

## OBSERVATIONAL STUDY OF TRAUMATIC TYMPANIC MEMBRANE PERFORATIONS IN RELATION TO AETIOLOGY AND MANAGEMENT

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### ABSTRACT

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#### OBJECTIVES

The aim of the study was to evaluate the various aetiological factors incidence and type of hearing loss, clinical presentation, treatment, prognosis and outcome.

#### METHODS

This prospective study performed in the Dept. of Ear, Nose and Throat at Chhattisgarh Institute of Medical Sciences, Bilaspur, from Jan 2014 to June 2015, during this period 60 patients of traumatic tympanic membrane perforation were diagnosed.

#### RESULTS

In our study, commonest cause of traumatic perforation was slap (63.3%) followed by Road Traffic Accident (21.6%), Crackers Blasting (3.3%), perforation by solid object (1.6%), sport injuries (1.6%). Most common clinical presentations were pain in ear, tinnitus and decrease in hearing. The prognosis of traumatic perforation was excellent but healing time was uncertain.

#### CONCLUSION

Overall, healing in all the patients with traumatic perforations with (Either conservatively or with myringoplasty) groups were 100%. It is very common in day-to-day life and the highest incidence is by slap and that too in males of age group between 20-30 years of age and mild conductive loss was seen in majority of the patients and the perforation was mainly seen in posteroinferior quadrant.

#### KEYWORDS

Tympanic Membrane, Traumatic Perforation, Hearing Loss, Slap Injury.

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**INTRODUCTION:** Among the various aetiological causes of tympanic membrane perforations, traumatic tympanic membrane perforation is a common type of perforation seen in ENT OPD. The tympanic membrane is an important pathway for conduction of sound by virtue of its vibratory character. An increased incidence of traumatic tympanic membrane perforation in the present scenario is due to increased domestic violence and road traffic accidents.<sup>1,2,3</sup> Traumatic perforation is commonly seen in healthy community. Tympanic membrane is structurally very thin and may be ruptured by sudden increase in air pressure in the external auditory canal by slap, RTA, Blast injury and traumatic asphyxia.<sup>4</sup>

Most authors have generally stated that the hearing loss is dependent on the side and size of perforation, but their results were found to be conflicting and inconclusive.<sup>5</sup>

It is also caused by self-cleaning of ear, scratching the ear by sharp edge solid objects (Safety pin, match stick) thermal or caustic burns and by fluids (Syringing, caloric test, water diving) and barotraumas.<sup>6,7</sup> Spontaneous healing is excellent but healing time is uncertain, moreover hearing loss and tinnitus can effect patient's psychological stress during healing. However, controversy exists over the mechanisms by which spontaneous healing of traumatic tympanic membrane perforation occurs.<sup>8</sup>

Temporal bone is a complex bone in human body. It houses many vital structures including the cochlea, vestibular end organ and facial nerve. Involvement of all these structures in temporal bone fractures is possible in road traffic accidents including blunt trauma, laceration, avulsion of the part or whole of the pinna with tympanic membrane perforation.<sup>9</sup> It is sometimes associated with injuries of ossicular chain and inner ear.

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**AIMS AND OBJECTIVE:**

1. To evaluate the various aetiology of traumatic ear drum perforations.
2. To evaluate the degree and type of hearing loss.
3. To evaluate the prognosis and outcome.

**METHODS & MATERIALS:** The present study was done in the Department of Otorhinolaryngology, Govt. Chhattisgarh Institute of Medical Sciences, Bilaspur from January 2014 to June – 2015. During this period, patients attended the ENT OPD and RTA patients through casualty OPD, in which total 60 patients fulfilled our inclusion criteria.

**Inclusion Criteria:** All age groups of those who suffered from traumatic tympanic membrane perforation irrespective of aetiology, sex and socioeconomic status.

**Exclusion Criteria:** Subjects reported with secondary middle ear infections and giving history of injury.

**OBSERVATION AND RESULT:**

1. Age description of patient with traumatic ear drum perforation: we categorised the age group for 10 years and analysed the data as per our study and found that membrane injury was more reported for 21–30 years of age group.

Sl. No.	Age in Year	Number	Percentage (%)
1	10 – 20	12	20
2	21 – 30	22	36.6
3	31 – 40	15	25
4	41 – 50	06	10
5	51 – 60	04	6.6
6	> 60	01	1.6

**Table 1**

Female patients - 16 (26.6%). Male patients - 44 (73.3%).

2. Aetiological profile and sex of the patient:  
We studied the various causes for tympanic membrane perforation presented given below.

