



A STUDY ON TRAUMATIC TYMPANIC MEMBRANE PERFORATION : CHARACTERISTICS AND FACTORS AFFECTING OUTCOME

ENT

**Dr. Navami
Chandran**

Junior Resident, Department Of ENT, Sri Siddhartha Medical College, A Constituent College Of Sri Siddhartha Academy Of Higher Education, Tumkur.

**Dr. Swaroop Dev.
M**

Professor, Department Of ENT, Sri Siddhartha Medical College, Tumkur.

**Dr. Bharath
Kumar K L**

Associate Professor, Department Of ENT, Sri Siddhartha Medical College, Tumkur.

ABSTRACT

Background: Trauma constitutes a significant cause of Tympanic Membrane (TM) perforation, following infection. This study aims to comprehensively characterize various etiologies, clinical features and treatment outcomes of Traumatic Tympanic Membrane Perforation. **Methods:** A prospective study was conducted in the Department of Otorhinolaryngology at Sri Siddhartha Medical College and Hospital, Tumkur, Karnataka, for a duration of 24 months. After obtaining institutional ethical clearance, a total of 55 patients of both the genders of age above 5 years with clinical features of traumatic tympanic membrane perforation were enrolled in the study and were subjected to history and clinical examination and Otoscopic examination and Pure Tone Audiometry. All patients were followed-up every 2 weeks to look for spontaneous healing upto 3 months. Tympanoplasty was done for perforations that didn't heal spontaneously even after 3 months and follow-up PTA was done at the time of spontaneous healing. **Results:** Majority of cases were in 21-30 years age group (40%). Out of 55 patients, males account for 37 patients, and females for 18. (33) patients had left ear affected compared to the right (22 patients). Hearing impairment was the commonest symptom (35 patients) with "Slap Over Ear" (43 patients) being the most common cause. 60% had small perforations and posterior inferior (PI) quadrant was mostly involved (34 patients). Majority of patients had conductive hearing loss in the 26-40 dB range (42 patients). Most patients healed within 6-8 weeks (26 patients). 90.9% (50) patients were managed conservatively and 5 patients whose Traumatic Tympanic Membrane Perforation didn't heal spontaneously underwent surgery i.e, Tympanoplasty. **Conclusion:** This study shows that even though majority of cases can be managed conservatively, proper evaluation and follow up will help in timely surgical intervention in cases that will warrant intervention.

KEYWORDS

Trauma; Tympanic Membrane; Perforation; Pure Tone Audiometry; Spontaneous Healing.

INTRODUCTION:

Trauma is an omnipresent aspect of human existence, taking on many forms as a result of daily activities. Among the various injuries that can occur, ear injuries are especially important due to their potential impact on hearing and balance. The ear, located within the craniofacial structure, is susceptible to trauma, which can be caused by blunt forces like contusions and concussions or by penetrating injuries such as fractures. Major injuries to the ear can lead to profound disturbances in auditory function and balance, especially when the inner ear is involved.

This study aims to comprehensively characterize traumatic tympanic membrane perforation by examining its distribution patterns, underlying mechanisms of injury, treatment outcomes, and factors influencing recovery trajectories.

AIM:

To study the clinical profile and various factors affecting outcome of a Traumatic Tympanic Membrane perforation.

MATERIALS AND METHODS

A. Source Of Data:

All the patients of both the genders above 5 years of age with Traumatic Tympanic Membrane Perforation attending Outpatient Department of ENT and casualty, Sri Siddhartha Medical College & hospital, Tumkur were enrolled for the study.

B. Study Design:

Prospective study.

C. Sample Size:

Using the following formula for calculation of sample size for prevalence studies using confidence level of 95% and precision of 8%

$$n = Z^2 \cdot P(1-P) / d^2$$

Where n is the sample size,

variable used to calculate sample size = prevalence of patients with traumatic Tympanic Membrane perforation.

Precision = 0.08(8%)

Z value for 95% c.i = 1.96.

Considering 10% non response rate sample size. = 55.

This study utilized a sample size of 55 patients.

D. Sampling Method: Convenient sampling.

E. Study Period: 24 months.

F. Inclusion Criteria:

- All patients diagnosed with Traumatic Tympanic Membrane perforations.
- Above 5 years age group in both the genders.
- Patients willing to give informed written consent.

