RADIOLOGY

Computed tomography features of head injury in Ghanaian children

M. O. Obajimi[1], K. B. Jumah[1], W. O. Brakohuapa[1], W. Iddrisu[2]

Departments of Radiology[1] and Surgery[2], Korle-Bu Teaching Hospital, Accra, Ghana.
Reprint requests to: Dr. (Mrs.) M. O. Obajimi, Department of Radiology, University College Hospital, Ibadan, Nigeria.

ABSTRACT

Background: Injuries to the head are common in children. There are several reports in literature of head injury and evaluation with computed tomography scan (CT scan) but only a few focus on children.
Method: A retrospective review of films and reports of the CT scans of 41 children with head injury.
Results: Positive CT findings were noted in 19 (46.3%). Road traffic accident was found to be the commonest cause of injury with the highest incidence in the 5 – 9 year age group. Cranial fractures were the commonest (73.68%) CT findings especially in the frontal and parietal bones. Intracranial haemorrgage was outlined in 47.37%. In classifying the extent of head injury type 3 with intracranial injury alone occurred most (58.8%). Extraparenchymal haemorrages occurred more in 69.2% than the intracerebral variety (30.8%) Hydrocaphalus and cerebral oedema were also reported.
Conclusion: CT scan provides accurate non-invasive diagnosis of fractures, intracranial haemorrhages and other sequale of head injury. However, it should be done only when clinically indicated to reduce cost and avoid unnecessary irradiation

Key words: Head injury, computed tomography children

Introduction

Injuries to the head are quite common in children. [1-4] According to Abatanga and Mock, they constitute 40 % of paediatric trauma in a hospital-based study in Kumasi Ghana. [4] There are several accounts in literature of head injury and evaluation with computed tomography scan (CT) [3,5,6,7,8] but only a few focus on children. [3,5] They also document findings in Caucasians. Here in Ghana there is a dearth of literature on this relatively new and useful imaging modality. This descriptive study of the patterns of CT findings in 41 head injured Ghanaian children was prompted by the above reasons.

Patients and Method

The study sample includes all children under the age of 16 who had CT Scans done in the Radiology department of the Korle-Bu Teaching Hospital, Accra on account of head injury during a two-year period (1997-1999). Forty-one patients were documented. The indications for CT Scans in these children were, history

of head injury, unconsciousness, change in clinical status, neurologic deficit and headaches. The time interval between head injury and CT examination was variable. All Scans were done in the supine position using a Phillips CS/Q Scanners at 10mm intervals. No intravenous contrast medium was administered in order to avoid masking of any hyperdensity, which is a typical CT appearance of acute haemorrhage. The extent of head injury was classified into the following types;

Type 1- Vault fractures only.

Type 2 - Intracranial injury only (comprising of intra and extraparenchymal Haemorrahage, cerebral contusion and cerebral oedema).

Type 3 - Combined intracranial injury and fractures.

Results

All 41 patients were under the age of 16 years; the youngest was a 6 months old child. There were 25 males and 16 females giving a male, female ratio of 5.3:2.

The aetiology of the injuries is summarised in Table 1. Road traffic accident (RTA) was not only the commonest cause of head injury (43.9%), it was found to be prevalent in the 5-9 years age group (41.5%). RTA was followed by sustained injuries from a fall 11(26.8%).

Table 2 Shows that a child is more likely to have a positive CT finding if injury is sustained from a road traffic accident or from a fall. Table 3; The several indications for the 41 CT Scans done in this study are listed. CT Scans done for just a history of head injury or headaches were of no diagnostic yield. However, the incidence of a positive CT finding was high in the unconscious patients (90%) and those with a change in their clinical status (80%).

Table 4 The abnormal CT findings are itemised in this table. Interestingly, cranial fractures occurred most with equal incidence 14(73.7%). Parietal fractures were the commonest 5(35.7%) followed by the frontal and frontoparietal varieties 4(21.4%) and 3(21.4%) respectively. Only 1 occipital fracture was reported (figure 1). The epidural and intracerebral haemorrhages were all associated with fracture. Comminuted fractures were demonstrated in the only case that was injured by a fallen pole.

Subdural haemorrhage, an extra-parenchymal haemorrhage was outlined as a biconcave effusion adjacent to the vault and was seen in both the acute and chronic phases as. One hyperdense (acute) or two hypodense (chronic). Bleeds (figure 2) were outlined. Epidural haemorrhage was noted as a biconvex effusion. It was seen only in the hyperdense (acute) phase and occurred in 4 children. Intracerebral haemorrhage was reported in only 2 children.

Table 5 Shows the extent of injury as per mentioned classification. The type 2 was the commonest variety 10 (52.6%).

