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RESEARCH ARTICLE

OTOLOGIC TRAUMA: THE BURDEN OF A VIOLENT SOCIETY

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ABSTRACT

Background: It was observed that many young adults were presenting with hearing loss secondary to trauma. The rate appeared increasing as the days pass by as seen in a tertiary health facility in the heart of the town.
Objectives: To determine the aetiology, presentation, treatment and outcome of patients with ear trauma managed in a tertiary hospital at a central location in the city and suggest ways to reduce the frequency.
Methodology: Clinical case review and observation of patients presenting with ear trauma were studied over three years in the urban city. Patients' clinical records were studied to generate the data required for the study. The data so generated were analyzed using descriptive statistics and results presented in tables and text.
Results: Seventy seven patients, males 46(59.74%), females 31(40.26%), ratio 1.5:1 were studied. Their ages ranged from 0.67 to 51years with an average of 24.4059±12.3762 years. Assault 55 (71.42%) was the most popular aetiology with the left ear 49(63.63%) more affected than the right ear 25 (32.47%). Hearing loss 44.16%, noise in the ear 33.77% and bleeding from the ear 32.47% were the most frequent presentations. They were managed conservatively and outcome was uniformly uneventful except for 13(16.88%) cases who defaulted for follow up and whose outcome one cannot categorically talk about.
Conclusion: Assault was the leading cause of ear trauma in our locality. This can be checked if the fundamental human rights were respected both at governmental and societal level. It is submitted that this be enforced to stem the tide and save the society from turning deaf.

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INTRODUCTION

The complaints of hearing loss by young adults from ear trauma appeared increasing unabated. Trauma is a physical injury; and a deeply distressing or disturbing experience. Trauma to any part of the body is not without its attending consequences, the extent of which depend upon the part of the body affected, the type and nature or agent of the trauma. Ear trauma can involve any part of the ear depending on the nature and force of the trauma. Reported cases of trauma of the external ear were dominated by auricular (pinna) involvement (Prasad *et al*., 2005; Lee, 1996; Ghanem *et al*., 2005; Giles *et al*., 2007; Yamasoba *et al*., 1990; O'Donnell, 1999). Middle ear injury is critical in ear trauma as directly or indirectly the delicate function of hearing and balance may be affected in variable degrees. In variably the tympanic membrane is perforated with the attendant conductive hearing loss.

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Affectation of or otherwise of the ossicles, facial nerve, and inner ear structures is a function of the severity of the trauma. Perhaps, because the tympanic membrane plays a pivotal role in the middle ear function many authours (Fernandez *et al*., 2001; Griffin, 1979; Davison, 1992; Ott, 2001; Fagan, 2002; Reiter, 2008; Orji, 2008; Ritenour *et al*., 2008; Chukwuezi, 2009; Robbins, 2007; Jensen, 1993; Lindman *et al*., 1987; Søren, 1992; Camnotz, 1985; Chukuezi, 2012) have variously written on the aetiology and management of its perforation.
In this study we present our review of the aetiology, presentation, treatment and outcome of consecutive patients with ear trauma managed in our facility. The mechanisms of injury from varied causes were also highlighted and suggestions made on how to check the trend.

Patients and methods

Consecutive patients managed for ear trauma in the ear, nose and throat (ENT) clinic of Enugu State University of Science and Technology (ESUT) Teaching Hospital Enugu, a tertiary health facility at the heart of the city for a period of three years (2009-2011) were reviewed.

The clinical records and charts of the patients were consulted for the relevant information. The data extracted were the biodata, the mode of trauma, presentation, management and outcome among others. The data obtained were analyzed with descriptive statistics and presented in tables and text. The study was approved by the institutional ethics review board.

RESULTS

Seventy seven cases were studied in the period under review. They were made up of 46(59.74%) males, and 31(40.26%) females Table 1 with a ratio of 1.5:1.

