Correlation Between MERI and Hearing After Tympanoplasty

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ABSTRACT

Background: Chronic otitis media is otological challenge in the developing countries it is particularly single most common cause of hearing impairement. **Objective:** The objective of this study was to observe the impact of prognostic factor middle ear risk index on hearing of patients undergoing tympanoplasty for chronic otitis media. **Methods:** This was a prospective analytical study conducted in 50 patients planned for tympanoplasty for chronic otitis media and evaluation done by MERI (Middle Ear Risk Index) and pure tone audiometry. **Results:** This study shows that most of the patients had mild MERI (64%), followed by severe MERI (20%) and then moderate MERI (16%). The mean preoperative PTA average was 44.34 dB (SD 8.01 dB) for patient with mild MERI, 44.75 dB (SD 5.87 dB) for patient with moderate MERI, and 54.9 dB (SD 14.05 dB) for patient with severe MERI and the mean preoperative A-B gap was 37.36 dB (SD 5.73 dB). Post operatively for mild MERI mean hearing gain is 12-14dB, for moderate MERI mean hearing gain is 10-13dB and for severe MERI mean hearing gain is 10-13dB and post operative mean A-B gap was improved by 10-11dB. There is a statistically significant hearing improvement in A-B gap with different types of MERI. **Conclusion:** MERI scoring is useful for predicating the outcome of hearing after tympanoplasty.

Key words: *Chronic otitis media, middle ear risk index, tympanoplasty*

INTRODUCTION

Chronic otitis media (COM) is otological challenge in the developing countries it is a persistent disease causing severe destruction of middle ear with irreversible sequale[1]. In 1965, the American Academy of Ophthalmology and Otolaryngology Subcommittee on Conservation of Hearing set forth a standard classification for surgery of chronic middle ear infection and defined tympanoplasty as a procedure to eradicate disease in middle ear and to reconstruct the hearing mechanism[2]. Kartush has introduced the MERI for the prognosis of tympanoplasty. Becvarovski and Kartush revised and updated middle ear risk index in 2001 which generates a numeric indicator of the severity of the middle ear disease and is used to predict the outcome of tympanoplasty.

MERI combines the known preoperative and intraoperative risk factors for tympanoplasty prognosis into a numeric value. Kartush modified the Austin classification and presented the middle ear risk index (MERI) to define those basic data and to classify cases in different prognostic categories. The factors they monitored included otorrhea, perforation of the eardrum, cholesteatoma, ossicular status, middle ear granulations or effusions, previous surgery and smoking, and they assigned a risk value to each of these factors. It also allows meaningful study comparisons by delineating essential data and stratifying cases within various prognostic categories. There are various reports discussing prognostic factors in tympano-mastoid surgery and their impact on hearing results[3]. Black introduced the system of Surgical, Prosthetic, Infection, Tissues and Eustachian tube function (SPITE), as prognostic indicators for tympanoplasty[4].

Tympanoplasty is a surgical procedure performed to eradicate infection and restore the function of the middle ear. Wullstein introduced a classification for tympanoplasty that is based on two things: (1) the remaining structures of the middle ear after all pathology has been eradicated, and (2) how sound is transferred to the oval window while the round window is being protected[5].

The purpose of this study is to verify the correlations of MERI with result of tympanoplasty and post operative hearing gain in patients classified according to MERI.

MATERIAL AND METHODS

This is a Prospective analytical study conducted from July 2014 to April 2015 in the department of otorhinolaryngology, Nepalgunj Medical College Teaching Hospital, Kohalpur in 50 patients undergoing tympanoplasty. Inclusion criteria were patients of either sex, age between 7-50 years, patients with COM (mucosal and squamous). Exclusion criteria were patients age <7 years and >50 years, COM with complications, patients with any comorbid medical conditions and unwilling patients.

All patients were admitted to the hospital at least a day before surgery and went a through history taking, ENT examination,

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							Risk Value
Otorrhea	Perforation	Cholesteatoma	Ossicle status	ME Pathology	Previous surgery	Smoker	
Dry	None	None	M+I+S+	No	None	No	0
Occasional Wet	Present	Present	M+S+		Staged		1
Persistent Wet			M+S-	Yes	Revision	Yes	2
Wet Cleft Palate			M-S+				3
			M-S-				4
			Ossicle head fix				2
			Stapes fix				3

Total MERI Index: MERI 0- Normal, MERI 1–3 mild diseases, MERI 4–6 moderate disease, MERI 7–12 severe disease

Table I: Middle Ear Risk Index

along with MERI and audiological examination pre and post operative using ALPS AD2100 (calibrated according to ISO 1964 specifications) air and bone conduction were measured for 250, 500, 1000, 2000, 4000 Hertz and the resulting level was expressed in dB hearing loss and degree of hearing loss is calculated according to WHO criteria. Masked PTA was done if the air bone gap (A-B) was more than 40 dB.