Sl. No.	Predispositions	Male	Female	Percentage
1	Slap	22	16	63.3 M=36.6 F= 26.6
2	Road Traffic Accident	13	00	21.6
3	Self-Cleaning with Solid Objects (Septic pin/Key/Match Stick)	05	00	8.3
4	Instrumentation	01	00	1.6
5	Fire Crackers	02	00	3.3
6	Sport Injury	01	00	1.6

**Table 2**

3. Sources of slap:

Sl. No.	Source	Number
1.	Spouse/Love Mate	16
2.	Senior Student	02
3.	Assault from fight/Domestic violence	20

**Table 3**

4. Degree of hearing loss & number of cases:

Sl. No.	Degree of Hearing Loss (dB)	Frequency of Patient
1	Mild (26-40)	40
2	Moderate (41-55)	10
3	Moderately severe (56-70)	07
4	Severe (71-90)	03

**Table 4**

Our study included 60 patients with traumatic tympanic membrane perforations, who attended the Otolaryngology Department of CIMS Bilaspur, Chhattisgarh from January 2014 to Jun 2015. All the cases underwent complete otological examination followed by otoscopic examination, tuning fork test, pure tone audiometry (PTA).

Tympanic membrane perforation was identified and hearing loss was recorded.

The following observations were found during examination and investigations.

Out of 60 patients, 44 males and 16 female patients with male-female ratio 5.5:2 in which 59 patients had unilateral perforation (49 left ear & 10 right ear), one was bilateral. 50 patients had mild-to-moderate conductive hearing loss and 10 patients had mixed hearing loss component involvement. Age ranges from 11 to 80 years. Posteroinferior perforations occurred in 35 patients and anteroinferior perforation 08 and 17 central perforations. 50 patients had small size of the perforations and 10 had moderate size perforations.

Aetiology of traumatic TM perforation showed in table no. 2 in order of frequency. The commonest cause was slap injuries (63.3%) maximally reported by husband-wife domestic quarrel followed by conflict between students and common people, perforation by RTA (21.6%), self-cleaning (8.3%), fire crackers (3.3%) sport injuries (1.6%) and instrumentation (1.6%).

Traumatic perforation in 90% cases heal spontaneously and healing time was one and half months to 4 months depending on the size of perforation they were treated conservatively. Two patients of traumatic TM Perforation developed facial nerve palsy after 3<sup>rd</sup> day of RTA. and

recovered with medical management. Perforation of one patient healed with tympanosclerotic patch with mild conductive hearing loss. Six patients had undergone type -1 tympanoplasty.

All patients who suffered from traumatic perforation with self-cleaning (Septic pin, key, match stick) associated with otitis externa.

**DISCUSSION:** In the present study, commonest symptom was the pain in ear in first few hours, then hearing loss, tinnitus and bleeding from ear.

In our study, the most common aetiology for traumatic perforation of tympanic membrane was caused due to slap injuries (Total - 63.6%, Male-36.6% and Female-26.6%). All females were affected by slap injuries. Second most common aetiology was road traffic accident (21.6%). Similar study conducted by Rahman A et al (2012),<sup>2</sup> Sarojamma et al (2014)<sup>6</sup> and Al Juboori A. N. et al (2014)<sup>7</sup> has positive agreement with our study but Dawood M.R. et al(2014)<sup>3</sup> reported that most common aetiology was blast injuries. In our study, trauma to temporal bone (Due to RTA 21.6%) with fracture and leakage of CSF into middle ear causing conductive hearing loss, one patient had CSF. leakage and two patients had facial nerve palsy.

Other rare causes of traumatic tympanic membrane perforation were observed in our study i.e. self-cleaning with solid object (8%), fire crackers (3.3%) instrument injury (1.6%) and sport injury (1.6%).

In our study, left eardrum (87.5%) was found more affected than right eardrum (16.6%). The predilection for the left ear may be due to fact that slap which was given by right-handed persons. Sarojamma et al (2014),<sup>6</sup> reported a similar predilection for the left ear. Study conducted by T.O. Adedeji et al (2014)<sup>10</sup> reported that right ear is more affected and foreign body is most common aetiological factor for tympanic membrane perforation.

In our study, posteroinferior quadrant of the tympanic membrane was found to be affected most commonly, since it is more laterally placed. Total 35 patients were presented with involvement of posteroinferior quadrant and 8 patients were with anteroinferior quadrant, rest of the 17 patients had central perforation. Small size perforation (i.e. triangular or linear tear with ragged margin) was observed in majority of slap injured, self-cleaning with solid object and instruments is the most common with 83.3%. In road traffic accident, fire crackers, and sport injury caused medium size perforation (16.6%). These finding shows positive agreement with the study conducted by Dawood M.R. (2015)<sup>3</sup> in which small size perforation was reported 51.5% followed by medium size of 39.4%, similar finding also reported by Lou Z.C. et al (2011).<sup>8</sup>

Those six patients who undergone tympanoplasty type-1, in which total three patients injured by fire cracker, sport injury, and three patients by self-cleaning with solid object, were secondary infected, may be due to scratching and instillation of some home remedies, oil. This result is almost agreed with result of other studies.<sup>2,3,7,9</sup>

