ORIGINAL ARTICLE

Computerised tomographic patterns in patients with head injury at the University of Benin Teaching Hospital

AA Adeyekun, EB Obi-Egbedi-Ejakpovi

Department of Radiology, University of Benin Teaching Hospital, Benin City, Nigeria

Abstract

Background: Head injuries rank high among morbidities due to trauma. Computerised tomography is an important modality in the investigation of these cases. However, literature on this subject in the south-south geopolitical zone of Nigeria is sparse. This study therefore aimed to document the computerized tomographic features of patients with head injury managed at the University of Benin Teaching Hospital (UBTH).

Materials and Methods: A prospective study involving patients with head injury referred for CT scan from the Accident and Emergency Unit of UBTH over a 12-month period. A total of 100 patients were studied, using non-enhanced cranial CT scans. Findings were recorded and data analysis using SPSS done.

Results: The age group 21-30 years was most frequently involved. Sex preponderance was 4.3:1 (male: female). Twenty-six patients had normal CT scans. The most common abnormal finding was intracerebral hemorrhage 35 cases (33%). This was followed by skull fractures, 23 cases (31%); subdural hemorrhage, 16 cases (21%); cerebral edema, 11 cases (15%). Others included mass effect, nine cases (12%).

Conclusion: CT plays a very significant role in management of head injuries, as demonstrated in this study, by making such diagnoses that guided eventual patient management. Intracerebral hemorrhage was the most common abnormal finding in this report. Regular use of CT in moderate to severe cases of head injury is advocated.

Key words: Benin City, computerized tomography, head injury

Date of Acceptance: 15-Apr-2011

Introduction

Head injury refers to trauma to the head. This may or may not include injury to the brain[1]

It may result from closed or open injuries;[2] and is an important cause of morbidity and mortality worldwide.

The clinical severity of head injury is classified based on the Glasgow Consciousness Score (GCS) score into mild (GCS 13–15), moderate (GCS 8–12), and severe (GCS less than 8).[3,4]

Thousands of patients are affected annually with young males mostly involved, probably due to increased activity associated with this group. Common etiologic factors of head injury include road traffic accidents (RTA), assaults, falls from height and stab wounds.[5]

Neuroimaging techniques provide some of the most important diagnostic, pathophysiologic and prognostic information in the management of patients with head injury.[6] Computerised Tomography, being a cross sectional imaging method can accurately identify and localize possible pathologies like hemorrhages (intracerebral,

Address for correspondence:
Dr. AA Adeyekun,
Department of Radiology, University of Benin Teaching Hospital,
P.M.B. 1111, Benin City, Nigeria.
E-mail: adeyekun@yahoo.com

Access this article online

Quick Response Code:

Website: www.njcponline.com

DOI: 10.4103/1119-3077.106717

PMID: *******

extradural, subdural, subarachnoid), cerebral contusion and edema. Cranial fractures and soft tissue abnormalities can also be detected.[6] Computerized tomography is also preferred as first line investigative modality because the imaging time is faster: This is very useful when dealing with severe injuries/emergencies.[7]

There have been reports documenting cranial CT findings in patients with head injury in Nigeria.[8-10] None of these covered Benin City and its environs.

The University of Benin Teaching Hospital (UBTH) is situated at the end of the busy Lagos-Benin dual carriageway that links the Western and Eastern parts of Nigeria. The hospital has a large Accident and Emergency Section that caters for victims of RTA.

Therefore, the aim of this study is to document the computerized tomographic features of patients with head injury managed at UBTH and further highlight the importance of this modality in the initial investigation and follow up of such cases.

Materials and Methods

This was a prospective study. The study population consisted of 100 patients with head injury referred for CT examination. Inclusion criteria were head injury associated with loss of consciousness at presentation; transient loss of consciousness at time of injury even if patient was alert and oriented at presentation; and associated symptoms/signs like severe headaches and neurological deficits. A third generation scanner SOMATOM AR- (Siemens, Germany) was used. Informed consent was obtained from patients or relations, of unconscious patients. Conscious patients, and relatives of unconscious ones, were reassured and procedure was well explained before examination.

With the patient placed in the supine position, 10 mm non-enhanced axial cuts were taken from the base of the skull to the vertex. Both bone and soft tissue windows were included in the scans. The scans were then reported by the first author (A.A.), a consultant radiologist. Findings were broadly classified into normal and abnormal. Abnormal findings were further classified into extracranial: Soft tissue swelling, subcutaneous emphysema, foreign bodies, and cranial fractures. Other abnormal classifications included and intracranial hematomas- extradural and subdural hematomas, intracerebral hematoma or confusion, cerebral edema, aerocele and intracerebral foreign body. Hematomata were classified into acute (hyperdense on CT); acute-on-chronic/subacute (mixed hyper and hypodensities); and chronic (hyperdense). Those patients for who follow up was possible had repeat CT scan done six months from the date of the initial scan. This was mainly for reasons of cost.

