

Evaluation of Tympanoplasty Results and its Association with Middle Ear Risk Index (MERI)- A Prospective Study

Jyoti Kumar Verma¹, Rajesh Kumar², Kanchan Chaudhary³

ABSTRACT

Introduction: Results of tympanoplasty depend upon severity of middle ear disease and for evaluation of tympanoplasty results, various grading systems were developed.

Material and methods: Present study was conducted in Department of Otorhinolaryngology, Institute of Medical Sciences, BHU from December 2017 to July 2019. Two hundred cases of middle ear diseases were selected with using random number table in the study. General physical, systemic examination and otological examination was done. Pure Tone Audiometry was done. Risk categories were derived from MERI's index. Chi-square test was used to find out the association between in variables.

Results: Maximum (42%) cases belonged to age group 20-30 years and females (54%) outnumbered male (46%). Ossicular involvement was present in only 17.5% cases. In majority of patients (81.9%), middle ear mucosa was dry. Graft uptake after 6 months was successful in 89% cases. Graft acceptance was 67.9% in mild MERI index cases while it was 8.18% in severe MERI index cases.

Conclusions: Present study shows significant improvement in hearing after surgery. ($p < 0.001$) MERI score was found to have statistically significant association with success of tympanoplasty, in form of graft uptake rate and hearing improvement (p value < 0.05).

Keywords: Chronic Suppurative Otitis Media, MERI Index, Tympanoplasty, Hearing

INTRODUCTION

Chronic suppurative otitis media (CSOM) is a potentially dangerous disease often capable of causing severe destruction and irreversible sequelae such as fatal intracranial complications which may result in undue burden on the patient, family and society. In developing countries like India, it poses serious health problem due to lack of awareness and specialized medical care.

CSOM produces psychosocial complications and affects the quality of individual's daily living activity. It has reduced mobility, fewer interpersonal contacts and it poses a significant economic burden, as few deaf people are employed in professional, technical and managerial position. CSOM and associated hearing loss is significant in our society and an effort directed towards the assistance of those who are afflicted is indeed worthwhile. The consistent achievement of good hearing results in presence of CSOM is still one of most difficult challenges of otologic surgery.

For evaluation of tympanoplasty results, various grading systems were developed such as Bellucci grading, Wullstein and Austin five part system, Kartush's factor¹ and SPITE

system of Black.² Middle ear risk index (MERI) is numerical evaluated with the help of the above factors. The total score of MERI is 12 and on the basis of this score, patients are classified as mild disease (1-3), moderate disease (4-6) and severe disease (7- 12).³ Therefore the aim of present study is to assess the result of various graft materials used in tympanoplasty of chronic suppurative otitis media and its relation to the MERI (middle ear risk index).

MATERIAL AND METHODS

Present study was conducted from in Department of Otorhinolaryngology, Institute of Medical Sciences, BHU, from December 2017 to July 2019. In present study, 200 cases of middle ear diseases were selected by using random number table. These patients were admitted and treated surgically and record was kept for 6 months follow-up in post operated period (45 days, 3 months and 6 months. Patients of all age groups, above 10 years and patients having middle ear diseases were included in present study while patients with sensorineural hearing loss, congenital deformity for ear, nose or throat were excluded. Detailed history, general and physical examination was done. Otological examination was done to evaluate perforation and status of ear, middle ear mucosa and ossicular chain status. Findings were then confirmed by microscopic examination. Pure Tone Audiometry examination was done and risk categories were derived from MERI's index.

All the selected cases underwent tympanoplasty under local anesthesia with intravenous sedation. Tympanoplasty or tympanomastoidectomy (CWD & CWU) with or without ossiculoplasty was performed according to the ossicular status found during surgery. Postoperatively, all the patients were put on antibiotics, analgesics, anti-histaminics and nasal decongestants. Supportive treatment was given and patients were called for follow-up after 1 month. Status of graft and hearing evaluation by pure tone audiometry (PTA)

¹Senior Resident, Department of ENT, Government Allopathic Medical College Banda, U.P., ²Professor & Head and ³Junior Resident, Department of ENT, Institute of Medical Science, BHU, Varanasi, UP., India

Corresponding author: Dr. Rajesh Kumar, Professor & Head, Department of ENT, Institute of Medical Science, BHU, Varanasi, UP.

