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Prevalence of Audiovestibular Dysfunction in Soldiers Following Posttraumatic Temporal Bone Fractures

Angshuman Dutta*, Chaithra B.G., Bharath M****

Author Affiliation: *Associate Professor, **Resident, ENT Senior Adviser ENT Command Hospital Air Force Bangalore.

Reprint Request: Angshuman Dutta, Dept of ENT, Command Hospital (Air Force), Post Agaram, Old Airport Road, Bangalore 560007.
E-mail: angshumandutta37@gmail.com

Abstract

A prospective study of 83 cases of head injury with fracture temporal bone in soldiers over a period of 5 years was done to analyse and elucidate the otologic involvement in these cases. The aim of this paper is to study the prevalence of hearing loss in soldiers following posttraumatic temporal bone fractures and the importance of appropriate investigations and intervention in these patients.

Keywords: Head Injury; Haemotympanum; Perforation.

Introduction

Head injury is one of the commonest traumatic events of this century causing considerable mortality and morbidity. The temporal bone is injured in 25-30% of head injuries[1]. Young men in the 2nd and 3rd decades are the most commonly affected group[2]. Road traffic accidents account for 40-50% of traumatic temporal bone fractures with falls, assaults, sports accidents being the other major causes. Temporal bone fractures present with features such as haemotympanum, tympanic membrane perforation, hearing loss conductive / sensorineural, facial paresis [3]. Most of these patients sustain other life threatening injuries which usually take priority in initial management. Unrecognised otological complications especially hearing loss if left untreated may lead to difficulty in rehabilitation and subsequently affect overall quality of life. The present study was carried out in 83 soldiers with temporal bone fractures to asess otological trauma and hearing loss and select the appropriate management strategy.

Materials and Methods

The prospective study was carried out in 83 patients of head injury who had sustained fracture temporal bone diagnosed on CT scan. The study was done over a period of 5 years from 2011 to 2015. The patients were males between 20 to 54 years of age. Of the 83 cases of temporal bone fractures studied 69 had been sustained in road traffic accidents, 8 had falls and 6 were cases of assault. Many of these patients 47out of 83 had other systemic injuries / other features of head injury. The patients presented with a variety of otological symptoms (Table 1).

Table 1: Otological Symptoms

Symptoms	Number of Patients
Otohaematorrhoea	51
Deafness	29
Vertigo	13
Tinnitus	4
Facial assymetry	3
Otalgia	11

Some of the patients had multiple complaints. On examination of these patients otological findings were seen as per Table 2.

Table 2 Otological findings

Findings	Number of patients
Haemotympanum	64
Traumatic perforation	18
CSF otorrhoea	4
Battle's sign	13
Conductive deafness	69
Sensorineural deafness	6
Mixed deafness	8
Facial palsy	5
Nystagmus	2
Positive Dix Hallpike test	9

Radiological investigation in form of HRCT temporal bone was done in all patients revealed Longitudinal fracture temporal bone In 69, mixed in 9 and transverse in 5 patients. Audiological investigations in form of PureTone audiometry revealed Conductive hearing loss in 69 patients- Mild in 57, Moderate in 10 and Severe in 2. Conductive loss was unilateral in 63 patients and bilateral in 6 cases. Sensorineural hearing loss was seen in 6 patients -Severe unilateral SNHL in 1; High frequency SNHL involving frequencies >4 Khz was seen in 2 -unilateral in 1 case and bilateral in 1 ; Mild SNHL unilateral was seen in 1 and Moderate unilateral SNHL was seen in 2 .In all 5 patients with transverse fracture temporal bone sensorineural hearing loss was present. Mixed hearing loss was seen in 8 patients.

Tympanometry was done in 12 patients 4 weeks after injury showed type B curve in 10 cases suggestive of haemotympanum and Ad type curve in 2 case suggestive of ossicular discontinuity.

Management and Followup

Most of the patients were managed conservatively. The protocol followed was avoidance of aural packs and aural toilet, keeping sterile pads and maintaining aseptic care. CSF otorrhoea spontaneously resolved in 4 cases within 7 days and haemotympanum resolved in 53 patients over a period of 3 to 5 weeks. Of the 18 patients with traumatic perforation in 8 healing occurred spontaneously, 10 patients required surgery 3 patients underwent chemical cauterization of edges, 5 underwent fat plug myringoplasty and 2 underwent Type I tympanoplasty. In the patients with haemotympanum haemotympanum resolved spontaneously. In 2 patients even after resolution of haemotympanum severe conductive hearing loss persisted hence patients were taken up for an exploratory tympanotomy on suspicion of ossicular disruption. On opening the incus was found to be dislocated. A type II tympanoplasty with incus interposition after sculpting the incus was done in both the patients. Surgery in all cases was carried out after 6 weeks. Pure Tone Audiometry in all 10 operated cases done after 6 months revealed good improvement with closure of airbone gap to 20 dB-30 dB. In the patients with mixed and sensorineural hearing loss medical management with steroids and vasodilators was followed. On serial audiometry after 4 weeks; mixed loss in 3 cases improved to normal hearing threshold while in 1 case it improved to mild SNHL(possibly due to resolution of haemotympanum). Mild unilateral SNHL in 1 case completely recovered. 2 cases with high frequency SNHL did not show any improvement. Patients with severe and moderate SNHL did not show any improvement.