G. Exclusion Criteria:

- Patience with middle ear infections like AOM and COM.
- Patients with head injury, temporal bone fractures, granulomatous diseases of ear, malignancy of ear.
- Patients with previous ear surgeries, sensory neural hearing loss.

Methodology:

The study included patients of both genders aged above 5 years, who presented with Traumatic Tympanic Membrane Perforation at the ENT and casualty departments of Sri Siddhartha Medical College and Hospital, Tumkur.

After taking written informed consent, a comprehensive history was obtained and a detailed clinical examination was performed. Otomicroscopy, tuning fork tests and Pure Tone Audiometry (PTA) were performed. Follow-up were scheduled every two weeks upto 3 months.

OBSERVATION AND RESULTS

A total of 55 cases attending ENT OPD and casualty with traumatic tympanic membrane perforation were evaluated and managed. The following observations were made:

AGE

Majority (40%) of the cases are in the 21-30 years age range, followed by 32.7% in the 31-40 years group. Smaller percentages are seen in the

other age categories, with the least (1.8%) in the 5-10 years category.

GENDER

Out of 55 patients 37 were males and 18 were females.

LATERALITY

Majority (60%) of patients have the left ear affected, while 40% experience involvement on the right side.

Mode Of Injury

In this study, the commonest cause is "Slap Over Ear," which affects 43(78.2%) patients, followed by "Direct Trauma" (18.2%). Direct trauma includes all the self-inflicted injuries. Only 2(3.6%) patients were affected by "Acoustic Trauma" which includes exposure to loud voices as in DJ parties and mining explosion.

Symptoms

The most common presentation is "Hearing Impairment" (35 patients), followed by "Tinnitus" (7), "Ear Pain" (5), and "Blood Discharge" (2). Very few patients(3) have both hearing impairment and tinnitus and 3 patients presented with both hearing impairment and ear pain.

Size Of The Perforation

Majority of cases (46) show small perforations, while (7) have medium-sized perforations, and only 2 Patients have large perforations.

Quadrants Affected

The majority of cases (34) show involvement in the PI (posterior inferior) quadrant. Fewer cases shows AI (anteroinferior) quadrant involvement (12), or a combination of PI and AI quadrants (7). Only 2 patients have involvement in more than three quadrants.

Hearing Loss(Db)

Most patients (42) have mild CHL in the range of 26-40 dB, while 11 patients have hearing loss between 15-25 dB, and 2 patients presented with moderate CHL between 41-55 dB.

Spontaneous Healing(WEEKS)

(26) experienced healing in 6-8 weeks followed by (22) patients healing in 4-6 weeks and 2 healing in 8-10 weeks.

Table 1. Management Of Traumatic Tympanic Membrane Perforation

Management strategy	No: of patients	Percentage (%)
Conservative Management	50	90.9
Surgery	5	9.1
Total	55	100

All patients were followed up at every 2 weeks upto 3 months to look for spontaneous healing.

Conservative management was followed for most of the patients 55(90.9). Patients were explained about the precautionary measures and were instructed to keep ear dry by preventing water from entering ear canal.

Remaining 5 patients who did not heal spontaneously underwent Tympanoplasty. Follow-up Pure Tone Audiometry was done at the time of spontaneous healing or healing after surgery.

Table 2: Comparison Between Initial Pure Tone Audiometry Values And After Spontaneous Healing/Surgery.

Hearing loss(dB)	Mean	Standard Deviation
Initial PTA values	33.1	4.4
PTA values after spontaneous healing/ surgery	22.09	2.6
Hearing Improvement	9	2
P value	<0.001	Significant

Mean hearing improvement compared between hearing loss at the time of presentation and after spontaneous healing or after surgery was 9 + - 2 dB, which is statistically significant.

DISCUSSION

Majority patients (40%) fall within the 21-30 years age group, followed by 32.7% in the 31-40 years range. This shows that younger adults are the most affected. Study by Sailesh AV et al showed that

56.66% of the patients belong to 20-30 years age group.

Male patients accounted for 67.3% of cases, while females were 32.7%. This disparity suggests that men may be more exposed to risk factors leading to the condition, possibly due to lifestyle or occupational hazards.

(60%) have the left side affected compared to 40% with right-side involvement. This asymmetrical distribution may be linked to common injury patterns or dominant hand use in interpersonal violence or trauma incidents. Study by Mazumder JA et al showed that 70.9% had left ear and 29.1% had right ear affected.

