



## ASSESSMENT OF TYMPANIC MEMBRANE PERFORATIONS CAUSED BY TRAUMA

## Otolaryngology

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## ABSTRACT

**Background:** The aim of the study was to evaluate various etiological factors, clinical presentation in patients presenting with Traumatic ear perforations. **Methods:** 24 patients were taken in our study who reported within two weeks of history of trauma with no previous history of middle ear pathology. Data was collected and patients were treated. **Results:** 24 patients were studied (12 males and 12 females); age ranging from 15 years to 56 years. Laterality of trauma was found to be more in left ear. Aural Fullness & pain in ear were the most common presenting complaints. Most common etiology was found to be assault and poster inferior quadrant was found to be most commonly involved. **Conclusions:** Traumatic perforations have a very good prognosis if they are treated at the right time. We would also like to stress on the fact that domestic violence is still prevalent in our society leading to patients of traumatic perforation.

## KEYWORDS

Trauma, Ear perforation, Traffic accident, Otoscopy, Microscopy

## INTRODUCTION

Traumatic tympanic membrane perforation is an injury of the eardrum, which is frequently faced by otolaryngologists. The tympanic membrane is a delicate translucent fibrous membrane which separates the external from the middle ear, and it produces a rupture, tear or perforation when traumatized. The tympanic membrane injury can predispose to middle ear infection which has grave consequences including facial nerve paralysis, formation of cholesteatoma, perilymph fistula, and intracranial infections and may require ear and intracranial exploration.

1 The incidence of perforations of the tympanic membrane due to trauma is on the increase consequent to trauma, and increased violence and accidents seen in present-day life.

2 Ear buzzing, earache, and hearing loss are the major symptoms of tympanic membrane perforation. In addition, tympanic membrane perforation can increase the risk for middle ear infection or otitis media

3 Treatment of traumatic tympanic membrane perforation range from inactive watchful waiting, active intervention to surgical intervention.

4 Otolaryngologists have however been advised to be reluctant in offering surgical intervention in cases of traumatic tympanic membrane perforation without significant symptoms as most patients will heal spontaneously within two months.

5 Active interventions include topical application of substances like epidermal growth factor, enoxaparin, and ascorbic acid to stimulate epithelization for quick closure or to prevent formation of sclerotic plaques in the perforated membrane. (6-8) Perforation of tympanic membrane may be caused by:

Change in air pressure (blow in the ear, blast injury, Eustachian tube inflation, nitrous oxide anesthesia and hyperbaric oxygen treatment.)  
By fluid (syringing, caloric test, diving.)

By solid objects (instrumentation, attempt to foreign body removal, match stick, hair clips and sparks of hot metal). Rupture due to air pressure change occurs mostly in the anteroinferior quadrant of tympanic membrane. Atrophic segments are likely to rupture at pressure change at least 50% lower than a normal tympanic membrane. (9) Fracture bone of skull is an important cause when the fracture line involves the attachment line of tympanic membrane. Lightning strike may cause rupture as rapid heating of intracorporal gas and increased middle ear pressure. (10) The objectives of this study were: To evaluate the presenting complaints in patients presenting with traumatic tympanic membrane perforations. To study the etiological

factors in patients presenting with traumatic tympanic membrane perforations. **METHODS** Prospective study was conducted on 24 patients presenting to the ENT OPD in Era's Lucknow Medical College and Hospital from October 2022 to September 2023. Data was collected including demographic data, date, mode of trauma, otoscopy, and tuning fork test, followed by Endoscopic examination of the ear. Patients presenting to us within 24 hours of trauma underwent examination under microscope and antibiotic soaked abgel was placed after everting the margins. Patients were treated conservatively with antibiotics (oral and/or local in infected cases) and anti-inflammatory for 7-10 days. Patients were advised to avoid water entry into ears and to avoid self-cleaning. Patients were included who reported within two weeks of a history of trauma and with no previous history of any external or middle ear pathology. Previously operated patients and patients with history of any ear pathology were excluded from the study. Written and informed consent was taken. The tympanic membrane perforation classified according to the quadrant involved - Anterosuperior, Posterosuperior, Anteroinferior, Posteroinferior & Central (if involve more than one quadrant)

The percentage distribution statistical tool was used to analyze the data.

## RESULTS

In our study we evaluated 24 patients of which 12 were females and 12 were males. The results are based on percentage distribution. Highest patients of traumatic tympanic membrane perforations were found in the age group of 30-40 years which included 8 patients, followed by age group of 20 - 30 which had 6 patients (Figure 1). Laterality of trauma was more towards the Left ear which included 15 patients and right ear was seen involved in 9 cases.

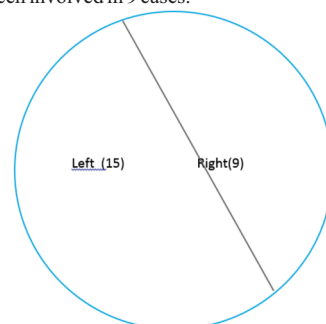


Figure 1: Laterality of trauma

**Table 1: Age And Sex Distribution.**

Age in years	Male	Female	Total
10-20	1	2	3
21-30	2	4	6
31-40	3	5	8
41-50	2	3	5
51-60	1	1	2

**Table2: Percentagedistributionofpresentingcomplaints.**

Presentingcomplaint	Numberofpatients	Percentage(%)
Tinnitus	12	50
Auralfullness	23	95.83
Hearingloss	10	41.6
Vertigo	2	8.33
Earbleed	12	50
Paininyear	22	91.6
Infection	5	20.83

Most common presenting complaint in our study was auralfullness (95.8%) followed by pain in ears (91.6%), tinnitus (50%), ear bleed (50%), hearing loss (41.6%), infection (20.83%) and vertigo (8.3%) (Table 1).