Results were recorded and statistically analyzed using the statistical package for social sciences (SPSS, Ver. 13). Data comparison or tests of significance was done with Pearson's Chi square tests. At 95% confidence interval, two-tailed *P* "*P*" value less than or equal to 0.05 was considered significant.

Results

The age range of patients examined was 11 months to 86 years with a mean age of 35.5 ± 17.0 years. The modal age group was 21-30 years. The sex ratio of the studied population was 4.3:1 (male: female). (M: F).

Road traffic accident (RTA) was the most common [most common] etiologic factor mechanism of injury?? ["Aetiologic factor" mechanisms of injury are different from etiologic factors – check available local and foreign texts for clarification] (79%), other causesbeing falls from height (11%), assaults (6%) and gunshot injuries (4%). The interval between occurrence of traumatic event and CT examination ranged from a few days to 20 weeks, with about one third of the scans done within one week of the traumatic event [Table 3]. Patients that presented late apparently did so for reasons of cost; only presenting in the hospital when they became symptomatic.

Twenty-six patients (26%) had normal CT findings while —74 patients (74%) had abnormal findings. Thirty **patients (40%) of the abnormal patients had single lesions. The patterns of abnormalities were intracerebral hemorrhage; 35 cases (47%), fractures; 23 cases (31%), subdural hemorrhage; 16 cases 21%), cerebral edema 11 cases (15%), ventricular compression with mass effect, 9 cases (12%). Other abnormal findings included foreign bodies (intracerebral) in four cases, scalp swelling in one case, sinus fractures with collection in nine cases. Full clinical recovery occurred in 28 patients (39%) of those with abnormal findings [Tables 1 and 2].

Intracerebral hemorrhage

This was the finding in 35 abnormal patients (47%). Twenty-two patients in this group (or 62.8%) bled into the left cerebral hemisphere (comprising 4 contusional, 14 acute bleeds, 2 sub-acute bleeds and 2 chronic hemorrhages). The right cerebral hemisphere was involved in 13 cases (31.7%).

Cranial fractures

Twenty three patients (or 31.0%) had skull fractures, with the vault involved in 19 cases (or 82.6%), and the base in four patients (17.4%). Those with basal fractures also had nasal discharge, most probably CSF rhinorrhea. Of the vault

fractures fifteen were linear, two stellate and two depressed. In 40% of the fractures, there was associated intracerebral hemorrhage.

Subdural hemorrhage

Sixteen patients (21.6%) had subdural hematoma. Four were acute, one acute-on-chronic, five subacute, and six chronic. The most frequently involved site was the left front parietal region, 11 patients (68%).

Epidural hemorrhage

Bleeding into the epidural space was seen in six patients (8.1%). Four of these were acute, and again, the left parietal region was mostly involved (66.6%).

Other abnormalities

Eleven patients (or 14.8%) had cerebral edema, nine patients (or 12.1%) had ventricular compression with midline shift (mass effect). Intraparenchymal foreign bodies (mostly metallic pellets) were seen in four patients, aerocele in two patients, while paranasal sinus fractures with collection were noted in four patients.

Discussion

Annually, thousands of people worldwide suffer head injuries especially young males.[10] In this study 65% of the patients were aged below 40 years, while 80% were males (sex ratio=4.3 male: female). The predilection for young males aged 20-40 years as seen in this study had been previously reported by several authors.[9-11] This high predisposition of young people is not unexpected, as they constitute an active and adventurous group that is more likely to be involved in accidents.[10] However, it is important to note other studies that reported increasing involvement of children and adolescents in head injuries, presumably due to falls.[12,13]

Road traffic accident (RTA) was the most common etiologic factor, a finding that agrees with other reports on head injury in Nigeria.[11,13-16] The deplorable condition of Nigerian roads is primarily responsible for this. The time interval of seven days between occurrence of injury and CT scan examination seen in this study varies slightly from an interval of fifteen days reported by Obajimi in a similar study.[8] This relative under utilization of CT scan may be a result of due to restricted access due to cost, distance to facility/location, and lack of awareness of the role of CT in the management of head injury by patients and their relations.

Twenty-six percent of patients in this study had normal CT findings while 74% had abnormal scans. These figures are in consonance with values of 61% and 78% for abnormal findings from previous studies on CT scan in patients with head injury by Ogunseyinde and colleagues,[9] as well as Ashaleye and co-workers,[10] respectively. We also found, in this study that there is a correlation between abnormal CT findings, presence of neurological features and low Glasgow Consciousness Scores ($P=0.018$).