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was done at 6 weeks, 3 months and 6 months postoperatively. Preoperative and 6 months postoperative follow-up PTA air-bone gap average were measured and compared. If at 6 months postoperative graft was found intact and air conduction threshold average was improved by more than 10dB, tympanoplasty was considered successful.⁴ The statistical analysis was done using SPSS for Windows version 23.0 software. The findings were present in number and percentage and analysed by frequency, percent and chi-square test. Chi-square test was used to find out the association between in variables. The critical value of 'p' indicating the probability of significant difference was taken

as <0.05 for comparison.

RESULTS

Table 1 shows the demographic profile of cases in present study. Maximum number of patients (42%) belong to age group 20-30 years followed by 10-20 years age group (35.5%). The youngest of the case was 12 years old girl and oldest was 60 years old male patient. In present study, female outnumbered male showing 54% cases in comparison of 46% males. Majority of cases (56%) were student followed by housemaker showing 37.5% cases. About 80% cases belonged to rural area in comparison of 20% of urban area.

Parameter	Observations		
	Age group	No. of cases	Percentage cases
Age	10-20	71	35.5
	21-30	84	42.0
	31-40	27	13.5
	41-50	13	6.5
	>50	05	2.5
Gender	Gender	No. of cases	Percentage cases
	Male	92	46.0
	Female	108	54.0
Occupational Status	Occupation	No. of cases	Percentage cases
	Student	112	56.0
	Housemaker	75	37.5
	Farmer	6	3.0
	Serviceman	7	3.5
Residential Status	Residence	No. of cases	Percentage cases
	Rural	159	79.5
	Urban	41	20.5

Table-1: Demographic Profile of Cases

Parameter	Observations		
	Chief Complaint	No. of cases	Percentage cases
Chief Complaint	Ear discharge(on/off)	197	98.5
	HOH	184	92.0
	Tinnitus	49	24.5
	Earache	18	9.0
	Ear itching	0	0
Duration of discharge free period	Gender	No. of cases	Percentage cases
	Active ear	25	12.5
	<3 months	94	47.0
	4-6 months	47	23.5
	7-12 months	15	7.5
	>1 Year	16	8.0
	No History Of Discharge	3	1.5
Ossicular involvement	Ossicular status	No. of cases	Percentage cases
	Ossicular chain intact and mobile	165	82.50
	Malleus necrosed	19	9.50
	Incus necrosed	11	5.50
	Stapes suprastructure	4	2.0
	Ossicular chain fixed	1	0.50
Middle ear mucosa status	Middle ear mucosa	No. of cases	Percentage cases
	Dry	163	81.9
	Wet	27	13.6
	Congested	9	4.5

Table-2: Clinical Profile of Cases

Table 2 shows the clinical profile of cases in present study. Almost all patients (98.5%) have complaint of on and off ear discharge followed by 92% cases having complaint of HOH followed by tinnitus (in 24.5% cases). 12.5% of the patients had active discharge. Maximum patients (47%) had ear dry for less than 3 months, rest had dry ear for more than 3 months. Three patients had history of trauma and no

history of ear discharge. Ossicular involvement was seen in only 17.5% cases while in 82.5% cases, there was no ossicular involvement. In majority of cases (81.9%) middle ear mucosa was dry followed by wet mucosa in 13.6% cases. Figure 1 shows surgical profile of cases in present study. Maximum number of cases (65.5%) had ossicular chain intact and underwent type 1 tympanoplasty followed by 10.5% cases underwent type 2 tympanoplasty in 10.5% cases.