Table 1. Sex distribution of patients with ear trauma

Sex	Number of cases	Percentage (%)
Males	46	59.74
Females	31	40.26
Totals	77	100.00

Table 2. Age distribution of the patients with ear trauma

Age group	Frequency	Percentage (%)
0 – 10	9	11.69
11 – 20	16	20.78
21 – 30	40	51.95
31- 40	6	7.79
41- 50	5	6.49
51 – 60	1	1.30
Totals	77	100.00

Table 3. Laterality of ear trauma

Side affected	Number of cases	Percentage (%)
Right ear	25	32.47
Left ear	49	63.63
Bilateral	3	3.90
Totals	7	100.00

The ages were 0.67 to 51years with a mean of 24.4059±12.3762 and a median of 25years. The 95% confidence interval (CI) of this was 21.4160 to 26.5235. The average age of the males (N = 46) was 24.4059±12.3762 while that of the females (N = 31) was 23.32±9.50 years. There was no statistically significant difference between the two means, p = 0.6808. Majority 40(51.95%) of the patients were in the 21-30 age group Table 2. The left ear was more affected 49(63.63%) than the right ear 25(32.47%) with 3(3.90%) involving both ears Table 3. Assaults 55(71.42%) ranked top in the causes of ear trauma followed by foreign bodies 10(12.99%) Table 4. Other causes were RTA 7(9.09%), falls from height 3(3.90%) and others (welding spike 1.30% and gunshot wound 1.30%) 2(2.60%).

Table 4. Aetiology of ear trauma

Cause	Number involved	Percentage
Assaults	55	71.42
Foreign bodies	10	12.99
RTA	7	9.09
Falls from height	3	3.90
Others	5	2.60

The assault cases were due to domestic issues 49(89.09%), law enforcement agents (police) 5(9.09%) and armed robbery attack 1(1.82%) while the foreign bodies included cotton buds 5(50%), match stick 3(30%), stone 1(10%) and pin 1(10%).

The patients presented with hearing loss 34(44.16%) as the most frequent complaint, followed by noise in the ear 26(33.77%), bleeding from the ear 25(32.47%) and others Table 5. In all 80 tympanic membranes were involved, 28(35.0%) were intact at presentation while 52(65.0%) were perforated Table 6. All the cases presented within two weeks of sustaining the injury not sustain (1-14 days) and were managed conservatively without any surgical procedures. They were made to keep the ears dry and given oral antibiotics.

Table 5. Presentations of patients with ear trauma

Presentation	Frequency	Percentage (%)
Hearing loss	34	44.16
Noise in the ear	26	33.77
Bleeding from ear	25	32.47
Otorrhoea	9	11.69
Feeling of water	8	10.39
Vertigo	3	3.90
Itching	1	1.30

Table 6. Status of the TM on presentation

Status	Number	Percentage (%)
Intact	28	35.00
Perforated	52	65.00
Totals	80	100.00

However, the cases that presented with otorrhoea were given in addition topical antibiotics based on sensitivity pattern. Spontaneous healing of the tympanic membranes occurred within one to two months of follow up. Audiogram done showed that 56(70%) of the affected ears had conductive hearing loss of 20dB- 25Db at presentation which reverted to normal within one to three months of follow up. Averages were taken at 500Hz, 1000Hz, 2000Hz and 4000Hz. However exemption is made of 13(16.88%) patients who were lost to follow up and whose outcome results in both TM and audiogram status cannot be commented upon.

DISCUSSION

Ear trauma in this study involved both males and females with males dominating in the ratio of 1.5:1. This is expected considering the nature of males but contrasted with a similar study in Orlu (Yamasoba et al., 2003) where females outnumbered males in the ratio of 1.3:1. Interestingly active young adults in the 21-30years age range were involved in the two studies. This may indicate that females are now tip-toeing men in outdoor activities and bracing up to resist them in conflicts. Also in both studies the left ear was more affected than the right probably reflecting the direction the injury came as most people are right-handed and the right hand the dominant hand of action. Similar to the previous study (Yamasoba et al., 2003) assaults (71.42%) was the leading cause of trauma in the study occasioned by human altercations. Of worrisome is the fact that most of the assaults were domestic in nature, thus compounding the abuse of human rights unduly meted to the public by the police and other law enforcement agents. The major complaints patients presented were hearing loss 44.16%, noise in the ear 33.77% and bleeding 32.47%; and 65% of the affected ears were perforated. It is usual in the middle ear injuries for patients to report with hearing loss which is conductive in nature and the result of TM perforation and/or ossicular disruption or fluid accumulation. Sensorineural hearing losses (SNHL) are rarely seen and when they occur, result from direct or indirect inner ear trauma. Penetrating trauma may directly affect the stapes or inner ear and lead to perilymph fistula, vertigo, and

impaired cochlear function. Luxation of the stapes in to the vestibule has been reported and is often associated with a mixed hearing loss or pure sensorineural hearing loss (Herman *et al*., 1996; Berger *et al*., 1994). Blast injuries may disrupt the round or oval window membranes resulting in sensorineural loss, though noise-induced temporary or permanent threshold shifts have been reported with these injuries (Teter *et al*., 1970; Stage, 1976). Welding spike was one cause of trauma in this study. Over heating of the perilymph by this thermal injury may cause sensorineural hearing loss (Panosian *et al*., 1993; Ralph *et al*., 2005).