In our study, we found excellent outcome of the spontaneous healing of traumatic tympanic membrane perforation which was associated with size of perforation and aetiology. Conservative and operative (Tympanoplasty Type 1), both processes have 100% success rate. During this study, most of the patients presented in ENT OPD with 2 days of trauma, were treated accordingly then followed up after 7 days and then after every 10 days with conservative treatment advised for 7 days i.e. antibiotic, antihistamine and nasal decongestant, they were advised to keep ear dry by preventing water entering the ear canal. In previous studies, regarding management and its outcome, various types of treatment have been studied and listed, including conservative with spontaneous healing, topical heparin (Zafarullah et al 2012),<sup>11</sup> gelfoam patching and edge approximation plus gelfoam patching (Lou Z. C. et al 2011),<sup>8</sup> natural evolution eardrum bridge & tympanoplasty type -1. Spontaneous healing is not dependent on gender, right and left ear, but cause of trauma shows significant effect. In our study, we found patients who injured by self-cleaning with solid object or by instruments, presented with poor healing, maybe due to infections caused by solid objects or instrument; however, the subjects with the said conditions were less, so couldn't be concluded. But Aljuboori A.N, et al (2014) studied that the rate of healing was reported to be faster in young people because of higher protein turnover in such individuals.<sup>9</sup> In our study, trauma to temporal bone (due to RTA 21.6%) with fracture and leakage of CSF into middle ear causing conductive hearing loss, one patient had CSF leakage and two patients had facial nerve palsy. Temporal bone houses many vital structures, involvement of these structures in temporal bone fractures is possible in road traffic accident including blunt trauma, laceration, avulsion of the part or whole of the pinna with tympanic membrane perforation.<sup>12-17</sup>

**CONCLUSION:** Overall healing in all the patients with traumatic perforations with either conservatively (90%) spontaneous healing or with myringoplasty (10%) groups were 100%. It is very common in day-to-day life and the highest incidence is by slap and Road Traffic Accident, that too in males age group between 20-30 years of age. The most common complaint was hearing loss and in the present study we observed mild conductive loss was seen in majority of the patients and the perforation was mainly seen in posteroinferior quadrant. Even though it is an uncommonly reported injury but still there is a need to spread awareness among the people especially husband-wife, student and security agents on alternative vindictive measure. We also need skilled medical person at primary health care centres to avoid damage due to improper procedure of removal of foreign body from ear.

**REFERENCES**

1. Ologe FE. Traumatic perforation of tympanic membrane in Ilorin, Nigeria. *Nig J Surg* 2002;8(1):9-12.
2. Rehman A, Hamid S, Sangoo M, et al. Pattern of hearing loss from otological trauma due to non-explosive blast injury caused by slap to the ear in Kashmiri population. *Otolaryngology* 2012;2:124.
3. Mohammad Radeef Dawood. Spontaneous healing of tympanic membrane perforation. *Mustansiriyah medical journal* 2015;14(1):24-29.
4. Westphal FL, De Sousa RT, Nadaf de Lima LC, et al. Tympanic membrane perforation caused by traumatic asphyxia. *Braz j otorhinolaryngology* 2013;79(1):122.
5. Nahata V, Patil CY, Patil RK, et al. Tympanic membrane perforations: its correlation with hearing loss and frequency affected – an analytical study. *Indian Journal of Otology* 2014;20(1):10.
6. Sarojamma S, Raj S, Satish HS. Clinical study of traumatic perforation of tympanic membrane. *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)* 2014;13(4):24-28.
7. Al-Juboori AN. Evaluation of spontaneous healing of traumatic tympanic membrane perforation. *General med* 2014;2:129.
8. Lou ZC, Tang YM, Yang J. A prospective study of evaluating the spontaneous healing of traumatic tympanic membrane perforation aetiology size and type –different group of traumatic tympanic membrane perforation. *Clin Otolaryngol* 2011;36(5):450-460.
9. Afolabi OA, Alabi BS, Busari SS, et al. Conductive hearing loss due to trauma. University of Ilorin teaching Hospital, Kwara State, Nigeria 2012;157-170.
10. Adedeji TO, Olaosun AO, Tobih JE, et al. An Audit otologic injuries in a Nigerian tertiary health facility. *East and central African journal of surgery* 2014;19(1).
11. Zafarullah B, Ahmad MM, Aamir Y, et al. Role of topical heparin in healing of traumatic tympanic membrane perforations. *Indian Journal of otology* 2012;18(3):143-147
12. Ijaduola GTA. The principles of management of deafness. *Nig Med Pract* 1986;12:19-25.
13. Bhattia PL, Varughese R. Pattern of otolaryngological diseases in Jos community. *Nig Med J* 1987;17:67-73.
14. Ladapo AA. Danger of foreign bodies in the ear. *Niger Med J* 1979;9(1):120–122.
15. Ijaduola GT, Okeowa PA. Foreign body in the ear and its importance: the Nigerian experience. *J Trop Pediatr* 1986;32(1):4-6.
16. Afolabi OA, Aremu SK, Alabi BS, et al. Traumatic tympanic membrane perforation: an aetiological profile. *BMC Research Notes* 2009;2:232.
17. Lou Z. Natural evaluation of an ear drum bridge in patients with a traumatic eardrum perforation. *European archives of oto-rhino-laryngology and head and neck* 2014;271(5):993-996.