

Causes and Characteristics of Traumatic Tympanic Membrane Perforation in a Tertiary Care Hospital

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ABSTRACT

Background: Due to human violence, perforation of the tympanic membrane is a frequent occurrence all over the world. The abrupt increase in air pressure in the external auditory canal is the pathophysiology of traumatic tympanic membrane perforation.

Objective: To assess the causes and characteristics of traumatic Tympanic Membrane perforation in a tertiary care hospital

Methodology: The current study was cross sectional study, conducted at the ENT Department of Sahara Medical College Narowal from January 2022 to July 2022. All the patients were examined by a sing ENT specialist and data was recorded on a pre-designed performa. All the analysis of data was done by IBM SPSS version 23.

Results: In the current study, totally 80 patients were enrolled. There were 50 (62.5%) male patients while female patients were 30 (37.5%). The mean age in our study was 28 (4.29) years. The most common type of tympanic membrane perforation was slap in 56 (70%) patients followed by blast injury in 8 (10%) patients. On left side of ear, perforation of the Tympanic membrane was observed in 39 (48.75%) patients. Based on number of perforation, single perforation was observed in 72 (90%) patients while multiple perforations were observed in 8 (10%) patients. Conductive hearing loss was observed in 62 (77.5%) patients and Mild Hearing Loss was observed in 44 (55%) patients.

Conclusion: Young males, particularly those between the ages of 18 and 30, often have traumatic tympanic membrane perforation. The most frequent cause of traumatic perforation was slap, which affects the left ear more frequently than the right ear. The most common type of hearing loss was conductive, and mild.

Keywords: Causes; characteristics; Tympanic Membrane perforation

INTRODUCTION

The human tympanic membrane (TM), which divides the middle ear from the external ear, is a thin, pearly-white membrane that is semi-translucent. It forms a significant portion of the middle ear cavity's lateral wall and is positioned obliquely near the medial end of the external auditory meatus. The vertical and horizontal diameters are, respectively, 10 mm and 5 mm. It has three layers: an exterior epithelial layer, a middle fibrous layer made up of radial and circular fibers, and an interior mucosal layer ¹. Because to its vibratory feature, the major function of the TM is to amplify and transmit sound waves from the external auditory canal via the ossicular chain to the oval window and vestibular ramp. Also, it shields the middle ear cleft ². A pathological disorder that dates back to the evolution of humans is tympanic membrane perforation ³. The literature reports a 6.80 per 1000 person incidence rate for traumatic TM perforation ⁴. Acute (less than 3 months) and chronic (more than 3 months) traumatic TM perforations are categorized according to their duration, and wet and dry perforations are categorized according to whether or not otorrhea is present ⁵. Moreover, the size of the perforation may be used to classify it. For calculating the size, the two commonly used methods are:

1 "Percentage of perforation=Perforation/ Total area of TM x 100 % (In this method perforation is measures in pixels). Thus perforation can be classified into Group-I (Small)- area in range of 0-8 mm², Group-II (Medium)- area in range of 8.1 -30 mm², Group-III (large) – area in range ≥30.1 mm² ⁶.

2 In this method perforation size can be calculated using equation; Percentage of perforation= Area of perforation/ Total area of perforation x100. Thus perforation can be categorized as Small (area involved is ≤25% or one quadrant), Medium (area involved is 25%- 50% or two quadrants), and Large (area involved is 50%- 75% or more than two quadrants) ^{2"}.

Traumatic TM perforation may be caused by abrupt increases in ear pressure from slapping, blasting, forceful syringing, caloric testing, improper ear cleaning method, probing, accidents, flying in a non-pressurized aircraft, or quick fluid compression when diving ¹. Because to increased interpersonal

aggression, increased industry, and misuse of weapons, the frequency of traumatic TM perforation is rising internationally. Traumatic TM perforation may cause facial nerve damage, hemorrhage, hearing loss, tinnitus, dizziness, and abrupt, acute pain ⁷. When traumatic TM perforation is not managed in a timely manner, it may lead to sensorineural hearing loss and suppurative otitis media. Traumatic TM perforation may be treated surgically and non-surgically. Its spontaneous healing rate is 78.6%, although in other studies it surpasses 90% ^{2, 4}. If the condition is additionally accompanied by a considerable conductive hearing loss, myringoplasty or tympanoplasty may be performed if natural healing fails after six months ². Traumatic TM perforation is a clinical issue that otorhinolaryngologists see often. As our department receives a sizable number of patients, this research aims to estimate the disease's burden since no such study has been done in our setting and to understand the specifics of this ailment in order to develop any preventative strategies."

