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Original Article

Clinical Outcome and Etiologies of Traumatic Tympanic Membrane Perforation

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ABSTRACT

Background: Trauma remains a regular occurrence relating to activities and lifestyle of humans and it can affect any part of the body. The ear is located within the cranio-facial skeleton which is exposed to environmental trauma that can occur as blunt injuries like contusion, concussion, decompression, and penetrating injuries as fractures. **Objective:** To assess the clinical outcome and etiologies of traumatic tympanic membrane perforation. **Methods:** This prospective cohort study was conducted at Department of ENT, TMSS Medical College &Rafatullah Community Hospital, Bogura, Bangladesh from June to December 2022. Total 50 patients included who presented to outpatient department of TMSS. Patients willing to be included in study and patients of all age group and gender with traumatic TM perforation were included in the study. Those patients with non-traumatic TM perforation as well as the traumatic perforation of TM with severe head injury, unconscious patients or patients with polytrauma were excluded from the study. **Results:** Total Fifty (50) patients who presented to the outpatient department of ENT and casualty of private chamber included in the study. Out of which, 13 patients were males (26.0%) and 37 were females (74.0%). Most of the patients fell under 20-30 age group (n=23 [46.0%]). Mean age group was 33.1 years and 74.0% were males. Ear pain was the commonest symptom with accidental trauma being the most common cause. 70% of them had left TM perforation and poster inferior quadrant was mostly involved. **Conclusions:** Traumatic TM perforation is commonly seen in young adults following accidental trauma and assault. Earache, sudden hearing loss and tinnitus are the common symptoms. Most of the cases heal spontaneously with conservative management.

Key Words: *TM, Trauma, Perforation, PTA.*

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INTRODUCTION

Trauma remains a regular occurrence relating to activities and lifestyle of humans and it can affect any part of the body. The ear is located within the cranio-facial skeleton which is exposed to environmental trauma that can occur as blunt injuries like contusion, concussion, decompression, and penetrating injuries as fractures [1]. Major injuries affecting the ears can lead to disturbances in hearing and difficulties in maintenance of balance especially when the inner ear is affected [2]. It can also result from attempts of self-cleaning of the ear, scratching the ear with sharp objects and due to various iatrogenic causes. Traumatic perforation of the tympanic membrane is a common injury that is under reported, hence there is a need to educate on unskilled removal of foreign body, early identification, evaluation and referral of patients so as to reduce the morbidity. It is sometime associated with injuries of the ossicular chain and inner ear. It is a source of great concern for otorhinolaryngologist to restore completely the functional integrity of tympanic membrane and associated structures [3]. More of ear traumas however affect either the bony skeleton or soft tissue structures within the external and middle ear. Ear injuries may lead to lacerations in the external ear, and disruption of the ossicular chain in the middle ear cavity. TM could be ruptured by trauma due to hair pin, matchstick or unskilled attempts to remove a foreign body, sudden change in air pressure e.g., a slap on the ear or a sudden blast, pressure by a fluid column, e.g., diving or forceful syringing, fracture of temporal bone etc [4]. The common manifestations of traumatic TM perforation are sudden severe pain, bleeding, hearing impairment, tinnitus and dizziness [5]. This symptomatology depends upon the site and severity of perforation. Treatment of TTMP range from inactive watchful waiting, active intervention to surgical intervention [6]. The tympanic membrane (TM) 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 TM injury can predispose to middle ear infection which has grave consequences including facial nerve paralysis, formation of cholesteatoma, perilymph fistula, intracranial infections and may require ear and intracranial exploration [7]. Significant morbidity or mortality can occur when traumatic ear injuries are associated with damage to contiguous facial structures and the brain. Effective management is expedient while prevention and reduction of complications must be given utmost attention to achieve a good outcome.

