COMPUTED TOMOGRAPHY: OCULAR MANIFESTATIONS IN ACUTE HEAD INJURY PATIENTS IN JOS UNIVERSITY TEACHING HOSPITAL

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ABSTRACT

Background: *Acute head injuries are common in the population. Associated ocular injuries are occasionally encountered and these are of varying nature and outcome.*

Methods: *We reviewed 98 brain computed tomographic results retrospectively. These are cases that were done between Jan. 2013- Jan. 2014. Statistical information and analysis was performed using SPSS version 20. Pearson correlation was performed and the level of significance set at d=0.05. Student t-test was also performed to compare the difference of the ocular findings and sexes.*

Results: *Head injuries are more in males with a ratio of 4:1. It was noted more in the third decade of life. Ocular findings were more in males and the severity of the ocular findings was related to the severity of the head injury.*

Keywords: *Acute head injury, Ocular findings and Computed tomography.*

INTRODUCTION

Head injury is an important public health problem and a common cause of death and disabilities in trauma patients. It is defined as trauma leading to brain injury, skull fracture and scalp injury.[1]The lifetime prevalence of ocular injuries is similar between black and white men, but black men are more likely to sustain a blinding injury.[2]

Head injuries can also be defined as those in which there is evidence of involvement of the brain including concussion, with loss of consciousness or post-traumatic amnesia, neurologic signs of brain injury or skull fractures.[3]

The Glasgow coma score and the Revised trauma scores (RTS) are commonly used in grading the severity of head injury into mild, moderate, and severe. The RTS is a triage tool and the score is inferred from physiologic derangement on initial evaluation. The data derived from these vital signs and levels of consciousness mathematically culminate into a single variable that correlates with mortality.[4]

Most head injury cases are mild and can be treated as out-patients. Those that need neuro-observation are treated as in-patients for 24–48 hrs.[4]

The eyes are often involved in head injury (directly and indirectly) with neuro-ophthalmic deficits.[5,6]In non-penetrating or closed head injury, displacement, stretching and shearing forces may damage areas of the brain including those associated with vision.[7]Direct ocular trauma also contributes to the visual dysfunction in patients with head injury.[8]

Common posttraumatic orbital injuries include anterior chamber injuries, injuries to the lens, open-globe injuries, ocular detachments, intra-orbital foreign bodies, carotid cavernous fistula, and optic nerve injuries[9]. Assault and motor vehicle injuries are usually the most severe and are the most likely to result in enucleation.[10]Several retrospective studies have reported a high incidence of neuro-ophthalmologic findings after severe head injury.[11] Ultrasonography (US) can be very useful for evaluating the globe and its contents; however, US is contraindicated if a ruptured globe is suspected. Magnetic resonance imaging may be difficult to perform emergently; it is contraindicated if there is a possibility that a metallic intraorbital foreign body is present. Computed tomography (CT) is considered to be the top choice for evaluating orbital trauma. The best protocol is to obtain thin-section axial CT scans, then to perform multiplanar

reformation.[12] There has been scanty data on the use of computerized tomography (CT) scans to detect ocular features following acute closed head injury. CT scans may be useful in such patients because a number of potential eye injuries may be escaping ophthalmological assessment.[13] This may include orbital wall fractures and posteriorly located globe ruptures. Early diagnosis of visual problems following traumatic head/brain injury is essential to maximize the overall intervention and rehabilitation potential.[14]

The aim of this study was to analyse the CT findings of patients with ocular manifestation in acute closed head injury presenting in Jos University teaching Hospital (JUTH) in order to determine its value in the management of these patients.

MATERIALS AND METHOD

Ninety eight (98) patients who had cranial CT-scan performed at the Jos university teaching hospital (JUTH) from January 2013- January 2014 for varying degrees of acute head injury were retrospectively examined. Demographic data including age and sex, as well as ocular findings were obtained from retrieved medical records. The patients that met the criteria of various degrees of acute head injury from the clinical notes were recruited in this study. The various appearances were noted and correlated with age, sex and clinical indications.

A 3rd generation helical BRIGHT SPEED GE CT scan with 4 slice system was used for the study. Axial scans obtained from the base of the skull to the vertex at 2.5mm and 5 mm slice thickness respectively were obtained in only the native scan. Reformatted images were also examined in evaluating the images for ocular findings.

Statistical information and analysis was performed using SPSS version 20. Pearson correlation was performed and the level of significance set at d=0.05. Student t-test was also performed to compare the difference of the ocular findings with ages and sexes.

