

Prognosis of patients operated with tympanoplasty for Chronic otitis media using the middle ear risk index (MERI)

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Abstract

Introduction: Otitis media is a prevalent global medical condition. Tubo-tympanic chronic otitis media often requires tympanoplasty, highlighting the need to assess severity and predict outcomes. The Middle Ear Risk Index (MERI) score predicts tympanoplasty results and correlates inversely with graft success and hearing improvement. This study aimed to evaluate the MERI score for mild middle ear pathologies and analyse surgical outcomes in tubotympanic chronic otitis media cases to the MERI score.

Methods: This prospective study was conducted at the Department of ENT, Aarupadai Veedu Medical College and Hospital, involving 50 patients with chronic suppurative otitis media and conductive hearing impairment. The study lasted 8 months, only including patients with a MERI score of 1-3, indicating mild conditions. Pure tone audiometry was performed preoperatively, and all patients underwent tympanoplasty using the underlay technique with temporalis fascia as the graft. Post-operative evaluations occurred in the second week, with follow-up audiometry at one and three months.

Results: The study included 50 patients with a mild MERI score. Males represented 56% of the participants. The predominant age group was 30 to 35 years, constituting 40% of the population. Patients with a mild MERI score demonstrated a statistically significant improvement in hearing post-surgery.

Conclusion: The MERI score is a valuable tool for assessing tympanoplasty effectiveness.

Keywords: Tympanoplasty, meri score, chronic otitis media.

Introduction

Chronic otitis media (COM) is a long-standing inflammatory condition of the middle ear and mastoid cavity, typically characterized by persistent or recurrent ear discharge through a perforated tympanic membrane [1]. It represents one of the most prevalent chronic infectious diseases globally, affecting an estimated 65 to 330 million individuals each year, with approximately 60% of them experiencing significant hearing impairment [2]. The disease predominantly affects populations in developing countries, where inadequate healthcare access, poor hygiene, and untreated acute otitis media contribute to its chronicity. Chronic otitis media not only causes functional disability through conductive hearing loss but also poses risks of serious complications, such as mastoiditis, labyrinthitis, facial nerve paralysis, and intracranial infections.

Chronic suppurative otitis media (CSOM), a major subtype of COM, is broadly classified into two forms mucosal and squamosal types. The mucosal type, often referred to as the tubo-tympanic type, is characterized by a central tympanic membrane perforation and mucopurulent ear discharge that may become intermittent. In contrast, the squamosal type, also known as the attico-antral disease, is associated with cholesteatoma formation and typically presents with marginal or attic perforation [3]. The mucosal form usually follows repeated acute infections, while the squamosal form is more destructive and carries a higher risk of complications due to bone erosion caused by the cholesteatoma.

The management of CSOM primarily focuses on eradicating infection, achieving a dry ear, and restoring hearing. Initial medical treatment consists of local and systemic antibiotics, meticulous aural toilet, and control of upper respiratory tract infections. However, surgical intervention becomes necessary in cases where conservative management fails or when there is significant tympanic membrane perforation [4,5]. Tympanoplasty is the mainstay surgical procedure for mucosal CSOM, aimed at reconstruction of the tympanic membrane and ossicular chain to restore middle ear function and hearing [6]. The success of tympanoplasty depends on several patient and disease-related factors, including the extent of middle ear pathology, Eustachian tube function, ossicular chain integrity, and overall ear health at the time of surgery.

To objectively predict surgical outcomes and standardize reporting, the Middle Ear Risk Index (MERI) system was developed by Kartush in 1994 [7]. The MERI scoring system assigns numerical values to specific preoperative risk factors, including the presence of cholesteatoma, ear discharge, size of tympanic membrane perforation, ossicular status, presence of granulation tissue, previous ear surgery, and smoking habits. Based on the cumulative score, patients are categorized into mild (1–3), moderate (4–6), or severe (7–12) risk groups. This classification assists in evaluating prognostic outcomes and facilitates comparison among studies.

Given the importance of assessing surgical prognosis, this study aims to evaluate tympanoplasty outcomes in patients with tubo-tympanic CSOM and analyse their association with the MERI score, particularly focusing on mild-risk cases (scores 1–3). Such an assessment helps in refining preoperative counselling, improving surgical planning, and enhancing the predictability of successful graft uptake and hearing restoration.

Materials and Methods

A prospective observational study was conducted at the ENT department of Aarupadai Veedu Medical College and Hospital in Puducherry, South India. The investigation encompassed 50 patients diagnosed with conductive hearing loss and chronic otitis media of the mucosal type over eight months. Each participant was assigned a MERI SCORE between one and three, classified as mild. The study included patients aged 20 to 45. Exclusion criteria comprised individuals with sensorineural hearing loss or hearing impairment from other etiologies. Furthermore, patients with bronchial asthma, diabetes mellitus, hypertension, thyroid disorders, or other comorbidities were excluded. The MERI system is designed to evaluate and predict tympanoplasty outcomes. A description of the seven factors and their corresponding scores is provided below.