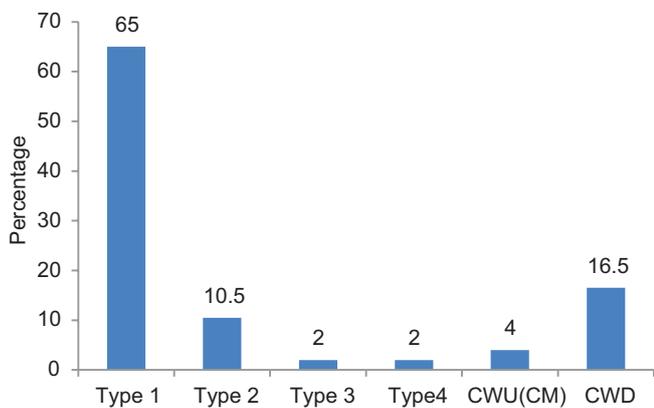


Figure-1: Surgical Profile of cases

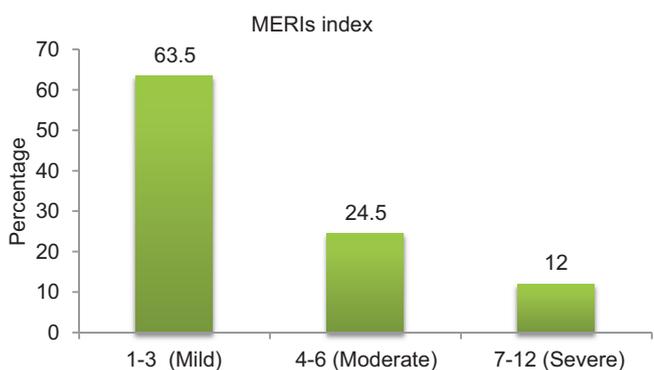


Figure-2: Distribution of cases as per MERI Index

Figure 2 shows that total number of patients with score 1-3 (mild score) were 63.5%, with score 4-6 (moderate disease) were 24.5% and with score 7-12 (severe disease) were 12.0%.

Table 3 shows that 20 days after surgery, 11% cases had wet graft. Rest 89% cases had congested dry graft. After 6 week follow-up, 10% cases had perforation while 90.0% cases had intact graft. After 6 months follow-up, 11% cases had permanent perforation while 89% cases had intact graft.

Table 4 shows that p-value <0.001 shows significant improvement in hearing after surgery.

DISCUSSION

In our study, out of 200 cases, maximum number of cases were in age group 21-30 years (42%), followed by 10-20 years (35.5%); 13.5% cases were in age group 31-40 years, 6.5% in 41-50 years age group and 2.5% cases in above 50 years age group. The reason behind this (maximum number of cases in age group of 21-30) may be that 21-30 years age group is socially the most active and health conscious age group. Another reason for the early presentation may be due to increased awareness to health issues and difficulty in hearing affecting the work efficiency, leading patients and parents to seek early medical intervention. Lasisi AO et al.⁵ observed majority of patients were in age group of 21-34 years which was in accordance with the result of present

Parameter	Observations		
	Graft uptake	No. of cases	Percentage cases
Graft uptake at 20 days	Wet Graft	14	7.0
	Congested graft	178	89
	Pale graft	8	4.0
Graft success on pale graft	Graft success	No. of cases	Percent
	Perforation	6	75.0
	Intact	2	25.0
Graft uptake at 6 week	Graft uptake at 6wks	No. of cases	Percent
	Perforation	20	10.0
	Intact	180	90.0
Graft uptake at 6 month	Graft uptake at 6mths	No. of cases	Percent
	Perforation	22	11.0
	Intact	178	89.0

Table-3: Profile of post-operative graft uptake during follow up

	Mean±SD (N=200)	t-value	p-value
Pre-operative PTA	34.58±9.587	13.119	<0.001
Post-operative PTA	27.15±9.154		

Table-4: Comparison of hearing before and after surgery

study. Study done by Kaur M et al.⁶ also found similar results. In our study, females (54%) slightly outnumbered male (46%). Reason behind this may be due to good education and better economic status of females in present day society. Study done by Arya SC et al.⁷ reported 56:44 male to female ratio. Similar distribution was observed by study done by Nagle SK et al.⁸ with male to female ratio 27:33. We got a mixed occupational profile with majority being students (56.0%) and homemaker (37.5%). Though occupation has not been shown to have any relation or predisposition to CSOM in any of the previous studies. The distribution can be attributed to the demographic profile of the patients attending the OPD.

