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An observational study on tympanoplasty in terms of middle ear risk index (MERI) of patients with chronic suppurative otitis media

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Abstract
Objectives: Our study was to evaluate the Middle Ear Risk Index (MERI) of patients which had undergone for tympanoplasty, and studied the relation between MERI score and success of tympanoplasty of patients with chronic suppurative otits media (CSOM).
Methodology: A total of 100 patients were taken for Tympanoplasty procedure. Detail assessment and examination were taken to all patients with Chronic Suppurative Otitis Media (CSOM). Middle Ear Risk Index (MERI) score were taken to all patients. And patients were categorized based on Middle Ear Risk Index (MERI) score. And then tympanoplasty procedure were applied.
Results: Data was analyzed by using simple statistical methods with the help of MS-Office software.
Conclusions: Patients with mild MERI Score were higher rate of succeeded for tympanoplasty than patients with moderate and severe MERI Score. Lower the MERI score were greater the chances of acceptance of graft for tympanoplasty procedure than higher the MERI Score of patients with Chronic Suppurative Otitis Media (CSOM).

Keywords: chronic suppurative otitis media (CSOM), tympanoplasty, middle ear risk index (MERI)

Introduction

Chronic suppurative otitis media (CSOM) is defined as a chronic inflammation of the middle ear and mastoid cavity, which presents with recurrent ear discharges or otorrhoea through a tympanic membrane perforation. The disease usually begins in childhood [1, 2] as a tympanic membrane perforation due to an acute infection of the middle ear, known as acute otitis media (AOM), or as a sequel of less severe form of otitis media (e.g. secretary OM) [3-5]. The infection may occur during the first 6 years of a child's life, with a peak around 2 years [6]. The point in time when AOM becomes CSOM is still controversial. Generally, patients with tympanic perforations which continue to discharge mucoid material for periods from 6 weeks [7] to 3 months, despite medical treatment, are recognized as CSOM cases. Chronic suppurative otitis media (CSOM) is a commonly encountered infection of the middle ear all over the world. In 1990, about 28,000 deaths all over the world and largely among developing countries were due to otitis media.8, 9 Mortality and disabilities due to otitis media are primarily related to the complications of CSOM, [10] particularly brain abscess [11, 18].

Tympanoplasty depends to a large extent on the severity of disease in the middle ear which is present preoperatively. Various grading systems were developed for this such as Belluci grading, Wullstein and Austin five part system, SPITE system of Black [12], Kartush's intrinsic and extrinsic factors [13]. The Middle Ear Risk Index developed by Becvarovski and Kartush combines these factors in the middle ear into a numerical value to assess the prognosis of tympanoplasty. Each patient is assigned a numerical score based on the risk factors. The total score is 12. Based on MERI score, the patients are classified as mild disease (1-3), moderate disease (4-6) and severe disease (7- 12). It was modified in 2001. Smoking was added as a risk factor [14]. The present study was done to assess the prognostic value of MERI index on the outcome of tympanoplasty. MERI score helps to predict the outcome of surgery in terms of success or failure. With increasing numbers of tympanoplasty procedures being performed nowadays, it is important to predict the outcome of surgery and give proper counseling for the patient. Objectives of our study was to determine the Middle Ear Risk Index (MERI) in patients with chronicsuppurative otitis media(CSOM) undergoing tympanoplasty, categorize the patients into mild, moderate and severe disease based on MERI score and to study the relation between MERI score and success of tympanoplasty.

Table 1: Middle Ear Risk Index (MERI)

Risk Factor	Risk Value
Otorrhea	Dry – 0
	Occasionally Wet -1
	Persistently wet – 2
	Wet with cleft palate – 3
Perforation	Absent – 0
	Present – 1
Cholesteatoma	Absent – 0
	Present – 2
Ossicular chain	Malleus, incus and stapes present – 0
	Defect of incus – 1
	Defect of incus and stapes – 2
	Defect of incus and malleus – 3
	Defect of malleus, incus and stapes - 4
	Ossicular head fixation – 2
	Stapes fixation – 3
Middle ear granulation/effusion	No – 0
	Yes – 2
Previous surgery	None – 0
	Staged – 1
	Revision – 2
Smoker	No – 0
	Yes – 2

Materials and methods

A total of 100 patients (58 males, 42 females) with age group 0 to 50 years with clinically suspected of otitis media were included in this study. The entire subjects/attendants signed an informed consent approved by institutional ethical committee of Vardhman Institute of Medical Science, Pawapuri, Bihar, India was sought.