Table 1: Middle Ear Risk Index Score:[7]

Otologic factor	Maximum score
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Ear discharge	3
Perforation in tympanic membrane	1
Cholesteatoma	2
Ossicular chain status	4
Granulations in the middle ear	2
History of surgery in the same ear	2
Smoking habit	2

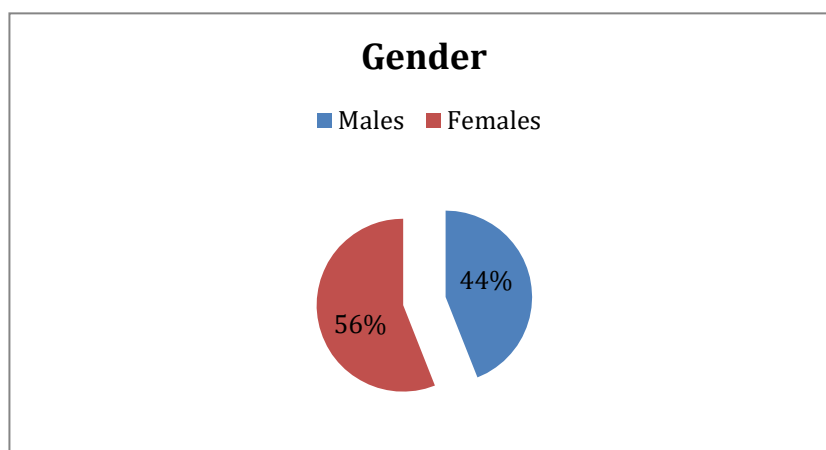
The severity of the disease is classified into three groups based on the aggregate of scores derived from evaluating various factors: mild disease is indicated by a score of 1-3, moderate disease by 4-6, and severe disease by 7-12. Every study participant underwent thorough blood tests. It assesses the dimensions and position of the tympanic membrane perforation. Before surgery, pure tone audiometry was conducted. Tympanoplasty was carried out on each patient under general anesthesia. All study subjects received temporalis fascia as the graft material, and the underlay technique was consistently employed during surgery. Patients were clinically evaluated two weeks post-operation, with additional pure tone audiometry tests performed at one and three months following the procedure.

Ethical clearance for the present study was obtained from the Institutional Ethics Committee of Aarupadai Veedu Medical College and Hospital, Puducherry, India (Ref No: AVMC/EC/2023/56284). A detailed Participant Information Sheet was provided to all participants, and written informed consent was obtained prior to their inclusion in the study.

Result

The age of participants spanned from 20 to 45 years, with the largest group (45%) being between 30-35 years old. The next largest groups were 35-40 years (25%), 40-45 years (20%), and under 30 years (10%). On average, participants were 33.5±2.8 years old.

Fig 1- Gender distribution of the study participants(N=50)



(Figure 1) The gender distribution showed 28 females (60%) and 22 males (40%). None of the participants reported any comorbidities.

Fig 2- Distribution of dry & wet ears among study participants (N=50)

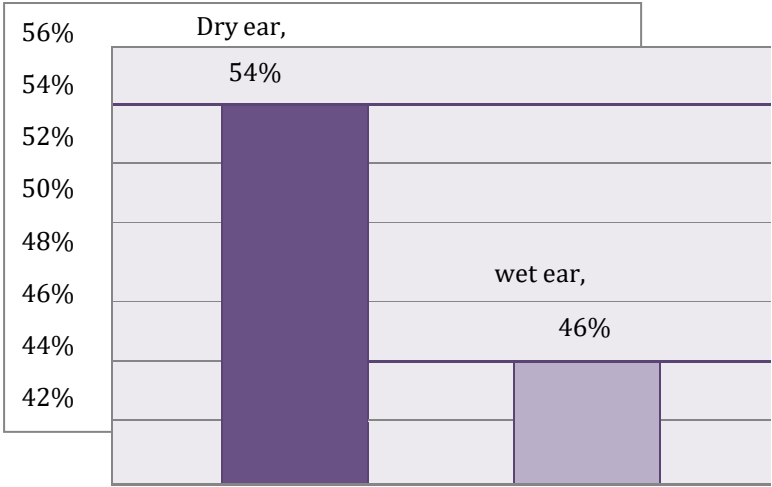


Fig 3- Distribution of granulations in the middle ear among study subjects (N=50)