MATERIALS &METHODS

This prospective cohort study was conducted at This prospective cohort study was conducted at Department of ENT, TMSS Medical College &Rafatullah Community Hospital, Bogura, Bangladesh from June to December 2022. Total 50 patients included who presented to outpatient department of TMSS&Rafatullah Community Hospital, Bogura, Bangladesh. Patients willing to be included in study and patients of all age group and gender with traumatic TM perforation were included in the study. Those patients with non- traumatic TM perforation as well as the traumatic perforation of TM with severe head injury, unconscious patients or patients with polytrauma were excluded from the study. The patients fulfilling the inclusion and exclusion criteria were selected using simple random sampling. The procedure protocol of the intended study was explained to the patients and informed written consent was taken from them. Demographic data was recorded. A detailed history was taken to find out the symptomatology, the cause of perforation, the time of presentation etc. Thorough examination of ear, nose and throat and otoscopic examination of ears were performed. The characteristics of the perforation like size and site of perforation was noted. Less than 25% of TM involvement was considered as small size perforation, 25-50% involvement was considered as medium sized perforation and 50-75% was considered as large sized perforation. PTA of the included patients was carried out at the time of presentation, at 3 months and at the end of 4 months. If the patient had pain at the time of presentation, the first PTA assessment was delayed for 7 days. Outcome of injury in terms of healing of the perforation and associated complications was also assessed. The patients were followed up for a period of 4 months. The data was analysed statistically employing frequency and percentage using SPSS software version 21.

RESULTS

Total fifty (50) patients included in the study. Out of which, 13 patients were males (26.0%) and 37 were females (74.0%) (Fig-1). Most of the patients fell under 20-30 age group 23 (46.0%) (Table-1).

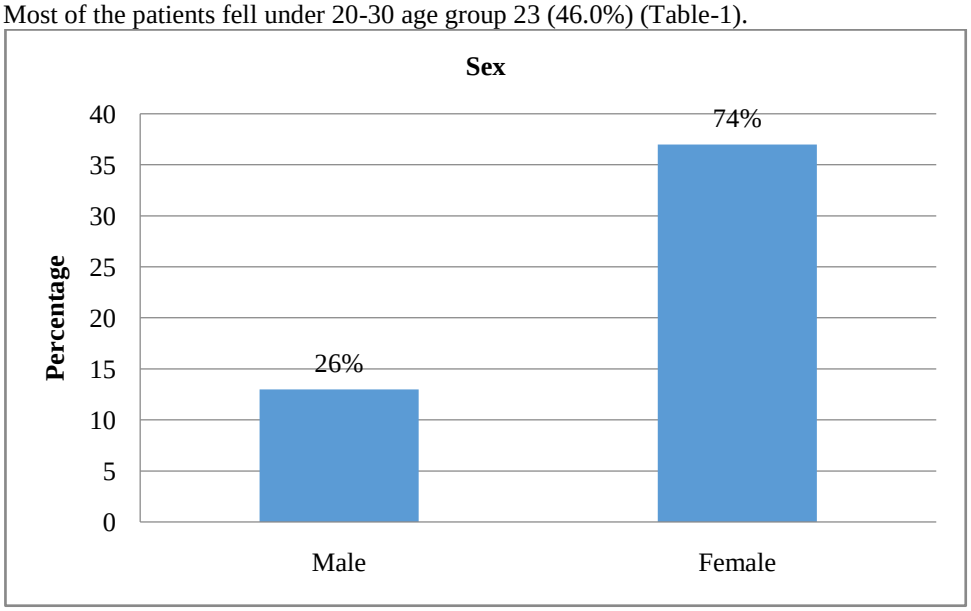

Fig-1: Gender distribution of patient.

Table-1: Age distribution of patient (N=50)

Age group	n	%
10-20	2	4.0%
20-30	23	46.0%
30-40	12	24.0%
40-50	10	20.0%
50-60	3	6.0%
Total	50	100.0%

Table-2: Clinical symptoms of patients (N=50)

Clinical symptoms	n	%
Ear pain	28	56.0%
Bleeding from ear	2	4.0%
Tinnitus	13	26.0%
Decreased Hearing	20	40.0%
Aural Fullness	3	6.0%

Majority of the patients presented with complaints of ear pain 28(56.0%) followed by decreased hearing 20(40%). Thirteen patients presented with tinnitus (26.0%), three patients with aural fullness (6.0%) and Two patient presented with bleeding from ear (4.0%) (Table-2).

Table-3: Time of presentation of the patients (N=50)

Time	n	%
<6hrs	25	50.0%
6hrs-1day	5	10.0%
>1day	20	40.0%

Table-3 shows that the most of the patients presented with the complaints within 6 hours 25(50%). Around 20 patients (40%) presented after 1 day and rest of the patients presented between 6 hours to 1 day.

Table-4: Cause of perforation (N=50)

Cause of perforation	n	%
Assault	20	40.0%
Accidental self-inflicted injury	3	6.0%
Accidental trauma	23	46.0%
Iatrogenic	2	4.0%
RTA	2	4.0%

Overall, the common causes of perforation were accidental trauma 23(46.0%) followed by assault 20(40.0%). Accidental hit against wall, hit by cow, sudden exposure to loud noise etc. were included among the causes in accidental trauma. Only 2 patients presented with traumatic tympanic perforation due to RTA. One patient had presented with foreign body in ear (tick) which on examination was seen lying on the TM. The attempted removal caused perforation of the TM and this was included as the iatrogenic cause (Table-4).

Table-5: Ear involved (N=50)

Ear involved	n	%
Right	15	30.0%
Left	35	70.0%

Out of the 50 patients included in the study, 35 patients (70%) had left ear involvement and the rest 15 patients (30%) were affected on the right ear (Table-5).

Table-6: Size of perforation (N=50)

Size	n	%
Small	45	90.0%
Medium	5	10.0%

Table-6 shows, majority of the patients 42 (84.0%) had only one perforation in the TM, whereas, 8 patients (16.0%) had two perforations in the TM on the same side. 45 patients (90%) had small sized perforation and only 5 patients (10%) had medium sized perforation.

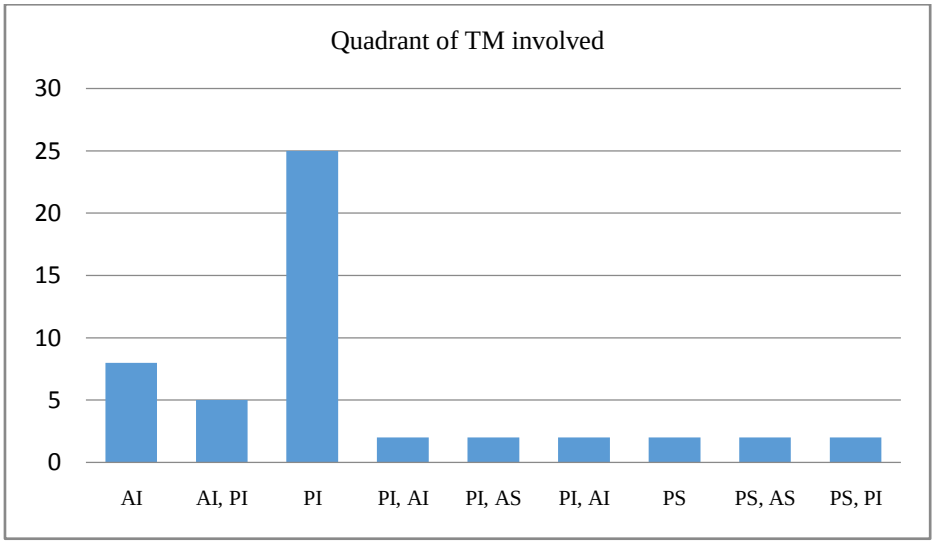

Figure-2: Quadrant of TM involved.

AI-anteroinferior, PI-posteroinferior, AS-anterosuperior, PS-posterosuperior.

Posteroinferior quadrant was the commonest quadrant involved 25(50%) followed by anteroinferior quadrant in 8 patients (16.0%) and involvement of both anteroinferior and posteroinferior quadrant was seen in 5 patients (10%) (Fig-2).

Table-7: PTA findings at presentation, after 3 months and 4 months.

PTA				
	At presentation	**After 3 months**	**After 4 months**	
	n	**%**	**n**	**%**
Minimal	25	50.0%	50	100.0%
Normal	25	50.0%	50	100.0%

Table-7 shows that, PTA performed at the time of presentation revealed minimal hearing loss (15-25 dB) in 15 patients (50%) and normal values in rest of the 15 patients (50%). The repeat PTA performed at 3rd and 4th month of presentation revealed normal values in all the patients. All the patients were managed conservatively and none of them developed complications and the traumatic perforation healed within 3 months in all patients.