RESULTS

A total of 98 patients made up of 80 males (81.6%) and 18 females (18.6%) were involved in this series giving a male: female ratio of about 4:1.

The age group with the highest incidence of acute closed head injury is the 3rd decade (21—30yrs) with 28.6% (28 patients) and the 3rd and 4th decades combined account for 50% (49 patients) of all patients in the series.The cases of head injuries are more in males compared to the females across all the age groups.

Acute moderate closed head injury accounted for most of the cases of head injury (52.5% and 72.2% in male and females respectively). This is followed by acute severe closed head injury, which accounted for 27.5% and 16.7% in male and females respectively.

Acute moderate closed head injury accounted for 56.1% (55 cases) in all age groups. This is followed by acute severe closed head injury which accounted for 30.6% (25 cases) in all age groups while acute mild closed head injury accounted for 13.3% (13 cases). Table I

Majority of the patients had normal ocular study. Males had more ocular findings compared to females. Subcutaneous emphysema was noted to be the commonest ocular findings. Table II

7.1% (7 patients) in the series had abnormal ocular findings with acute moderate closed head injury accounting for most of them (5 patients). However, these patients accounted for only 9.1% of those with acute moderate head injury. 2 patients with acute severe closed head had ocular findings. None of the patients with acute mild closed head injury had ocular findings. Table III

Males had more ocular findings compared to females. Subcutaneous emphysema was noted to be the commonest ocular findings. Table II

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Table 1 : Age distribution of indications in relation to sex

Age group	Sex	Indications Acute moderate closed head injury	Acute mild closed head injury	Acute severe closed head injury	P
≤10	Male	1(14.3)	4(57.1)	2(28.6)	0.502
	Female	0(0.0)	2(50.0)	2(50.0)	
11-20	Male	2(22.2)	6(66.7)	1(11.1)	0.496
	Female	1(20.0)	2(40.0)	2(40.0)	
21-30	Male	1(100.0)	13(100.0)	14(100.0)	-
	Female	0(0.0)	0(0.0)	0(0.0)	
31-40	Male	4(100.0)	11(84.6)	4(100.0)	0.715
	Female	0(0.0)	2(15.4)	0(0.0)	
41-50	Male	2(100.0)	2(28.6)	1(100.0)	0.117
	Female	0(0.0)	5(71.5)	0(0.0)	
51-60	Male	1(100.0)	4(80.0)	3(100.0)	0.638
	Female	0(0.0)	1(20.0)	0(0.0)	
>60	Male	1(100.0)	2(66.7)	1(100.0)	0.659
	Female	0(0.0)	1(33.3)	0(0.0)	

Table 2: Indications and ocular findings in relation to gender

Variables	Gender		P
	Male	Female	
Indications			
Acute mild closed head injury	12(15.0)	1(5.6)	0.442
Acute moderate closed head injury	42(52.5)	13(72.2)	
Acute severe closed head injury	26(33.3)	4(31)	
Ocular findings			
Normal	162(92.6)	72(94.7)	0.629
Collapsed left globe	3(1.6)	0(0.0)	
Left subcut emphysema	7(4.0)	2(2.6)	
Left subcut swelling + emphysema	0(0.0)	1(1.3)	
Bilat subcut emphysema	1(0.6)	0(0.0)	
Ruptured right globe	2(1.1)	1(1.3)	

Table III: Indications in relation to ocular findings

Indications	Ocular findings				P
	Normal	Left subcut emphysema	Bilat subcut emphysema	Rupturerd right globe	
Acute mild closed head injury	13(14.3)	0(0.0)	0(0.0)	0(0.0)	0.459
Acute moderate closed head injury	50(54.9)	3(100.0)	1(100.0)	1(33.3)	
Acute severe closed head injury	28(30.8)	0(0.0)	0(0.0)	2(66.6)	

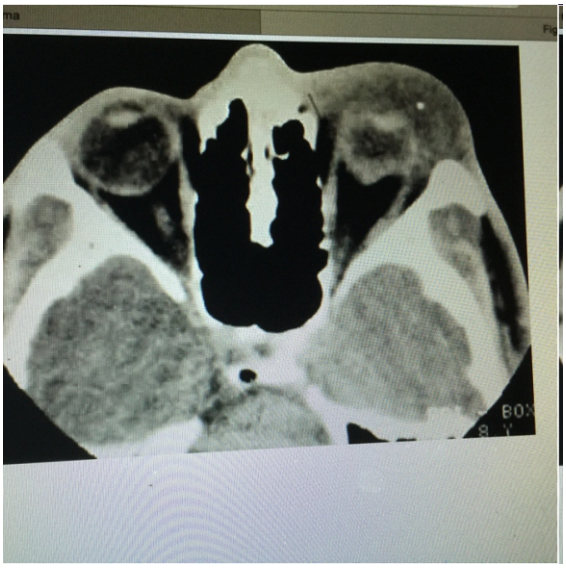

Fig 1: CT scan shows collapsed left globe and soft tissue swelling.