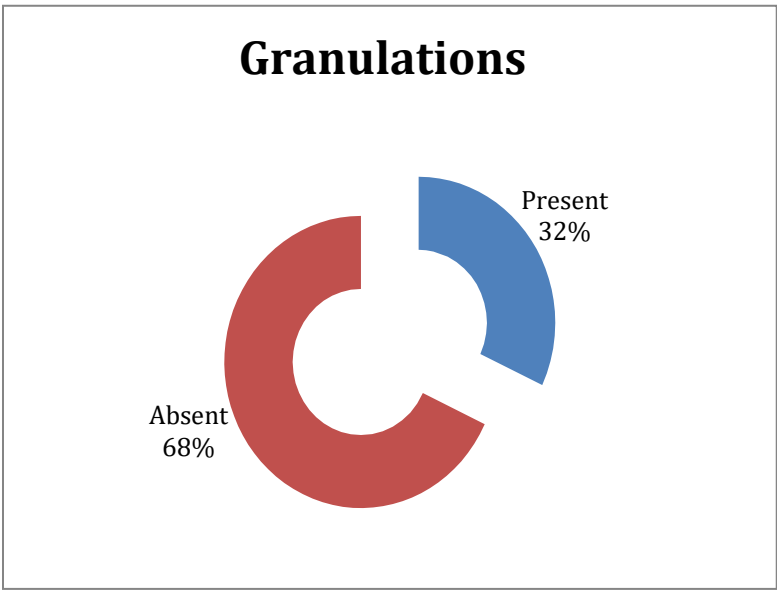
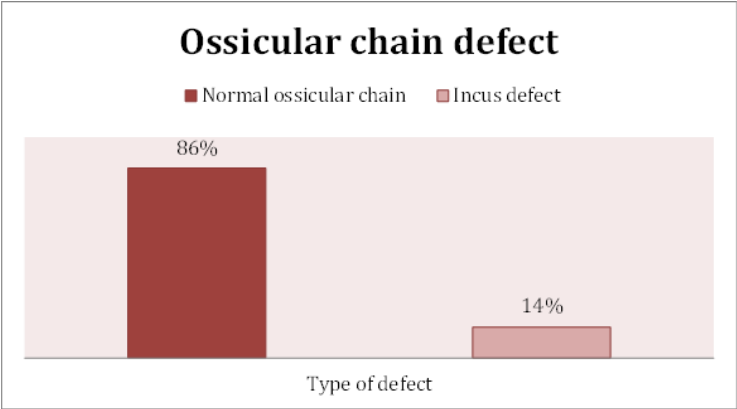


Figure 3 - Granulation among the participants (N=50)

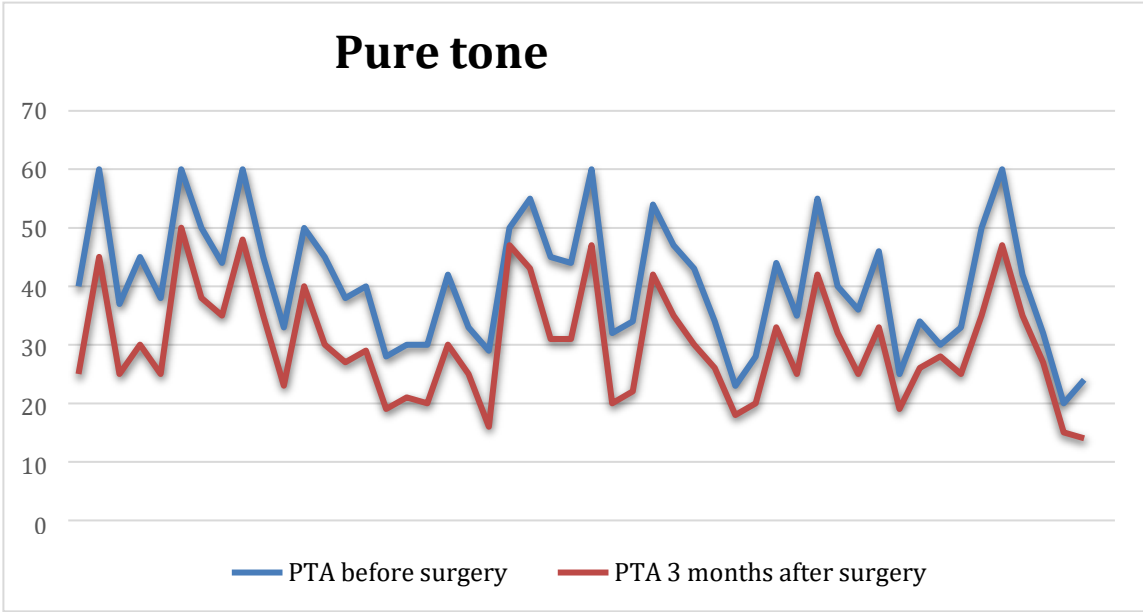
The otoscopic examination revealed that 23 individuals presented with intermittently moist ears, while 27 exhibited dry ears (Figure 2). All subjects demonstrated a moderate-sized perforation in their tympanic membrane. Among the 50 participants, 16 had granulation tissue in the external auditory canal (Figure 3).