Of the 5 patients with facial palsy 2 patients had immediate Grade V (House Brackmann) LMN facial palsy and one patient had Grade III palsy. All these 3 patients had fracture temporal bone transverse type. Two patients of longitudinal temporal bone fracture had delayed facial palsy Grade III(HB) after five days. In 3 cases patients were treated conservatively with oral steroids and physiotherapy and recovered completely over 4 weeks to Grade I (House Brackmann). 2 patients underwent facial nerve decompression and improved to House Brackmann Grade3 at 6months.

Of the 13 patients with vertigo onset was immediate within 3 days in 9 patients whereas in 4 onset was delayed occurring after 4 weeks. All were found to have complaints of positional vertigo and were treated with labyrinthine sedatives betahistine 16mg tds along with vestibular rehabilitation exercises. In 6patients canal repositioning maneouvre (Epley's) was done and symptoms of vertigo in all patients subsided over 2 weeks.

Outcomes

79 patients were followed for a period of 6 months to 1year while others were lost to follow up. All patients with conductive hearing loss improved spontaneously or after surgery. 3 patients of

sensorineural hearing loss were given digital hearing aids.

Discussion

Modern day soldier faces an increased risk of otologic injuries due to head trauma. However most of the otological injuries are correctable and treatable.

Temporal bone fractures have been classified as longitudinal, transverse or mixed by reference to the long axis of petrous temporal bone with the longitudinal fractures being the commonest. A classification based on presence or absence of involvement of otic capsule has also been suggested [4]. HRCT temporal bone is the key radiologic investigation for assessing and managing these patients [5].

Longitudinal temporal bone fractures are usually associated with trauma to the middle ear structures. Conductive hearing loss is generally caused by tympanic membrane perforation, haemotympanum or ossicular disruption [6]. The majority of these patients can be managed conservatively however in certain cases like ossicular dislocation and direct trauma to the facial nerve surgical intervention is mandatory.

The commonest cause of ossicular disruption is dislocation of incudostapedial joint [7] .The other common ossicular derangements include fracture of stapedial crura and dislocated stapes footplate [7]. Incus is more commonly involved in trauma as it is heavier than other ossicles, has no muscular attachments and hence easily dislocated. Dislocation of malleus is rare because of its firm attachment to the tympanic membrane and the strong anterior malleolar ligament. Conductive hearing loss due to ossicular chain disruption should be suspected if hearing does not improve after tympanic membrane heals or after haemotympanum has subsided [8]. In our series two patients had incus dislocation for which type II tympanoplasty with incus interposition was done.

In transverse fractures of temporal bone the damage to the audiovestibular apparatus and facial nerve is more severe [6]. The hearing loss associated with transverse fracture is usually sensorineural caused by disruption of the integrity of the labyrinth or the neurovascular bundle in the internal auditory canal. In longitudinal fracture sensorineural hearing loss is relatively uncommon and usually a mild high frequency loss maximal at 4 KHz is present. Fifty percent of patients with a temporal bone fracture who have audiometric evidence of a hearing loss are documented to have a irreversible sensorineural hearing loss in various studies [9, 10]. In our study sensorineural hearing loss was seen in all 5 cases with transverse fracture temporal bone of which 4 did not improve after treatment. 1 patients with longitudinal fracture of temporal bone developed high frequency sensorineural hearing loss.

Benign positional paroxysmal vertigo is the commonest cause of post traumatic vertigo in cases of temporal bone fracture which may present early or late [11]. Other causes of post traumatic vertigo include perilymph fistula and endolymphatic hydrops. In this study 9 patients had immediate onset vertigo whereas 4 patients had delayed onset vertigo after 4 weeks which were managed conservatively.

Facial palsy complicates 7% of temporal bone fractures [9]. Facial weakness after longitudinal fractures is generally rare and if it occurs is incomplete and delayed and is secondary to oedema rather than disruption of the nerve [12]. Two patient with longitudinal fracture had delayed onset facial palsy which recovered completely. Out of 3 patients with transverse fracture temporal bone one recovered spontaneously while two had partial recovery after facial nerve decompression.

CSF otorrhoea occurs in 25-33 percent of patients with a temporal bone fracture [13]. The management is initially conservative as 81% undergo spontaneous resolution within 5 days. In this study 4 patients had CSF otorrhoea which subsided in 3 days.

Conclusion

Careful screening of head injury patients need to be done to look for any otological injuries. The assessment of audiovestibular dysfunction and facial nerve function becomes important in planning appropriate intervention in a case of temporal bone trauma. Head injury patients need to be followed up for a period of 1 year to monitor for sequelae like benign positional paroxysmal vertigo, delayed conductive loss, delayed endolymphatic hydrops.

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