MATERIALS AND METHODS

The current study was cross sectional study, conducted at the ENT Department of Sahara Medical College Narowal. The duration of study was six months from January 2022 to July 2022. The study was approved properly from the ethical review board of the hospital. The sample size was 80 patients on the basis of WHO sample size calculator. The inclusion criteria were patients of both the gender and all ages with traumatic tympanic membrane perforation and patients willing to participate in our study. The exclusion criteria were patients with Non-traumatic tympanic membrane perforation, patients with traumatic perforation with severe head injuries, patients with poly trauma and patients not willing to take part in our study. Informed consent was taken in written from all the patients of our study. All the patients were examined by a sing ENT specialist and data was recorded on a pre-designed performa. A senior audiometrician performed pure Tone Audiometry (PTA) for all enrolled patients. All the analysis of data was done by IBM SPSS version 23. Frequency and percentages were calculated for variables like gender, causes of

perforation and side of ear involved while variables like age were computed in the form of mean and standard deviation.

RESULTS

In the current study, totally 80 patients were enrolled. There were 50 (62.5%) male patients while female patients were 30 (37.5%). (Figure 1) The mean age in our study was 28 (4.29) years with minimum age of 8 months and maximum of 60 years. Based on age distribution, 16 (20%) patients were in age group less than 18 years, 44 (55%) patients were 18-30 years old, 16(20%) patients were 31-40 years of age, 3 (3.75%) patients were in age group 41-50 years while only one patient (1.25%) was above 51 years of age. (Figure 2) The most common type of tympanic membrane perforation was slap in 56 (70%) patients followed by blast injury in 8 (10%) patients, stick in 7 (8.75%) patients, suction in 7 (8.75%) patients and road accident in 2 (2.5%) patients. On left side of ear, perforation of the Tympanic membrane was observed in 39 (48.75%) patients followed by right year perforation in 32 (40%) patients while bilateral perforation was observed in only 9 (11.25%) patients. Based on number of perforation, single perforation was observed in 72 (90%) patients while multiple perforations were observed in 8 (10%) patients. Based on pure tone audiometry finding, conductive hearing loss was observed in 62 (77.5%) patients, Sensorineural Hearing Loss in 16 (20%) patients while mixed Hearing Loss was observed in 2 (2.5%) patients. Based on Grades of hearing Impairment, Mild Hearing Loss was observed in 44 (55%) patients, Moderate Hearing Loss in 24 (30%) patients while severe Hearing Loss was observed in 12 (15%) patients. (Table 1)