Most common etiological factor was assault (50%) followed by accident (29.16%) and iatrogenic (20.83%) (Table 2).

**Table 3: Percentage Distribution Of Aetiology.**

Aetiology	Number of patients	Percentage %
Assault (slap)	12	50
Iatrogenic (caused by self cleaning, faulty technique of ear cleaning, trauma during foreign body removal)	5	20.83
Accidental (traffic accident, blast injuries, forceful blow, moving football or cricket ball)	7	29.16

**Table 4: Percentage Distribution Of Quadrant Of Tympanic Membrane Involved**

Quadrant of t.m involved	Number of patients	Percentage%
Anteroinferior	6	25
Anterosuperior	0	0
Posteriorinferior	12	50
Posterosuperior	2	8.33
Central	4	16.66

Posteriorinferior quadrant (50%) was most commonly involved in our study followed by anteroinferior (25%), central (16.66%) and posterosuperior (8.33%) (Table 3).

## DISCUSSION:

In this series we found that young age group that is between 20-40 years of age was found to be more affected which is comparable to the study done by Sogebi et al which had a mean age of 33.8 years. Other reports had age ranges of 29.2 to 33.6 years.<sup>12,13</sup> Females predominated over the male population. The reason for the slight preponderance of the left compared to the right ear found in this study is not clear. Sarojamma et al, however opined that it may be due to the fact that slap was a major etiological factor and a right-handed person tends to slap the victim over the left ear. <sup>2</sup> Exploration of the causes and mechanisms of traumatic tympanic membrane perforations revealed a trend similar to those reported from other studies.<sup>2,3</sup> Assault (50%) was a common and prominent cause of traumatic tympanic membrane perforation in our study like in other previous reports (37.4-86.4%).<sup>13,15,16</sup> There was a significant difference in the mechanisms of injuries in the sexes of the patients. While traffic accident and assault were common among the male patients, domestic assaults were prominent among the females. Lou et al, reported that slap or a fist by a spouse or lover was responsible for more than half of cases of traumatic tympanic membrane perforation in their study.<sup>13</sup> Attempt at removing foreign body, self ear cleaning with variety of objects like cotton bud, pin head, match stick and wax removal in an unskilled manner either by the parents or quacks with tympanic membrane perforation was a common cause found. Ear picking accounted for 90.3% of direct ear injuries seen in Japan and 19.3% of those seen in

Germany.<sup>15,16</sup> Most traumatic perforations have a tendency to heal spontaneously. In our study we found 78% (21) cases healed at 3 months. Rest 6 cases underwent tympanoplasty after 3 months. Two main factors that predispose to failure of the perforation to heal are loss of tissue and secondary infection.<sup>12</sup> Small perforations are more likely to close spontaneously than larger ones.<sup>9</sup> We observed in our study that the tympanic membrane healed spontaneously with prophylactic antibiotic cover & strict observation of the instruction not to allow water or any other fluid enter into the ear. In our study we had an unusual case of tinnitus and reduced hearing sensitivity following lightning. This patient a 30 year old male was riding a bike wearing a helmet with mobile phone in it on right side when he heard a loud thunder following lightning close to his helmet. After which he experienced loud sounds of mobile phone ringing and 5 seconds later was unable to hear anything and developed ringing sensation in ears. Otologic examination demonstrated tympanic membrane perforation in right ear while the left ear membrane was intact. Mechanism of injury is the flash-over phenomenon. Here, most lightning energy flows around the outside of the victim's body. Sweat on the victim's skin or moisture in wet garments acts as the conductor, and the inherent explosive effect of lightning caused by the rapid expansion of the surrounding air as the energy charge travels over the victim may result in blast injuries similar to those sustained in an explosion.<sup>17-23</sup> By 1-3 months follow up there was complete healing of the membrane and return to normal hearing in majority of uncomplicated cases. If the perforation fails to close spontaneously in 3-6 months (in absence of infection), surgical closure is indicated.<sup>9</sup> Wet perforation with bloody or watery discharge significantly improve the healing rate and shorten the average perforation closure time as compared with dry perforation.<sup>13</sup> We would like to conclude that traumatic perforations have very good prognosis rate if they are treated at the right time by the right Doctors. We would like to stress on the fact that ear dry precautions are very important for the healing of perforations and they should be clearly explained to the patients. We would also like to emphasize on the fact that domestic violence is still prevalent in our society and these cases cannot be reduced unless there is stoppage to this. Blast injuries from sound of crackers was also observed in our study which can easily be avoided but these are still prevalent in our society.

## CONCLUSIONS:

Traumatic perforations have a very good prognosis if they are treated at the right time. We would also like to stress on the fact that domestic violence is still prevalent in our society leading to patients of traumatic perforation

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**Conflict Of Interest:** None declared

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