Fig 2: CT scan showing subcutaneous emphysema in the left eye.

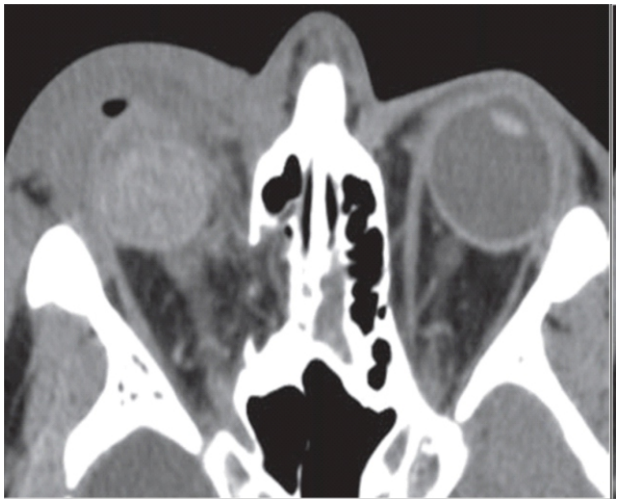

Fig 3: CT shows ruptured right globe with subcutaneous emphysema, soft tissue swelling and fracture of the medial orbital wall.

DISCUSSION

The age distribution in our study shows that the 21-30 years age group accounted for the highest incidence of acute closed head injury which can be explained by the fact that this is a highly active age group.[15]

In our study, majority of the head injury patients were males (81.6%). This is similar to findings in other studies done by Masila et al in Nairobi, Kenya (92.5%)[8], Kulkarni and Aggarwal (97%)[16] and Pelletier at al (81%).[17] The male to female ratio in this study is about 4:1 in favour of males, as also noted by Baker et al.[15]

This may be attributed to the fact that males are more active and involved in activities that put them at higher risk of head injury including operation of motor vehicles.

Majority of our patients had normal ocular findings irrespective of the degree of the head injury. This is at variance with what was obtained by Masila et al[8] which had 31.3% of their study being normal. The presence of abnormal ocular findings on CT scan in patients with acute closed head injury in our study was 7.1%. This however indicates those features that can be picked up by CT scan since clinical examination may reveal other features of ocular involvement. Kulkarni and Aggarwal found a much higher prevalence of ocular involvement in acute closed head injury patients while Kowal[18] found a lower estimate in the range of 30-50% of acute closed head injury patients with visual signs and symptoms.

Glasgow coma score is used to ascertained the degree of head injury. It groups the finding as mild(13-14),moderate(9-12)and severe(<8).[20] No ocular findings was noted on mild closed head injured patients. Majority of the patients in this study had ocular findings with acute moderate closed head injury. This differs from the findings by Odebode et al[17] who observed that nearly half of the ocular and visual injuries occurred in acute mild closed head injury.

We noted more globe rupture in acute severe head injuries. We noted that severity of ocular findings was to the severity of the head injury, even though, it was not statistically significant. This finding is similar to what was found by Masila et al and Odebode et al, that noted a positive correlation between severe head injuries and ocular findings.

Subcutaneous emphysema was noted in patients that had acute moderate head injury. Figs 3 and 1 showed subcutaneous emphysema with and without orbital fracture. Subcutaneous emphysema may be accompanied by soft tissue swelling as noted in Fig 3. Smith et al noted unilateral and bilateral orbital fractures with an associated subcutaneous emphysema in 9.1% [19] of their patients. Subcutaneous emphysema may or may not be associated with orbital bone fractures.

Odebode[17] reported globe ruptures in 2 patients with concomitant comminuted fracture of the orbit. However, our study showed that globe rupture occurred in the setting of acute moderate and acute severe closed head injuries with or without orbital fracture. Masila et al did not find any orbital fractures associated with globe rupture in their study, as noted in this study.[8] (Fig.1). Globe rupture can be seen with or without fracture of the orbital bones.

CONCLUSION

Acute head injury is more in males compared to females and is seen more in the active age group(21-30).Ocular findings are noted in 7.1% and severe eye injury was noted in patients that had acute moderate and severe head injuries.

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