Methods

Data was collected on the basis of inclusion and exclusion criteria, with irrespective of sex in OPD or the ward, of department of Ear Nose and Throat, Vardhman Instiute of Medical Science, Pawapuri, Bihar during period of December 2015 February 2016.

This prospective study was comprised 100 patients with chronic suppurative otitis media both mucosal and squamous type with hearing loss planned for tympanoplasty with or without mastoidectomy. Patients with systemic diseases, Otomycosis and other septic foci which can influence the outcome of tympanoplasty were excluded from the study.

A detail assesment was taken of the patient such as the nature of ear discharge, the period of dryness, hearing loss, other medical illness, history of smoking, previous ear surgery and long term use of ototoxic drugs. Otoscopic examination was done to find the presence or absence of perforation, granulation tissue and cholesteatoma. Examination of nose and paranasal nasal sinuses and throat was done to rule out septic foci. Basic investigations such as complete blood counts, aural swab culture sensitivity, Pure Tone Audiometry and CT temporal bone were taken. Otoendoscopy and otomicroscopy were done to confirm the otoscopic findings and also in large perforations, the middle ear mucosa, any polypoidal changes in middle ear, the ossicles, and attic were inspected. The middle ear risk index was calculated. MERI score of the patients had mild (0-3), moderate(4-6) and severe(≥7). The type of tympanoplasty and mastoidectomy was decided intraoperatively based on the extent of disease in middle ear and mastoid. Temporalis fascia graft was used for all patients. Graft status was analyzed by otoscopy. Successful graft are those who has the healed graft with proper middle ear aeration, b) Atelectatic graft. c) Graft failure or perforation of graft.

Statistical analysis

Data was analyzed by using simple statistical methods with the help of MS Office software.

Observations

This prospective study was consisted of 100 patients with Chronic Suppurative Otitis Media (CSOM) of both mucosal and squamous type. In this study, 56 patients were mucosal or tubotympanic type of CSOM and 44 patients were the squamous type or the atticoantral type.

Table 2: Age group, number and percentage of patients with CSOM

Age	No of patients	Percentage
0-10 years	7	7
11-20 years	38	38
21-30 years	32	32
31-40 years	15	15
41-50 years	8	8

In this present study, 7(7%) patients were in age group of 0-10 years. 38(38%) Patients were in age group of 11-20 years. 32(32%) patients were in age group of 21-30 years. 15(15%) patients were in age group of 31-40 years. And 8(8%) patients were in age group of 41-50 years

Table 3: MERI score of patients with CSOM.

	Mild	Moderate	Severe	Total
Taken	29	36	35	100(100%
Succeeded	27(93.10%)	29(80.55%)	22(62.85%)	78(78%)
Rejected	2(6.89%)	7(19.44%	13(37.14%)	22(22%)

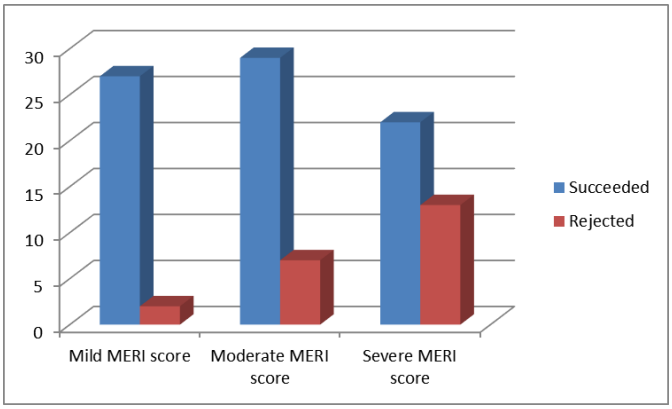

Fig 1: Tympanoplasty procedure patient with CSOM relation with MERI score

This study was comprised 27 patients with mild (1-3) MERI score, 29 patients with moderate (4-6) MERI score and 22 patients with severe (≥7) MERI score.