Table 1: Age distribution and the aetiology of injuries among the 41 children with head injury

Age (Yrs)	Cause of head injury				
	RTA	Fall	Assault	Others	Total (%)
0 – 4	-	8	3	-	11 (26.8)
5 – 9	8	3	5	1	17 (41.5)
10 – 14	6	-	1	-	7 (17.1)
15 – 16	4	-	2	-	6 (14.6)
Total (%)	18 (43.9)	11 (26.8)	11 (26.8)	1 (2.4)	41 (100)

Table 2: Causes of head injury and CT findings

Cause	No.	Positive CT scan (%)
RTA	18	10 (55.6)
Fall	11	6 (54.5)
Assault	11	2 (18.2)
Others	1	1 (100)
Total	41	19 (46.3)

Table 3: Indication for CT scans and CT findings

Indication	No.	Positive CT findings (%)
Unconsciousness	11	10 (90.9)
Change in clinical status	5	4 (80.0)
Neurologic deficit	15	5 (33.3)
History of head injury	6	-
History of headaches	4	-
Total	41	19 (46.3)

Table 4: Spectrum of CT findings in 19 children

Findings	No.	Abnormal scan
Fractures	14	4
simple linear		9
depressed		1
comminuted		
Intracranial haemorrhage	9	
Epidural (acute)		4
subdural		3
intracerebral		2
Cerebral oedema	9	
Contusion	7	
Hydrocephalus	6	

Some patients had more than one abnormal finding

Table 5: Extent of head injury in the 19 children with positive CT findings

Type of head injury	Description	No. (%)
1	Fractures alone	5 (26.3)
2	Intracranial injury	4 (21.1)
3	Combined fractures and intracranial injury	10 (52.6)
Total		19 (100)

Figure 1: A non-enhanced axial CT scan with a depressed right occipital fracture

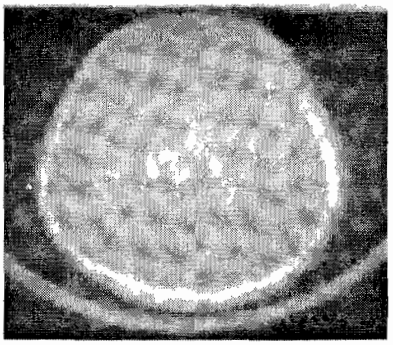


Figure 2: Chronic left frontal subdural haemorrhage seen as a crescentric in a non enhanced axial CT image

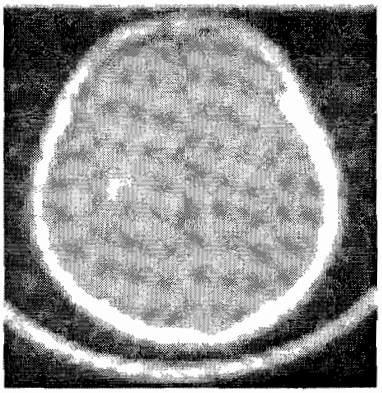
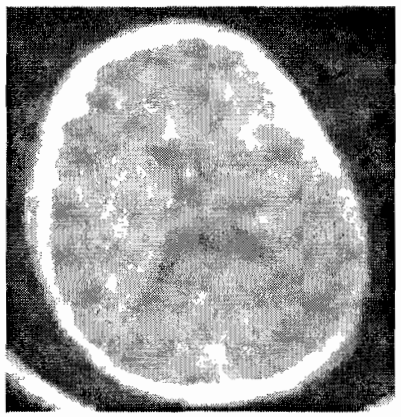


Figure 3: A non-enhanced axial CT scan showing right frontotemporal intraparenchymal hemorrhage. Surrounding hypodensity is due to cerebral oedema



Discussion

The approximate 5:3 Male/Female ratio observed in this study is a common trend in previous reports of injuries in children [1-4]. Also the commonest cause of head injury in these children was RTA just as it has been reported in another study in the same environment by the same authors [9].

This study shows that CT Scans done for history of headaches and head injury were counter productive, however high diagnostic yields were noted in the unconscious patients and those with a change in clinical status. Only 19(46.3%) demonstrated positive CT findings. This agrees with Ogunseyinde et al [3] who attributes this to the timing of examination or axonal injury that may not be detected by CT on an initial Scan. The site and type of fractures is said to be a result of the mechanism of injury. [5,6] Reports show that fronto-parietal fractures are commonest. [3,5,6,8] Both linear and depressed fractures were outlined effortlessly in this study, a known asset of CT imaging (figure 1). The sensitivity of CT in detecting intracranial haemorrhage is again noted in this study (Table 4). It is pertinent to note that all the 4 children with changes in clinical status demonstrated intracranial haemorrhage; this is because these haemorrhages usually develop several hours even up to 3 weeks after injury [10]. There were more extra parenchymal haemorrhages 7(36.8%) than intracebral 2(10.5%). The intracerebral variety was demonstrated as hyperdense areas within the brain due to the presence of haemoglobin in the brain parenchyma. (Figure 2). All the epidural haemorrhages were observed to cause a shift of the midline to the opposite side. A similar observation was noted in only 2 of the subdural haemorrhages when the effusion was present in more than 3 slices. Four of the six patients with hydrocephalus had ventriculo-peritoneal shunt done because of deterioration of the hydrocephalus after repeat CT scans. Of the 19 cases with positive CT findings 10(52.6%) had combined fractures and intracranial injury. The latter may be difficult to diagnose by plain films. [3,6]

Diffuse cerebral oedema is seen in 10% - 25 % of severe brain injuries and occurs in nearly twice as often in children compared to adults, [11] this was noted in 47.37% of our cases in agreement with these authors.

CT provides accurate non-invasive diagnosis of fractures, intracranial haemorrhages and other sequale of head injury like hydrocephalus and cerebral oedema. Its unique ability to differentiate acute from chronic haemorrhages are also valuable tips for corrective surgery. In children with hydrocephalus, follow up scans are useful in monitoring progression before irreversible damage in this growing army. However, despite the above advantages it should be done only when clinically indicated in order to reduce cost and avoid unnecessary irradiation to these children.

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