The leading cause of injury is a "Slap Over Ear (78.2%) cases, followed by "Direct Trauma" and "Acoustic Trauma". The high prevalence of slap injuries suggests that interpersonal violence or accidental slaps play a significant role in causing this condition. Sogebi OA et al showed that causes of the perforations were domestic assault in 15 patients (28.3%), self-inflicted/ accidental injuries in 11 (20.8%) patients, and road traffic accidents in 10(18.9%) patients.

Hearing impairment(63.6%) is the most common symptom followed by tinnitus (12.7%), ear pain (5%), and blood discharge (3.6%). Wani A et al found that tinnitus was the most frequent complaint (90.9%), followed by aural fullness (87.1%), reduced hearing (58.6%), aural pain (30%), bleeding from ear (6.3%), and vertigo (1.4%).

Most patients (83.6%) have small perforations, with only 12.7% having medium-sized and 3.6% having large perforations. This suggests that in most cases, the injury is mild to moderate, with fewer instances of severe perforations. The posterior inferior (PI) quadrant is the most frequently affected (61.8%), followed by the anterior inferior (AI) quadrant (21.8%). A smaller proportion (12.7%) have both AI and PI involvement, while only 3.6% have more than three quadrants affected, indicating that injuries are often localized rather than widespread. Study by Sarojamma et al also shows similar features. Posteroinferior quadrant seems to be more vulnerable to trauma since it is more laterally placed & more easily accessible.

Majority patients (76.4%) experience moderate hearing loss in the 26-40 dB range. This suggests that while hearing impairment is common, severe hearing loss is relatively rare. Wani A et al also found that majority of patients (62%), presented with conductive hearing loss in the range of 20-35 dB.

47.3% experience spontaneous healing within 6-8 weeks, while 40% recover within 4-6 weeks and 3.6% take up to 8-10 weeks to heal. This indicates that the majority of cases resolve naturally within two months, with prolonged healing being less common. Study by Mazumder JA et al showed that spontaneous healing was observed in 88.09% (n=185) cases at 3 months

CONCLUSION

Traumatic tympanic membrane perforations is an under reported otological defect. They are still common in our society due to domestic violence, assaults etc. It affects all the age groups with predominance in 20-30 years age group in our study. It has a good prognosis if treated at right time with a need to educate the patients to keep the ear dry for 8 to 12 weeks. Most of the perforations healed spontaneously with conservative management (90.9%) in our study. Small sample size and limited duration of study are the limitations of the current study.

REFERENCE

- Guenzani S, Mereu D, Messersmith M, Olivari D, Arena M, Spanò A. Inner-ear decompression sickness in nine trimix recreational divers. *Diving Hyperb Med*. 2016; 46:111-116.
- Yetiser S, Hidir Y, Birkent H, Satar B. Durmaz Traumatic ossicular dislocations: etiology and management. *Am J Otolaryngol*. 2008; 29:31-36. doi: 10.1016/j.amjoto.2007.01.001.
- Sailesh AV, Arumugham V, Pakanati SSR, Potnuru S. Traumatic tympanic membrane perforation: an overview in a tertiary care centre-Khammam. *Int J Otorhinolaryngol Head Neck Surg* 2021; 7:1275-8.
- Mazumder JA, Nasir SM, Rashid S, Khan AM. Traumatic Perforation of Tympanic Membrane: A Rural Profile of Bangladesh. *Medicine today*. 2016; Volume 28: Number 02:79.
- Sogebi OA, Oyewole EA, Mabifah TO. Traumatic tympanic membrane perforations: characteristics and factors affecting outcome. *Ghana Med J*. 2018 Mar;52(1):34-40. doi: 10.4314/gmj.v52i1.7. PMID: 30013259; PMCID: PMC6026949
- Wani A, Rehman A, Lateef S, Malik R, Ahmed A, Ahmad W, Kirmani M. Traumatic tympanic membrane perforation: An overview. *Indian J Otol*. 2016;22(2):100-104. doi:10.4103/0971-7749.182276.
- Sarojamma RS, Satish HS. A clinical study of traumatic perforation of tympanic membrane. *IOSR J Dent Med Sci*. 2014 Apr;13(4):24-8.