In this study, 29 patients were taken with mild MERI score, in which 27(93.10%) patients were accepted and 2(6.89%) patients were rejected the graft. 36 patients were taken with moderate MERI score in which 29(80.55%) patients were accepted and 7(19.44%) patients were rejected the graft. And 35 patients were taken with severe MERI score in which 22(62.85%) patients were accepted and 13(37.14%) patients were rejected the graft. Hence, graft with mild MERI score were less chances for rejection, and graft with severe MERI score were higher chances for rejection. That means, patients with higher the MERI score were greater chance for rejection of graft.

Discussion

Chronic suppurative otitis media is a very common Otorhinol aryngeal problem worldwide, especially in developing countries. It is more common in rural areas than urban areas and is associated with poor hygiene, illiteracy and is common among the middle and low income groups. Inspite of the availability of wide range of antibiotics, better surgical techniques and newly developed prosthetic materials we are still not able to reach 100% successful outcomes in tympanoplasty. This is due to the extent of pathology in the middle ear and mastoid which affects the outcome. Hence these are summarised and assigned a numerical value, the MERI index, which helps us to identify the extent of disease and thereby predict the outcome of surgery. In our study, majority of patients (38%) were in age group of 11-20 years. Mild MERI score patients were more success rate than moderate and severe

MERI score patients. Overall success rate of graft was 78 % and rejection of graft was 22%. 93.110% patients were succeeded the tympanoplasty with mild MERI score. 80.55% patients were succeeded tympanoplasty with moderate MERI score. And 62.85% patients were succeeded the tympanoplasty with severe MERI score. In this study, overall success rate of tympanoplasty was 78%.

Manpreet Kaur *et al* did studies on comparison of graft uptake between tympanoplasty alone and tympanoplasty combined with cortical mastoidectomy in non cholesteatomatous chronic suppurative otitis media in patients with sclerotic bone. They concluded that graft uptake was 76% in patients who underwent tympanoplasty and 88% in tympanoplasty [15] combined with cortical mastoidectomy. Veysel Yurttafl *et al* stated that the presence of granulation in middle ear had a negative effect on the hearing improvement after tympanoplasty. Their study concluded that graft uptake rate was only 44.4% in patients with extensive middle ear granulation tissue [16]. they advocated mastoidectomy in addition to tympanoplasty for all patients with active middle ear infection to remove granulation tissue from middle ear and mastoid cavity. Success of hearing reconstruction procedure also depends on the preoperative ossicular status. An intact ossicular system with only a perforation in the tympanic membrane gives the best results. Smoking is asssociated with reduced graft uptake. Zoran Becvarovski stated that delayed failure of the graft was more commonly seen in smokers (60%) than non-smokers (20%). The patients without tympanic membrane perforation had better graft uptake in the absence of other significant middle ear pathology. Many studies have concluded that the rate of graft uptake is lesser with anterior perforations than posterior perforations. This is due to lesser blood supply to anterior part of the drumhead and lesser surgical access to the anterior part. Cholesteatoma is associated with reduced rate of graft uptake and hearing benefit. Generally canal wall down procedure is done for extensive cholesteatoma. Tere is higher rate of recurrence especially if there is cholesteatoma in inaccessible sites. Stankovic M stated that Cholesteatoma recurrence is more than twice common in [17] children than adults.

Future Research

Science is dynamic and there is always a scope of improvement and change in time to come ahead. With progressive aim to move ahead we aspire to achieve highly accurate and reliable results. Thus every study leaves back scopes for other researcher to do something more advanced and varied in order to touch the height of perfection. This study examined only 100 subjects (58 males and 42 females), future researchers can expand the study by including more number of subjects so as to make generalization of the results and practice, further studies with a larger sample size and in multiple centers are required. Thus it could be applied to real life situation.

Limitation

There were several limitations like, the sample size was small, and it was a hospital-based study, the instrumentations and investigations may be different from a different health setup.

Relevance to clinical practice

This study is relevant to the MERI score for tympanoplasty. It opens up new possibilities for management of chronic suppurative otitis media (CSOM) and makes maintain the good health of population. Such knowledge in future would not only reduce this disease but also have significant medical benefits on the health care systems

Conclusion

Our study concluded that MERI score is a very useful measure for the tympanoplasty procedure of middle ear. CSOM Patients with mild MERI score had a greater chance of acceptance of graft. Patients with lower the MERI score greater the chance of acceptance than patients with higher the MERI score. Patients with severe MERI score had more chance of rejection of graft in tympanoplasty.

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