After thorough evaluation and preoperative preparation patients were shifted to operation theatre for tympanoplasty ossicular status was assessed at the time of operation. According to the MERI carried out for 50 ears studied, assessment was done for suggested risk categories, number of ears that fall in each category and result of tympanoplasty.

STATISTICAL ANALYSIS: Significance level was assessed by calculating 'p' value using t-test and chi-square test, p-value less than 0.05 was considered significant.

RESULT

In the demographic profile the mean age of the patient was 22.66(SD 9.16) years with the minimum and maximum age of 7 and 50 years respectively. There was no significant difference among the genders of the study patient. After tympanoplasty patients were followed up for three months at 1st, 2nd & 3rd month. Patients were assessed for graft uptake, average hearing threshold and A-B gap.

Symptoms	No. of cases	Percentage
Ear Discharge	48	96
Hearing Loss	49	98
Otalgia	4	8
Vertigo	8	16
Tinnitus	11	22
Headache	0	0

Table II: Distribution based on symptoms of patient

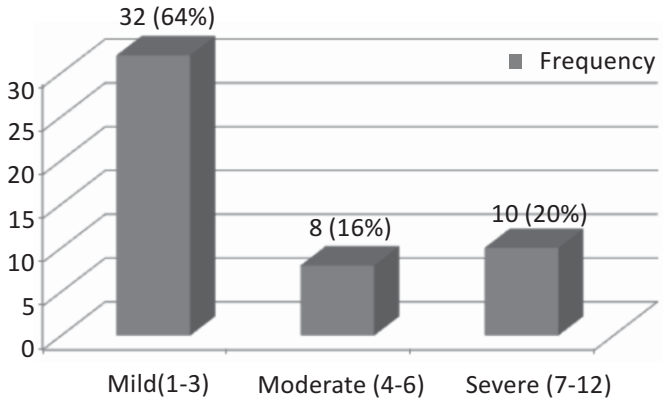

Figure 1: Distribution based on pre-operative MERI

MERI	Mean PTA average (dB)
Mild	44.34±8.01
Moderate	44.75±5.87
Severe	54.9±14.05

Table III: MERI correlation with mean pre operative PTA average

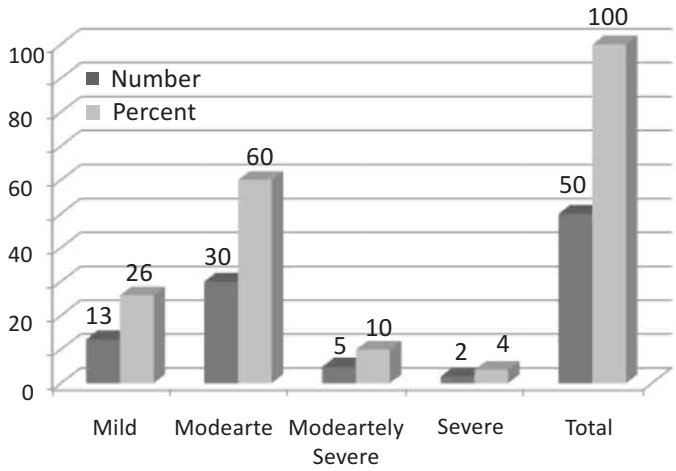

Figure 2: Preoperative Hearing loss

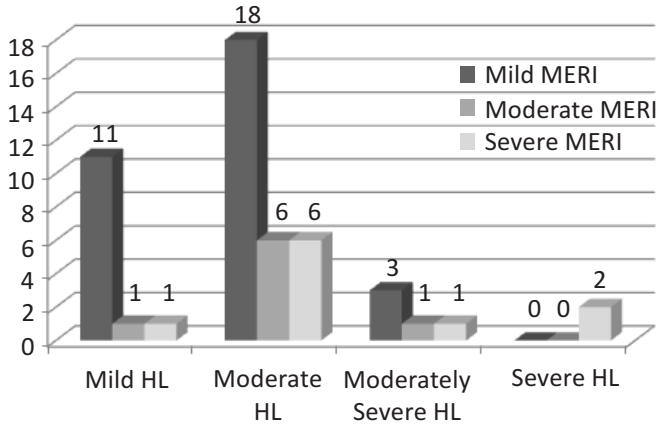

Figure 3: Correlation between MERI and preoperative hearing loss

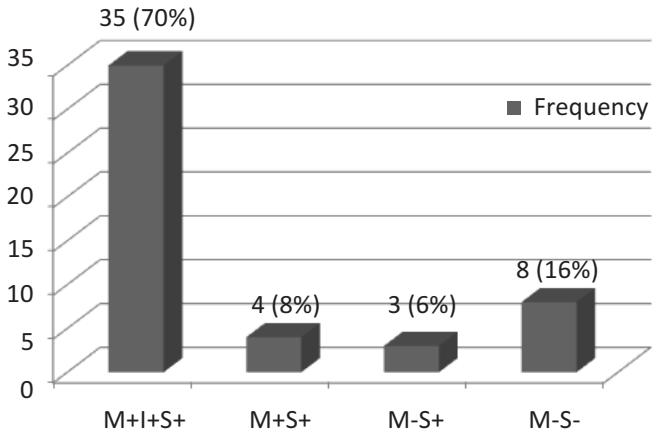

Figure 4: Ossicular status operatively

	1st month PTA average categorization					
MERI	Mild HL	Moderate HL	Moderately Severe HL	Total	p value	Mean PTA avg(dB)
Mild	22	5	0	27	0.015	34.93±5.72
Moderate	4	2	0	6		36.83±4.62
Severe	3	1	2	6		44.67±13.85
Total	29	8	2	39		

Table IV: Correlation between MERI and first month PTA average:

	2nd month PTA average categorization					
MERI Score	Normal	Mild HL	Moderate HL	Total	p value	Mean PTA avg(dB)
Mild	5	16	0	21	0.004	28.95±4.2
Moderate	1	5	0	6		30.33±5.39
Severe	1	2	3	6		41±10.97
Total	7	23	3	33		

Table V: Correlation between MERI and second month PTA average

	3rd month PTA average categorization					
MERI	Normal	Mild HL	Moderate HL	Total	p value	Mean PTA avg(dB)
Mild	11	5	0	16	0.022	24.62±5.01
Moderate	2	4	0	6		26.16±4.02
Severe	1	3	2	6		38.17±8.99
Total	14	12	2	28		

Table VI: Correlation between MERI and third month PTA average

A-B gap	Mean±SD	p value
Pre OP A-B gap	37.36±5.73	
First month A-B gap	30.97±6.81	0.0001
Second month A-B gap	26.09±6.98	0.0001
Third month A-B gap	22.28±7.53	0.0001

Table VIII: Correlation between preoperative and postoperative A-B gap

DISCUSSION