Fig 4- Type of ossicular defect among the participants (N=50)



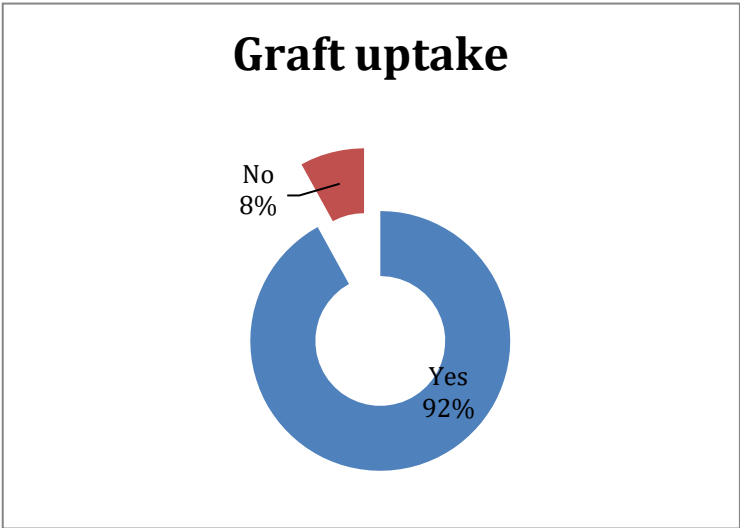
Among the 50 patients examined, 7 exhibited an incus defect, while the remaining 43 had a normal ossicular chain. Five out of the 50 individuals reported a history of smoking. None of the patients had undergone previous surgery on the affected ear or presented with cholesteatoma.

Fig 5–Differences in PTA findings after the surgery (N=50)



The results of pure tone audiometry are presented in the aforementioned diagram (Fig. 5). Before surgical intervention, the mean hearing loss was 40.3 dB, which subsequently decreased to 30.2 dB post-procedure. The investigation demonstrated a mean improvement in auditory function of 10.1 dB. P value is < 0.05, a statistically significant enhancement in auditory function for mild cases, based on an average MERI Score of 10 dB.

Fig 6- Proportion of graft uptake among study subject (N=50)



At the two-week and one-month post-operative clinical evaluations, 90% of patients showed successful graft acceptance (Figure 6).

Discussion

Tympanoplasty is widely regarded as the optimal surgical treatment for tubotympanic chronic otitis media. Several factors, including eustachian tube dysfunction and recurrent upper respiratory tract infections, have been shown to influence surgical outcomes, as reported by Çayır et al. and Lin et al. [8,9]. The present study was conducted on 50 patients with tubotympanic chronic otitis media and low Middle Ear Risk Index (MERI) scores. The male-to-female ratio was 2:3, with the majority of patients (45%) belonging to the 30–35-year age group. Intermittent ear discharge was the most commonly reported presenting complaint. Pure tone audiometry revealed a mean preoperative hearing loss of 40.3 dB and a postoperative mean of 30.2 dB, indicating an average hearing improvement of 10.1 dB. These findings are consistent with observations reported by Felek et al. [10], who demonstrated a statistically significant difference in hearing improvement between mild and severe MERI groups.

A high graft uptake success rate of 90% was observed in the present study, indicating favorable anatomical outcomes. This result is comparable with findings reported by Kumar et al. [11], who documented an 86% graft uptake rate in patients with mild MERI scores. Although age alone should not be the sole criterion for determining candidacy for ossicular reconstruction, the maturation of the eustachian tube plays a crucial role in surgical success. In pediatric patients, hearing aids may serve as a less invasive alternative when surgical intervention is deferred. While no universal consensus exists regarding the ideal age for tympanoplasty, evidence suggests that surgical success improves with increasing age, as supported by findings reported by Ismi et al. [12].

Different grafting techniques used in tympanoplasty have shown variable anatomical and functional outcomes. Studies by Ozbek et al. and Çayır et al. [8,13] have demonstrated favorable results with fascia and cartilage grafts. Furthermore, the overall success of tympanoplasty has been shown to correlate strongly with MERI scores, as reported by Shishegar et al. and Pinar et al. [14,15]. While many otolaryngologists emphasize the importance of operating on a dry ear, some studies suggest that ear dryness may not significantly affect graft success. However, patients who maintained a dry ear for at least three months prior to surgery demonstrated improved graft uptake rates, as noted by Uyar et al. [16], indicating a possible association between preoperative ear status and postoperative outcomes.

Conclusion

Studies have demonstrated that a modest MERI can protect against surgical complications. The assessment of MERI prior to surgery may prove advantageous in determining a patient's suitability for tympanoplasty, more intricate surgical interventions, or preoperative medical management to enhance outcomes.

Conflict of Interest: NIL

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