Myringoplasty surgery was done in all patients fulfilling preoperative inclusion criteria. The Audiometric evaluation was conducted at follow up after 3 months postoperatively and results were compared with preoperative hearing level and tympanic membrane status. **Results:** Out of total 76 cases was followed up and 04 Cases were lost in follow up. Graft take up rate achieved was 97.37%. Post operative hearing improvement was found in 72 (94.74%) patients. The mean pre-operative air bone gap was 30.39dB±4.56 SD while after surgery it was 16.39dB ±6.55 SD ($p<0.001$). Majority of patients i.e. 54 (71.05%) had hearing gain in the range of 11-20 dB. On an average 10.25dB hearing gain was seen in patients with small central perforation, 13.15dB ±6.89 SD in patients with medium size central perforation and 15.6dB ±4.83SD hearing improvement was noted in patients with large size central perforation. **Conclusion:** Underlay myringoplasty is an effective surgical technique for the repair of tympanic membrane perforations in terms of graft take up and improvement of hearing.

Keywords: Myringoplasty; hearing outcome, Tympanic Membrane Perforation; Chronic Otitis Media.

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INTRODUCTION

Chronic otitis media is an inflammatory process of the mucoperiosteal lining of the middle ear space and mastoid, characterized by chronic, intermittent, or persistent discharge through a perforated tympanic membrane. Chronic otitis media is a widespread disease of developing countries such as India, especially in rural areas, and the prevalence ranges from 2% to 15% [1]. Tympanic membrane (TM) perforation is a common surgical indication in an otolaryngology practice; it can be managed by tympanoplasty or myringoplasty [2]. Repair of TM perforation via the microscopic ear surgery (MES) is traditionally preferred worldwide, with success rates ranging from 83% to 100% [3, 4]. The term tympanoplasty was first used in 1953 by Wullstein to describe surgical techniques for reconstruction of the middle ear hearing mechanism that had been impaired or destroyed by chronic ear disease. Tympanoplasty is the culmination of over 100 years of development of surgical procedures on the middle ear to improve hearing. The first of these procedures was stapes

mobilisation, followed by plastic repair of a perforated tympanic membrane and correction of congenital meatal atresia [5]. The aim of myringoplasty done for chronic otitis media mucosal type is the dry ear and hearing improvement after surgery. The primary success of myringoplasty is assessed by the successful graft uptake. The graft uptake rate of myringoplasty varies from various studies and is commonly over 80% in various studies [6,7]. Myringoplasty is a surgical operation to graft and repair a persistent perforated tympanic membrane. Common causes for a perforated tympanic membrane are trauma, infection, and tympanostomy tube extrusion. Persistence of the perforation can lead to hearing impairment and chronic otorrhoea. The indications for myringoplasty are to stop chronic otorrhoea, to waterproof the middle ear, and to improve conductive hearing loss. The outcome of myringoplasty success is achievement of an intact tympanic membrane and a dry, self-cleansing ear, with improvements of hearing loss. With regards to myringoplasty outcomes in the United Kingdom

(UK), a 3-year prospective myringoplasty national audit was undertaken and reported in 2015 [8].

AIMS & OBJECTIVES

To evaluate the hearing outcomes after Myringoplasty and compare the results of pre-operative and post-operative air bone gap.

MATERIALS AND METHODS

This was a prospective observational study conducted in the Department of ENT, Jaipur Golden Hospital, New Delhi from January 2017 to August 2018. A total of 80 patients with persistent central perforation of tympanic membrane undergoing myringoplasty were enrolled in the study.

INCLUSION CRITERIA

- Patients age between 12 to 45 years with both sexes.
- The perforation is of central type i.e.in pars tensa with intact annulus.
- The ear should be dry for at least 4 weeks pre-operatively
- The audiometry should reveal only conductive deafness ranging from 25dB to 40dB of hearing loss with good cochlear reserve.
- The middle ear should be disease free as evidenced by absence of granulations, edema, hyperemia or polyps of mucus membrane

EXCLUSION CRITERIA

- Patients of age <12 years or >45 years.
- Patients with sensorineural hearing loss or mixed hearing loss
- Patients having conductive hearing loss greater than 40dB.
- Previous ear surgery OR only hearing ear.
- Evidence of cholesteatoma, severe tympanosclerosis, chronic otitis externa, complications of chronic otitis media.