Tympanic membrane perforation which was prominent in our study 65%, healed spontaneously with conservative management. Most acute traumatic TM perforations have the tendency to heal spontaneously. This has been validated by many studies (Griffin, 1979; Davison, 1992; Orji, 2008; Lindman *et al*., 1987; Søren, 1992). Thus, the management of a fresh tympanic membrane perforation should be limited to cleaning the traumatized ear and preventing infection (Camnotz, 1985). There is no significant difference between paper prosthesis and spontaneous healing with treatment with oral antibiotics (Lindman *et al*., 1987; Søren, 1992; Chukuezi *et al*., 2012) even though the mechanism of injury may influence the rate of spontaneous healing (Søren, 1992).

Sudden change in the ear canal air pressure can rupture the tympanic membrane. Blow/slap from assault topped the causes of ear trauma here. The blow/slap caused a sudden increase in the ear canal air pressure (Teter *et al*., 1970) resulting in the TM rupture and it has been documented that the ear is the organ that is most vulnerable to damage by blast over pressure (Robbins, 2007; Sprem *et al*., 2001). A negative canal air pressure by a sucking action during kissing has caused tympanic membrane rupture; ultimately resulting to variable degree of ear injury (Reiter, 2008; Chukwuezi, 2009). Blast injuries through the ear canal may be explosive or non-explosive. Both are produced by a sudden positive pressure wave exerted through the external auditory canal (Teter, 1970; Wurtele, 1981). In these types of injuries, TM perforation are common, and significant trauma to the middle and inner ear structures may occur. Both types of blast injuries have been associated with noise-induced hearing loss, and at times round window membrane rupture (Teter *et al*., 1970; Stage *et al*., 1986; Miller *et al*., 2002). Explosive injuries are more severe; the severity being proportional to the proximity (Gluncic *et al*., 2001). It is important to note that non- explosive blast injury is more common and frequently results from human altercations, sports and other recreational activities. Lightening ear injury, though rare cause sudden expansion of the surrounding air producing an explosive blast injury that invariably results in unilateral or bilateral tympanic membrane perforation (Belluci, 1983). Temperature rise from the lightening equally causes thermal injury but the blast produces more damaging effect (Belluci, 1983). Facial nerve paralysis and sensorineural hearing loss may equally occur. Penetrating trauma injury has been reported as the most common cause of middle ear injury through the external auditory canal (Strohn, 1986). Penetrating trauma in this study constituted 12.99% and was grouped as foreign bodies. The injuries arising thereof are usually accidental ant self-inflicted and usually result from use of slender object to scratch an itch or clean the ear canal. Tympanic membrane perforation frequently occur and ossicular chain disruption is common. Penetrating trauma to the ear is the most common cause of luxation of the stapes into the vestibule and the ensuing perilymph fistula.[23]Though this study did not record elaborate investigations, in this case CT scan is necessary for the diagnosis and would make obvious the displacement of the stapes or reveal pnemolabyrinth in the patients (Berger *et al*., 1994). However, direct trauma to the round or oval window may cause a perilymph fistula without stapes luxation (Yamasoba et al, 2003). Welding spike may cause thermal injuries to external ear, tympanic membrane and middle ear structures during welding. Facial nerve paralysis as a result of direct thermal trauma has also been described (Panosian *et al*., 1993; Ralph *et al*., 2005). Welding spike injury can be prevented by wearing ear protection. The patients in the study presented fairly early for treatment and this may explain the good outcome.

Conclusion

Assault was the major cause of ear trauma in our environment. Active young adults were mostly involved and the commonest presentation was hearing loss. Early presentation and timely intervention produced good result. It is our opinion that human right abuse be checked both at governmental and societal level to halt the trend.

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