Hearing result post tympanoplasty depends on a variety of well-identified factors related to both the pathologic condition and the surgical strategy and technique. In the past, studies described success in terms of hearing improvement only when elimination of infection and preservation or restoration of anatomy was present. Therefore, results today are reported in relation to control of pathology, anatomic status, hearing improvement, and postoperative complications. In the developing countries the cost of surgery and absence from the work are major restrains for two stage surgical procedure. If we can predict the outcome of the treatment depending upon different middle ear risk factors this will improve the patients compliance[6].

The ideal tympanoplasty restores sound protection for the round window by constructing a closed air containing middle ear and rebuilds the sound pressure transformation mechanism for the oval window by connecting a large tympanic membrane with the stapes footplate via either an intact or a reconstructed ossicular chain[2].

In this study the mean preoperative PTA average was 44.34 dB (SD 8.01 dB) for patient with mild MERI, 44.75 dB (SD 5.87 dB) for patient with moderate MERI and 54.9 dB (SD 14.05 dB) for patient with severe MERI and the mean preoperative A-B gap was 37.36 dB (SD 5.73 dB). In this study, third month PTA average was 24.62±5.01 dB for patient with mild MERI, 26.16±4.02 dB for patient with moderate MERI and 38.17±8.99 dB for patient with severe MERI which was statistically significant and the mean A-B gap at first follow-up was 30.97±6.81 dB, second follow-up was 26.09±6.98 dB and the third follow-up was 22.82±7.53 dB which was highly significant. Post operatively for mild MERI mean hearing gain is improved by 12-14 dB, for moderate MERI mean hearing gain is improved by 10-13dB and for severe MERI mean hearing gain is improved by 10-13dB and post operative mean A-B gap was improved by 10-11dB. There is a statistically significant hearing improvement in A-B gap with different groups of MERI.

Similar study was done by Chrobok V et al (2009) shows patients with lower MERI had significantly better pre-op and post-op air and bone conduction than patients with a higher MERI. In patients with a mild MERI hearing improved by 4 to 6 dB. In patients with moderate and severe MERI hearing improvement was not seen[7]. The study done by Alshehabi M 2010 the mean preoperative ABG was 38 dB, and the mean postoperative ABG was 25.3 dB achieved[8] were as Demir UL et al 2012 they found that the ABG gain (p=0.001 and p=0.014) and air-conduction improvement (p<0.001 for both) were statistically significant in the mild- and moderate-risk groups, whereas those changes were found to be insignificant in the severe-risk group[9].

In the present study it was found that the A-B gap and air conduction improvement is statistically significant for patients with mild, moderate and severe MERI.

CONCLUSION

This study shows that statistically significant prognostic difference was found in those patients who had higher middle ear risk index (MERI) as compared to patients with a mild MERI and moderate MERI. This concludes that the aggregate MERI is a good prognostic factor for hearing before and after surgery.

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