The detailed clinical history and examination were carried out as per the proforma prepared. Laboratory investigations were done. All patients were subjected to pre-operative audiometric evaluation by Pure Tone Audiometer which is calibrated for precision and accuracy .The design of Audiometer used in our hospital is ARPHI, Diagnostic audiometer 2001.

The Myringoplasty surgery was done in all patients fulfilling preoperative inclusion criteria.

The Audiometric evaluation was conducted at follow up after 3 months postoperatively and results were compared with preoperative hearing level and tympanic membrane status.

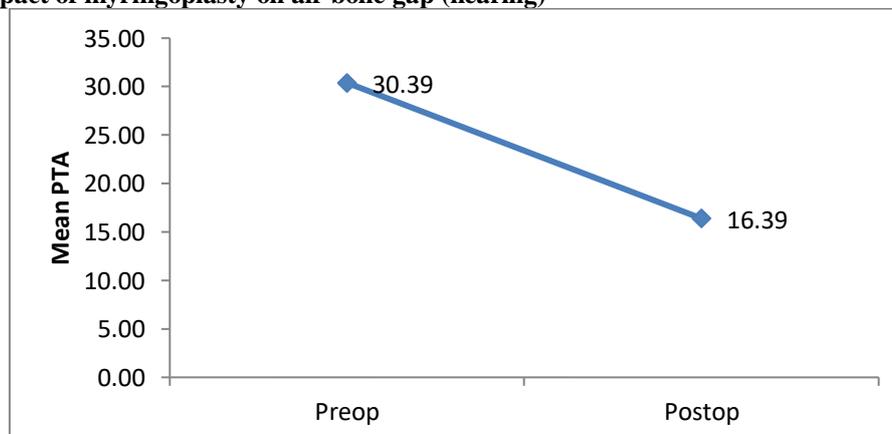
STATISTICAL ANALYSIS

The data is tabulated in MS Excel and analysis performed using Statistical Package for Social Sciences (SPSS) version 16.0 software. Qualitative variables are expressed as frequencies/percentages and evaluated using McNemar Test. Quantitative variables are expressed as Mean±SD and compared across groups using paired t-test, unpaired t-test and ANOVA. Pearson's correlation coefficient is used to assess correlation between a pair of quantitative variables. P value < 0.05 will be considered statistically significant

RESULTS

A total of 80 cases of tympanic perforation were operated in the present study in which 76 cases was followed up and 04 Cases were lost in follow up. Graft take up rate achieved was 97.37%. Post operative hearing improvement was found in 72 (94.74%) patients and worsened in 4 (5.26%) patients. The mean pre-operative air bone gap was 30.39dB±4.56 SD while after surgery it was 16.39dB ±6.55 SD (p<0.001)

Figure 1: Impact of myringoplasty on air bone gap (hearing)



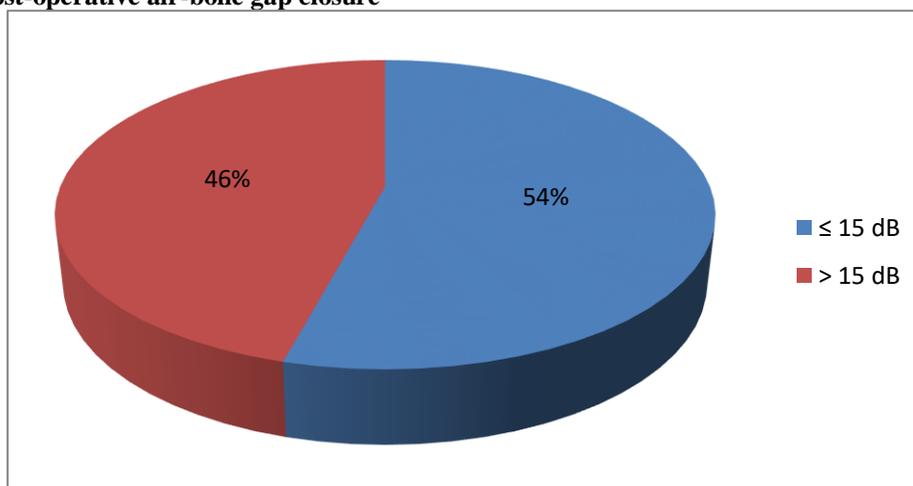
As per the **Belfast rule of thumb**, the patient undergoing Tympanoplasty is likely to report a significant benefit if the post-operative hearing level was 30dB or better and the interaural difference is reduced to less than 15dB. In this study, 41 patients had pre-operative air-bone gap ≤ 30dB while 35 patients had >30dB air bone gap.

After surgery 73 patients had air-bone gap within 30 dB and only 3 patients had more than 30 dB air bone gap. 76 patients who came for follow up at 3 months postoperative period, 53.95% patients had hearing in range 21-30 dB and 46.05% had hearing in range 31-40dB.

Table 1: preoperative & postoperative air bone gap as per Belfast rule of thumb

PTA,AIR BONE GAP (dB)	Pre operative	Post operative	p-value
≤ 30	41	73	<0.001*
> 30	35	3	
TOTAL	76	76	

Figure 2: Post-operative air-bone gap closure



The Hearing levels were assessed at 3 months post-operatively by Pure-Tone audiometry test. Post-operatively 10 patients had air-bone gap within 10dB, 51 patients had hearing in 11-20dB range, 12 patients had hearing in 31-40dB range while 1 patient had hearing in 31-40dB range and 2 patients had hearing in 41-50dB range. Majority of patients i.e. 54 (71.05%) had hearing gain in the range of 11-20 dB

Table 2: Preoperative and postoperative status of hearing

AIR-BONE GAP IN dB	Pre operative		Post operative	
	n	%	n	%
< 0	0	0.00%	0	0.00%
0 - 10	0	0.00%	10	13.16%
11 - 20	0	0.00%	51	67.11%
21 - 30	41	53.95%	12	15.79%
31 - 40	35	46.05%	1	1.32%
41 - 50	0	0.00%	2	2.63%
TOTAL	76	100%	76	100%

After 3 months follow-up period, graft was found taken up in 74 patients (97.37%) while residual perforation was noted in 2 patients (2.63%).

Table 3: complications related to graft take up

Complication	Frequency	%
Residual/Recurrent perforation	2	2.63%
Medialization	2	2.63%
Lateralization	2	2.63%
TOTAL	6	7.89%

On an average 10.25dB hearing gain was seen in patients with small central perforation, 13.15dB ±6.89 SD in patients with medium size central perforation and 15.6dB ±4.83SD hearing improvement was noted in patients with large size central perforation. No significant co-relation was seen between graft take and age and gender distribution of patients in our study

Table 4: Correlation between graft taken rate with age, gender and size of perforation

Variables	Graft taken (n=74)	Residual perforation (n=2)	P value
Tympanic membrane	Large	28 (37.84%)	0.531
	Medium	60 (60.81%)	

perforation size	Small	1 (1.35%)	0 (0%)	
Age in years	≤ 20	14 (16.92%)	0 (0%)	0.146
	21-30	36 (48.65%)	0 (0%)	
	31-40	19 (25.68%)	2 (100%)	
	41-50	5 (6.78%)	0 (0%)	
Gender	Male	46 (62.16%)	2 (100%)	0.146
	Female	28 (37.84%)	0 (0%)	

There is significant negative co-relation between the age and hearing improvement i.e.as age of patient's increases, the hearing improvement decreases

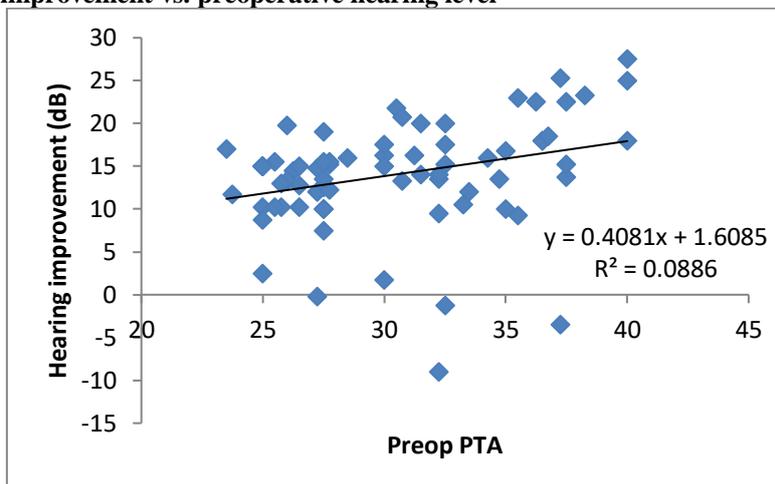
Table 5: hearing improvement in relation with other variables

Hearing improvement vs. Variable	Correlation	P-Value
Age	-0.272	0.017
Hearing loss duration (months)	0.087	0.455
Discharge duration (months)	0.102	0.381
Preop PTA	0.298	0.009

In our study, no significant co-relation of hearing improvement was found with duration of ear discharge and duration of hearing loss.

Level of Hearing improvement was found to be co-related with pre-operative air-bone gap. The hearing improvement was found more with larger pre-operative air-bone gap

Figure 3: hearing improvement vs. preoperative hearing level



DISCUSSION

Myringoplasty is a simple, easy otologic surgery with good overall outcome. This procedure is done to prevent recurrent infection of the middle ear & to improve hearing. Various studies stress on the importance of the long-term follow up indicating the true graft uptake picture [9].

In our study the graft uptake rate after myringoplasty was higher (97.37%), our results comparable with the other studies: Plodpai Y, et al [10] and Atal A, et al [11] observed graft success rate were 96.7% and 90% respectively.

Current study observed significant improvement of hearing after successful myringoplasty was found in 94.74% of patients, accordance to the Balan S, et al [12] and Swapna U P, et al [13].

In the present study post operative air bone gap was significantly reduced after Tympanoplasty. The mean pre-operative air bone gap was 30.39dB ± 4.56 SD while after surgery it was 16.39dB ± 6.55 SD, similar finding also reported by Rayamajhi P, et al [14] and

Albu S, et al [15].

In our study average 14.01dB ± 6.26 SD hearing improvement was noted, in agreement with the studies conducted by Rasha A, et al [16] and P drola et al [17] was achieved mean hearing improvement 12.5dB and 13.6dB respectively.

Majority of patients i.e. 71.05% had hearing gain in the range of 11-20 dB in this study, findings consistent with the Kothandaramanujam, et al [18] and Thakur G, et al [19].

The level of Hearing improvement is found significantly co-related with pre-operative air-bone gap. More the preoperative air bone gap better is the chance for closure of air bone gap.

Sangavi B, et al [20], reported that the pre-operative Air Bone gap increased as the size of perforation increased and that there was no worsening of hearing or sensorineural loss in any case postoperatively.

There is no significant co-relation was seen between graft taken rate and age, gender distribution and size of perforation in the current study, our results

correlate with the Karunaratne D, et al [21].

There is significant negative co-relation between the age and hearing improvement i.e.as age of patient's increases, the hearing improvement decreases, accordance to the S Lee, et al [22].

In our study the level of Hearing improvement was found to be co-related with pre-operative air-bone gap. The hearing improvement was found more with larger pre-operative air-bone gap, our results was comparable with the Saraf A, et al [23] and Vybhavi MK, et al [24].

CONCLUSION

We have concluded that Myringoplasty is safe and effective technique to improve the quality of life of patients suffering with chronic ear discharge and hearing loss subsequently. The graft uptake rate after myringoplasty was very high (97.37%) and also observed significant hearing improvement after myringoplasty.

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