Table 1: Frequency of CT findings

CT findings	No. of cases	Percentage
Normal	26	26
Abnormal	74	74
Fractures	23	31
Epidural hemorrhage	6	8
Subdural hemorrhage	16	21
Intracerebral hemorrhage	35	33
Intraventricular hemorrhage	1	1
Cerebral edema	11	15
Ventricular compression and midline shift	9	12
Cerebellar hemorrhage	1	1
Intraparenchymal foreign body	4	5
Aerocele	2	3
Scalp swelling	1	1
Paranasal sinus fracture	4	5
Paranasal sinus collection	5	5
Mastoid fracture	3	4
Mastoid collection	5	7

*Some patients had multiple findings on cranial CT scan

Table 2: Frequency distribution of outcome in abnormal cases

Outcome	Frequency	Percentage
Full recovery	28	38
Death	23	31
Posttraumatic seizures with headaches	9	12
Ischaemic cerebrovascular accident	3	4
Nerve palsies – 3rd, 5th, 6th cranial nerves	3	4
Progressive visual impairment	2	3
Chronic mastoiditis	2	3
Others	4	5

Table 3: Interval between accident and CT examination

Interval	Frequency
<1 week	37
1-2 weeks	28
3-4 weeks	7
5-6 weeks	15
>6 weeks	13

*$P=0.012$

The most frequent abnormality seen in this study was intracranial hemorrhage; about 58 percent of abnormal cases, as shown in [Table 1]. Ogunseyinde and others[9] made similar findings. These intracranial bleeds, were mostly intracerebral (35%), followed by subdural (16%), epidural (6%) and intraventricular (1%). The hemorrhages were mainly frontal, though some patients had a combination of these. Ashaleye *et al.*,[10] similarly found intracerebral hemorrhage as the most common intracranial bleed, whereas

Ogunsheyinde *et al.*,[9] however found subdural haematoma as the most common bleed. Shiomi and Echigo[5] even had epidural hematoma as the most frequent intracranial bleed in their study. The variations in findings by these authors can be ascribed to various factors such as patient selection, severity of head injury and also interval between injury and CT examination.

An incidence of 31% of skull fractures was found in the abnormal patients, with many of these associated with intracranial lesions, especially intracerebral hemorrhage (43.5%). These lesions were ipsilateral to the fracture sites. The fractures involved the cranium in nineteen patients (82%), and the base in 4 patients (17.4%). The parietal bone (43.5%) frontal parietal (17%) and frontal bones were involved. The explanation for this is probably because these are the most convex areas of the calvarium, and the more prone to impact. It is pertinent to note however, that Ashaleye and others[10] found epidural hematoma, rather than intracerebral hematoma, to be more associated with skull fractures. In this study, paranasal sinus fractures associated with hemorrhagic collections were seen in 4% of abnormal cases.

Intracerebral metallic fragments (bullet pellets) were seen in all four patients with a history of gunshots. There is a possibility of underreporting of gunshot injuries here, as this appears to be relatively low incidence. Another explanation for this may be due to the reduced access to firearms here, unlike the industrialized countries, where a higher incidence of gunshots accounts for head injury. Other findings included aerocele in two cases. This is a benign condition of air in cerebral tissue, due to a dural tear communicating with a sinus or air cavity. It usually resolves spontaneously.

Conclusion

The most common abnormal finding in this study was intracerebral hemorrhage. The diagnoses of normal/abnormal findings enabled the attending physicians/surgeons to manage the patients more appropriately. It can be seen therefore that computerized tomography remains a very important modality in the management of patients with head injury The use of this modality is advocated in all cases of moderate to severe head injury is advocated.

References

1. Anderson T, Heitger M, Macleod AD. Concussion and Mild head Injury. Pract Neurol 2006;6:342-7.
2. Asimor I, Bassett BL, Bearmer PL, Bean WB, Engley FB, Christensen JF. Stedman's Medical Dictionary 23rd ed. Philadelphia: Williams and Wilkins; 1979. p. 709.
3. Fischer J, Mathieson C. the history of Glasgow Coma Scale: Implications for practice. Crit Care Nurs Q 2001;23:52-8.
4. Murshid WR. Management of minor head injuries: Admission criteria, radiological evaluation and treatment of complications. Acta Nuerochir (Wien) 1998;140:56-64.
5. Shiomi N, Echigo T. (A guide to initial management of minor head injury). No Shinkei Geka 2004;32:465-70.
6. Newberg AB, Alavi A. Neuroimaging in patients with head injury. Semin Nucl med 2003;33:136-47.
7. Sutton D, