Original Article

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Website: www.ijciis.org
DOI: 10.4103/IJCIIS.IJCIIS_108_16
Quick Response Code:

Otorhinolaryngological manifestations in head trauma: A prospective study of the epidemiology, clinical presentations, management, and outcomes

Adeyi A. Adoga, Kenneth N. Ozoilo[1], Andrew A. Iduh[2], Joyce G. Mugu[2]

Departments of Otorhinolaryngology, Head and Neck Surgery and [1]Surgery, Faculty of Medical Sciences, University of Jos, [2]Department of Otorhinolaryngology, Head and Neck Surgery, Jos University Teaching Hospital, Jos, Plateau State, Nigeria

Address for correspondence:
Dr. Adeyi A. Adoga,
Department of Otorhinolaryngology, Head and Neck Surgery, Faculty of Medical Sciences, University of Jos, PMB 2084, Jos, Plateau State, Nigeria.
E-mail: adeyiadoga@gmail.com

ABSTRACT

Background: Otorhinolaryngological injuries following head trauma may be missed, overlooked, or forgotten in the acute phase resulting in worsened management outcomes. This study aims to report the epidemiology, clinical presentations, management, and outcomes of otorhinolaryngological injuries in head trauma with a view to creating awareness for early recognition and prompt treatment.

Patients and Methods: Head injured patients consecutively presenting over a 5-year period were prospectively studied for age, gender, otorhinolaryngological presentations, interventions, and outcome of interventions. Data obtained were statistically analyzed.

Results: There were 91 (1.3%) otorhinolaryngological presentations among 7109 head injured patients. Mean age of 34 years, standard deviation = ±15.6 with a male:female ratio of 2.4:1. Severe head injury (Glasgow coma scale <9) occurred in 46 (50.5%) patients. Patients aged 30–39 years were mostly affected (n = 30; 32.9%). Most injuries were from motor vehicular accidents (n = 61; 67%) and assaults (n = 23; 25.3%). The most common otorhinolaryngological presentations were cerebrospinal fluid (CSF) rhinorrhea (n = 26; 28.6%) and CSF otorrhea (n = 25; 27.5%). Conservative management was achieved in 59.3% of patients. Mean time of hospital presentation was 13.8 h. There was no statistical correlation between outcomes and each of etiology and time of presentation (P values 0.18 and 0.9, respectively). Seventy-five (82.4%) were discharged without neurological deficits. A case fatality rate of 6.6% was recorded.

Conclusion: Frontal skull base and temporal bone fractures with CSF rhinorrhea and otorrhea are the most common injuries occurring mostly in young active males with favorable outcomes following conservative management.

Key Words: Head trauma, Jos-Nigeria, otorhinolaryngological injuries

INTRODUCTION

Injuries and violence are some of the leading causes of death and disability worldwide,[1] especially in developing countries such as Nigeria where industrialization and urbanization have resulted in an increase in the number of high-velocity motor vehicles and the spate of terrorist attacks with ethnoreligious clashes have become common in recent times.[2] This has caused trauma surgeons to

Cite this article as: Adoga AA, Ozoilo KN, Iduh AA, Mugu JG. Otorhinolaryngological manifestations in head trauma: A prospective study of the epidemiology, clinical presentations, management, and outcomes. Int J Crit Illn Inj Sci 2017;7:231-5.

witness unexpected mass casualties, especially head injuries in the accident and emergency (A and E) department of secondary and tertiary health centers.[3]

A substantial number of these injuries involve otorhinolaryngological structures and in the acute phase, they may be missed or overlooked and forgotten.[4] Chief among these are fractures of the temporal bones (TBs) occurring in 30%–70% of cases,[5] which can be classed as transverse or longitudinal based on the relationship of the fracture line to the axis of the petrous ridge. Longitudinal fractures account for 70%–90% of these cases while transverse fractures occur in 10%–30%.[6] These fractures are usually associated with cerebrospinal fluid (CSF) otorrhea.

The facial nerve may also be involved by being trapped in the fracture line or severed and is usually associated with sensorineural deafness in 20%–30% of patients.[7] Head and neck trauma may occur without fractures giving rise to peripheral and central lesions, which cause a traumatic cochlear hearing loss.[8]

Fractures involving the midfacial skeleton may occur with epistaxis and patients at risk of brain injury with or without fractures involving the calvarium.

Hemorrhage in the ear canal or behind the tympanic membrane may indicate occult brain injuries, which may be difficult to predict initially.

Anosmia is a common feature as a result of severance of the olfactory nerves at the cribriform plate of the ethmoid bone[9] which can be accompanied by CSF rhinorrhea with the risk of developing meningitis.[10]

Dysphagia may be a feature increasing the risk of aspiration and inadequate nutrition.[11]

To our knowledge, there has been no study from Nigeria, on the otorhinolaryngological manifestations in head injured patients; hence, this study aimed at reporting the epidemiological characteristics, clinical presentations, management, and outcomes of these associated injuries with a view to creating awareness for early recognition and prompt treatment to achieve better management outcomes for patients.

PATIENTS AND METHODS

We prospectively studied head injured patients who were consecutively managed at the Jos University Teaching Hospital from February 2011 to January 2016.

Methods

Consecutive patients with head injury presenting to the A and E department were studied for age, gender and otorhinolaryngological presentations, interventions, and outcome of interventions. The etiologies of the injuries sustained were grouped into motor vehicular accidents (MVA), assault, fall and others that included domestic or occupational accidents and sport injuries.

Patients were resuscitated by the application of the advanced trauma life support protocol.

Grading of head injury was done with the Glasgow coma scale and head injury outcome was graded using the Glasgow outcome score.

Radiological and laboratory investigations were carried out as necessary following resuscitation. Further treatment such as blood transfusions, tracheostomy, craniotomies, laparotomy, fracture reductions, fixations, and immobilization were effected where necessary.

The management of these patients was multidisciplinary involving the attending trauma surgeons, otolaryngologists, neurosurgeons, and cardiothoracic surgeons.

A pro forma was designed and all the data entered as required.

All patients were followed up in our outpatient facility following discharge from hospital, especially those with various neurological deficits who are undergoing physiotherapy.

Patients with medical emergencies and other surgical emergencies were excluded from the study.

Patients with head injuries but brought in dead were also excluded from this study.

Ethical consideration

Approval for this study was obtained from the Ethical Clearance Committee of the teaching hospital.

Statistical analysis

Data collected were entered into the Statistical Package for the Social Services (SPSS) software version 20 (SPSS Inc., Chicago, IL, USA).

Descriptive analysis of mean and standard deviations (SDs) was used to summarize the collected data.

All tests of statistical significance were two-tailed and a $P < 0.05$ was considered statistically significant.

The results obtained are presented in tables and charts.

RESULTS

A total of 21,338 injured patients were managed in the study period, of which 7109 (33.3%) were head

injured patients. Ninety-one (1.3%) of these had various otorhinolaryngological presentations with an age range of 3–75 years (mean = 34 years; SD = ±15.6) comprising 64 (70.3%) males and 27 (29.7%) females giving a male to female ratio of 2.4:1.

Mild head injury occurred in 28 (30.8%) patients, moderate injury in 17 (18.7%), and severe head injury in 46 (50.5%) of patients.

Patients aged 30–39 years were in the majority (n = 30; 32.9%) followed closely by those in the 20–29 years age bracket (n = 22; 24.2%) [Table 1]. Injuries sustained from MVA were the highest (n = 61; 67%). Others were assault (n = 23; 25.3%) of which 2, 16, and 5 were from gunshots, machete, and bomb-blast injuries, respectively [Figure 1]. There were 73 (80.2%) polytraumatized patients and 18 (19.8%) patients with isolated injuries.

The most common otorhinolaryngological presentations were CSF rhinorrhea in 26 (28.6%) patients and TB fractures with CSF otorrhea in 25 (27.5%) patients. In 12 (48%) of these patients who had computerized tomography (CT) scan of the TB, fracture was longitudinal.

Other injuries recorded were fractures involving the facial skeleton [Table 2].

The interval between injury and time of presentation to the hospital was 1 h to 3 weeks (mean = 13.8 h; SD = ±16.1)

Fifty-four (59.3%) patients were managed conservatively – CSF leaks (n = 51) and nasal bone fractures (n = 3). Others had various forms of surgical interventions which included open reduction and internal fixation of facial bone fractures (n = 37), suture of facial lacerations (n = 5), repair of cut throat injuries (n = 2), tracheostomy (n = 11).

The recorded outcome of management is shown in Figure 2.

Table 1: Age and gender characteristics of patients

Age range (years)	Gender		Total (%)
	Male	Female	
0-9	1	4	5 (5.5)
10-19	4	5	9 (9.9)
20-29	15	7	22 (24.2)
30-39	23	7	30 (32.9)
40-49	7	2	9 (9.9)
50-59	7	1	8 (8.8)
60-69	6	0	6 (6.6)
70-79	1	1	2 (2.2)
Total	64	27	91 (100)
Mean age	33.92		
Median	34		
SD	15.647		
Minimum	3		
Maximum	75		

SD: Standard deviation

Table 2: Otorhinolaryngological presentations

ORL manifestation	Frequency (%)	Valid percent
CSF rhinorrhea	26 (28.6)	28.6
Depressed frontal bone fracture	2 (2.2)	2.2
Depressed frontal fracture, cut throat	1 (1.1)	1.1
Face laceration	3 (3.3)	3.3
Face laceration, frontal fracture	1 (1.1)	1.1
Face laceration, mandibular fracture	1 (1.1)	1.1
Frontal bone fracture, nasal fracture	1 (1.1)	1.1
Mandibular fracture	8 (8.8)	8.8
Mandibular fracture, nasal fracture	1 (1.1)	1.1
Maxilla fracture	4 (4.4)	4.4
Maxilla fracture, TB fracture	1 (1.1)	1.1
Midface laceration	1 (1.1)	1.1
Midface fracture	10 (11.0)	11.0
Midface fracture, TB fracture	2 (2.2)	2.2
Nasal fracture	6 (6.6)	6.6
Nasal fracture, cut throat	1 (1.1)	1.1
TB fracture	18 (19.8)	19.8
TB fracture, midface fracture	1 (1.1)	1.1
TB fracture, nasal fracture	2 (2.2)	2.2
TB fracture, zygomatic fracture	1 (1.1)	1.1
Total	91 (100.0)	100.0

TB: Temporal bone, CSF: Cerebrospinal fluid, ORL: Otorhinolaryngology

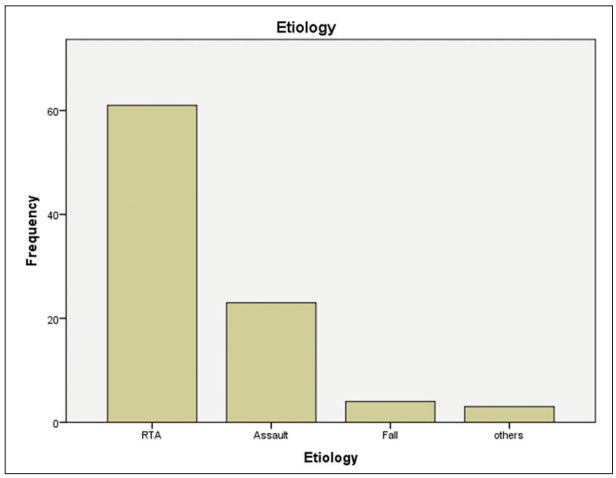

Figure 1: Etiology of injuries

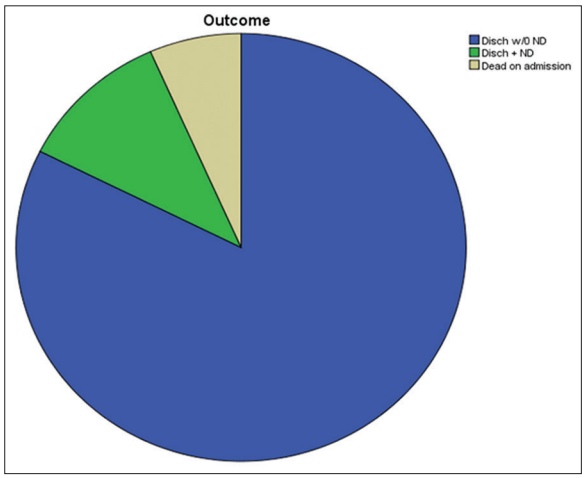

Figure 2: Outcome of interventions. ND: Neurological deficit

Six (6.6%) patients died while on admission – 1 from severe head injury and 5 from multiple injuries sustained.

Bivariate correlation analysis revealed no statistically significant correlations between etiology and intervention outcomes ($P = 0.18$) and time of hospital presentation and intervention outcomes ($P = 0.9$).

DISCUSSION

This study further establishes the fact that MVA accounts for higher incidences of head trauma as recorded in other studies done locally and internationally[12,13] and was responsible for the highest number of otorhinolaryngological manifestations in the patients we studied.

Males in their active productive and reproductive ages have continued to suffer the brunt of these injuries as noted in our study. These are individuals responsible for the socioeconomic development of any society. This, therefore, portends great danger to societal development. This trend is a result of several factors which include but are not limited to an influx in high-velocity vehicles in Nigeria, lack of adherence to traffic rules and regulations acts which go largely unpunished by road safety enforcement agents, deplorable road conditions, and outright recklessness on the part of road users.[2]

Other etiological factors recorded in our study are assaults from gunshots, machetes, and bomb blasts in times of terror attacks. These have been documented previously in a study conducted from our center in which the recent trend of increasing ethnoreligious crises and insurgent attacks were highlighted.[2]

The most common otorhinolaryngological manifestations of head trauma in our study were skull base fractures with CSF rhinorrhea and TB fractures with CSF otorrhea. However, CSF rhinorrhea resulting from fracture of the frontal skull base was the highest in occurrence. This is contrary to the finding in other studies in which TB fractures with CSF otorrhea occurred the most.[6,13]

The management of CSF leaks depends on the nature of the fistula, site, and volume of flow and they can be managed conservatively through control of intracranial pressure by the patient lying supine with the head propped at angle of 30 degrees from the horizontal as it was achieved in all our patients or the use of shunt procedures.[14] Other modalities include prophylactic antibiotic cover,[15] a method employed in our center for such cases. Failure of conservative management requires surgical closure of the fistula and endoscopic repair has become a prominent mode of achieving this closure.[14]

There are no recorded cases of meningitis and CSF leaks thus far on follow-up of despite conservative approach for all of our patients.

Hearing loss may or may not follow TB fracture resulting in a traumatic cochlear hearing loss.[5] Fractures of the TB may involve disruption of the ossicular chain leading to conductive deafness. This may be the case in some of our patients. However, we do not have facilities in our center for high-resolution CT scan to determine the presence or absence of these disruptions. Injuries involving the frontoethmoidal complex can be associated with anosmia as seen in a few patients in our study and is a result of severance of the olfactory nerves by fractures of the cribriform plate of the ethmoid bone.[9]

The pattern of fractures of the facial skeleton varies from one part of the world to another. The most common we recorded in our study is fractures of the mandible which is similar to a study by Kumar *et al*.[16] This is because the mandible is the most prominent and only mobile facial skeleton therefore easily fractured as compared to the well-articulated mid-facial bones.[17]

The etiological factors highlighted in our study are modifiable for a better outcome for the citizenry. Strict enforcement of traffic rules and regulations can reduce the incidence of MVA. Establishment of functional conflict management units by government is required to reduce the spate of communal clashes and insurgent attacks thereby decreasing the incidence of these injuries.

The severity of injuries in head injured patients, the patients' level of consciousness, the presence of other injuries requiring emergent intervention usually leads to a delay in the otorhinolaryngological evaluation and management of these patients.[18]

However, these otorhinolaryngological presentations in patients with head trauma equally need early identification and prompt treatment to avoid untoward complications and even death.

The limitations to our study are as follows; first, this is a single-center study and does not indicate the differences that may exist between different trauma institutions in their clinical approaches to the management of these types of injuries. Second, this study involves a small sample size and therefore does not reflect national figures needed for proper and effective injury surveillance. We recommend a multi-center study on a larger population size to determine true national figures of these types of injuries.

Despite these limitations, our study has been able to demonstrate the otorhinolaryngological injuries in head injured patients on a regional level and gives a template from which further studies can be done.

CONCLUSION

Our study demonstrates that the most common otorhinolaryngological presentations in head injured patients are frontal skull base and TB fractures with CSF rhinorrhea and otorrhea occurring mostly in males aged 30–39 years with favorable outcomes on conservative management.

Management outcomes were not affected by injury etiology or time of presentation to the hospital.

Early identification of these injuries among head injured patients in the acute phase of presentation is essential to instituting prompt treatment.

Acknowledgment

We are grateful to Mr. Gyang Iliya Sunday of the Medical Records Department of the Jos University Teaching Hospital, for his assistance with patients' records where necessary.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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