DISCUSSION

Traumatic injuries are often sporadic in occurrence and are mostly unplanned events thus patients who sustain such injuries consult the nearest available doctor for initial evaluation. About three quarter (74.0%) of the patients in this study had been evaluated initially by non-specialist Otolaryngologist. This may also connote scarcity of needed specialists in our locality. Nevertheless, most patients still presented and were reviewed by Otolaryngologists within 72 hours of the injuries. These relatively-early presentations might not be unconnected with the disturbing symptoms which evoked some anxiety in the patients. This finding could be a result of more outdoor activities in males when compared to females. In this study, the commonest age group affected was 20-30 years. Other studies have reported age ranges of 29.2. to 33.6 years [7,8]. In this study, the common presenting symptoms of the patients were ear pain (56.0%), decreased hearing (40%) and tinnitus (26.0%). In a study conducted by Sogebi et al, hearing loss was the commonest symptom with which the patients presented accounting to 64.2 %, followed by tinnitus in 50.9 % and earache in 41.5% [5]. 50% of the patients included in this study presented within 6 hours and about 40% of the patients reported after 1 day. Other studies have reported a mean duration of presentation as 3 days. In this study, accidental trauma was the commonest cause of traumatic TM perforation, followed by assault. Lou et al and Sarojamma et al in their studies have reported assault to be the commonest cause of TM perforation [8,9]. This difference that was noticed may be because of the reluctance that the common people show to reveal the truth. Left ear was the commonest ear to be involved, and so was the result as observed by many of the earlier studies. As opined by Sarojamma et al in their study, 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 [9]. In our study, majority of the patients had single perforation in the TM on examination and about 5 patients had two perforations in the TM and most of it were of small sized perforation. This might be the reason for normal PTA results in 50% of the patients, at the time of presentation. As per the results of our study, poster inferior quadrant (50%) was the commonest to be involved, followed by anteroinferior quadrant (16.0%). As the TM lie obliquely in the medial end of external auditory canal, with the angle of 55°, the posterior part is more lateral than its anterior part. As most of the cases of traumatic TM perforation heals spontaneously within two months, otolaryngologists have however been advised to be reluctant in offering surgical intervention in cases of TTMP without significant symptoms [10]. All the study participants in our study were managed conservatively and their perforations healed within an average duration of 3 months, without development of complications. Active interventions for treating traumatic TM perforation include topical application of substances like epidermal growth factor, enoxaparin, and ascorbic acid to stimulate epithelization for quick closure and to prevent formation of sclerotic plaques in the perforated membrane [11-13]. As per the observations of other studies, factors associated with poor healing were postero-superiorly-located perforations, large sized perforations and penetrating injuries to the TM. If not taken care, the TM injury can predispose to middle ear infection which has grave consequences including facial nerve paralysis, formation of cholesteatoma, perilymph fistula, intracranial infections and may require ear and intracranial exploration [14]. When traumatic ear injuries are associated with damage to contiguous facial structures and the brain, significant morbidity or mortality can occur. Effective management and prevention and reduction of complications must be given utmost attention to achieve a good outcome. We had few patients with sero-sanguinous ear discharge and fewer ones with purulent discharge who had ear swab cultured for micro-organisms, but we could not do proper comparative analysis. A limitation to the study was the fact that many patients defaulted, and some were not followed-up for sundry reasons which drastically reduced the sample size. This study thus concludes that TTMP was common in young adult males, caused often by assaults, presented with ear blockage/hearing loss and tinnitus, perforations were located in antero-inferior quadrant of the TM most of which healed well.

CONCLUSION

Traumatic TM perforation can affect any age group, commonly seen in young adults following accidental trauma and assault. Traumatic perforation was found to be more common among females in the age group of 21-30 years. The most common presenting complaint was hearing loss. Most common cause for the perforation was due to slap injury. Male preponderance and left ear involvement are commonly observed. Most of the patients present immediately after injury. Majority of the cases heal spontaneously without developing complications. The commonest quadrant of TM involved is poster inferior followed by anteroinferior. PTA performed at time of presentation did not reveal any significant hearing loss. Early identification and evaluation are necessary to reduce the attendant morbidity.

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