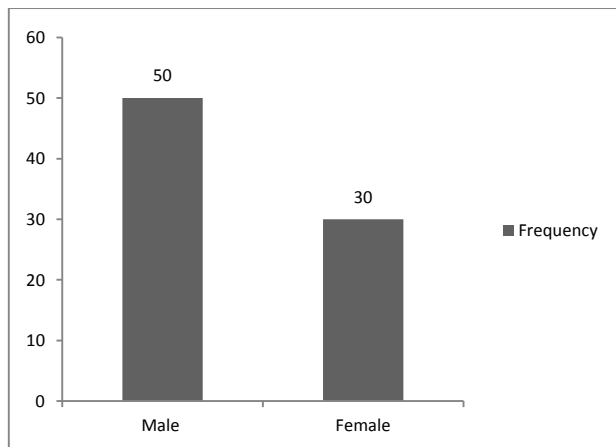


Figure 1: Gender wise distribution of patients

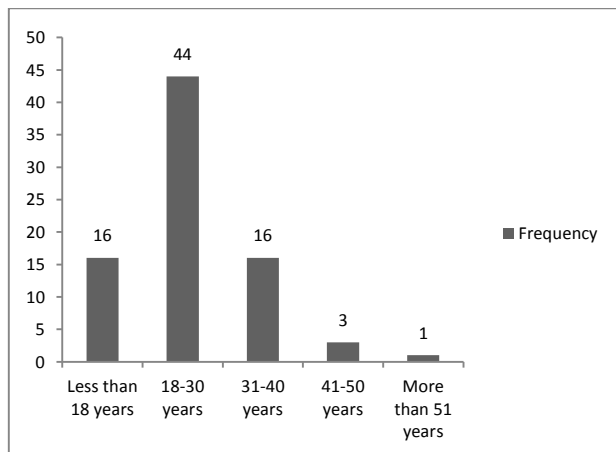


Figure 2: Age wise distribution of patients

Table 1: Causes and characteristics of traumatic Tympanic Membrane perforation

Parameter	Sub category	Frequency (%)
Causes of TMP	Slap	56 (70%)
	Blast	8 (10%)
	Stick	7 (8.75%)
	Suction	7 (8.75%)
	Road accident	2 (2.5%)
Side of ear	Left side	39 (48.75%)
	Right side	32 (40%)
	Bilateral	9 (11.25%)
Number of perforations	Single	72 (90%)
	Multiple	8 (10%)
Pure tone audiometry finding	conductive hearing loss	62 (77.5%)
	Sensorineural Hearing Loss	16 (20%)
	mixed Hearing Loss	2 (2.5%)
Grades of hearing Impairment	Mild	44 (55%)
	Moderate	24 (30%)
	Severe	12 (15%)

DISCUSSION

"Due to human violence, perforation of the tympanic membrane (TM) is a frequent occurrence all over the world. The abrupt increase in air pressure in the external auditory canal is the pathophysiology of traumatic TM perforation. This lead to rupture of the thinnest region of the membrane, the degree of which varies with the rate of change in pressure. In the current study, totally 80 patients were enrolled. There were 50 (62.5%) male patients while female patients were 30 (37.5%). Another study done by Fazal I. Wahid and Sajid Rashid Nagra also reported male predominance (100). Other studies also reported male predominance ^{1, 2}. The mean age in our study was 28 (4.29) years with minimum age of 8 months and maximum of 60 years. Based on age distribution, 16 (20%) patients were in age group less than 18 years, 44 (55%) patients were 18-30 years old, 16(20%) patients were 31-40 years of age, 3 (3.75%) patients were in age group 41-50 years while only one patient (1.25%) was above 51 years of age. In accordance with our study another study reported similar results. They reported majority of their patients in age range of 20-30 years ⁸. Other studies were carried out by Onotai et al. and Chukuezi et al. from Nigeria reported that majority of the patients were in age range of 20-30 years ^{3, 9}. This might be due to more activities of this age group individual and are more prone to violence.

The most common type of tympanic membrane perforation was slap in 56 (70%) patients followed by blast injury in 8 (10%) patients, stick in 7 (8.75%) patients, suction in 7 (8.75%) patients and road accident in 2 (2.5%) patients. These findings were consistent with the findings of another study done by Rabbani SMG et al. who reported that slapping for is responsible for the majority of cases of perforation of tympanic membrane ¹. Another study done by Fazal I. Wahid and Sajid Rashid Nagra also reported slap as cause of perforation of tympanic membrane in majority of their cases ⁸. In contrary to our results, another study from Iraq reported that blast was the main cause of perforation of tympanic membrane ². On left side of ear, perforation of the Tympanic membrane was observed in 39 (48.75%) patients followed by right year perforation in 32 (40%) patients while bilateral perforation was observed in only 9 (11.25%) patients. In accordance with our findings, other studies also reported left ear in majority of their cases ^{8, 10, 11}. The most likely reason for the involvement of the left side is that right-handed people often slap victims who are facing them over the left ear. Based on number of perforation, single perforation was observed in 72 (90%) patients while multiple perforations were observed in 8 (10%) patients. Based on pure tone audiometry finding, conductive hearing loss was observed in 62 (77.5%) patients, Sensorineural Hearing Loss in 16 (20%) patients while mixed Hearing Loss was observed in 2 (2.5%) patients. Based on Grades of hearing Impairment, Mild Hearing Loss was observed in 44 (55%) patients, Moderate

Hearing Loss in 24 (30%) patients while severe Hearing Loss was observed in 12 (15%) patients. A study done by Wani et al. reported single tympanic membrane perforation in majority (92.3%) of their enrolled patients. They also reported that 62% of their patients with conductive hearing loss and mild degree hearing loss was observed in 24.50% of their patients. These findings are in line with the findings of our study ⁴."

CONCLUSION

Young males, particularly those between the ages of 18 and 30, often have traumatic tympanic membrane perforation. The most frequent cause of traumatic perforation was slap, which affects the left ear more frequently than the right ear. The most common type of hearing loss was conductive, and mild.

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