In our study, majority of patients were from the rural areas (79.5%) and only 20.5% from urban areas. The reason behind this may be that in rural areas, lack of hygiene, malnutrition and overcrowding with poor economic status results in ear infections which in turn may lead to Eustachian tube dysfunction and chronic suppurative otitis media. Findings of present study are in accordance with the study done by Sayeed Ahmana et al.

In our study, 31% cases had bilateral disease while 69% had unilateral disease. In studies done by previous authors, disease was also found more commonly in bilateral CSOM. 12.5% of the cases had active ear discharge while rest 87.5% had dry ear. 1.5% had no history of ear discharge and gave history of trauma. 47% cases had less than 3 months of duration of inactivity, followed by 23.5% cases with 4-6 months of duration of inactivity and 15.5% with more than 6 months of duration of inactivity. The duration of inactivity depends on multiple factors like maintenance of dry ear precautions, personal hygiene, overcrowding, allergy, recurrent upper respiratory tract infections. Study done by Adkins WY et al.⁹ found similar results.

Maximum number of cases had disease for less than 5 years duration (33.5%) while 66.5% had disease for more than 5 years. This can be attributed to the fact that CSOM is a chronic disease for which patients in developing countries like ours do not seek immediate medical attention due to lack of awareness, education and economic resources. During surgery, 78% cases had normal middle ear mucosa while 22% cases had unhealthy middle ear mucosa. Study done by Debora et al.¹⁰ has shown 13.4% abnormal middle ear mucosa.

In present study, graft success rate was 89.0% after 6 months follow-up with graft failure rate of 11.0%. Studies done by various authors (Brandow et al.¹¹ and Kalyanasundram R et al.¹²) found graft success rate 85% and 74% respectively.

In our study, overall graft acceptance rate was 89%. Study done by Wullstein H¹² showed the success rate of Type 1, Type 3 and Type 4 tympanoplasty as 87%, 76% and 78% respectively.

MERI (Middle ear risk index)v/s success rate of tympanoplasty

The term middle ear risk index is used to predict the success rate of middle ear reconstruction procedures. For accurate

prediction of the surgical results the status of middle ear and its ossicles must be ascertained. The total number of patients with score 1-3 (mild disease) were 63.5%, with score 4-6 (moderate disease) were 24.5% and with score 7-12 (severe disease) were 12%. Patients with score 1-3 had graft acceptance of 85.03%, with score 4-6 had graft acceptance 77.55% and with score 7-12 had 54.16% success.

Before surgery, hearing loss >40db was found in 12.6% cases with MERI 1-3, in 28.6% cases with MERI 4-6 and in 50% cases with MERI 7-12. After surgery, hearing loss >40db was found in 2.4%, 12.2% and 33.3% cases with MERI 1-3, 4-6 and 7-12, respectively.

Study done by Nishant et al.¹³ observed that maximum number of ears 72% fall under MERI 1-3, followed by 24% ears with MERI score of 4-6 and then by 4% ears with MERI score of 7-12. He found that ear that are staged into MERI 1-3 i.e. mild disease have a graft acceptance of 86%, and ear termed to have a severe disease i.e. MERI 7-12 have a 100% chance of graft rejection. In study conducted by Pinar et al.¹⁴ MERI score ($p=0.000$) was found to be statistically significant prognostic factor that affects success rate.

CONCLUSION

Chronic suppurative otitis media was prevalent in all age groups and both sexes. Most of the cases were of 21-30 years age-group and females outnumbered males. Maximum cases belonged to rural areas with lower socioeconomic status. Most common mode of presentation was intermittent otorrhoea and hearing loss and about two third cases underwent type I tympanoplasty. About two third cases had mild disease on MERI score followed by 24% having moderate disease and 12% severe disease. In present study, graft success rate after 6 month follow up was 89%. MERI score was found to have statistically significant association with success of tympanoplasty, in form of graft uptake rate and hearing improvement (p value < 0.05).

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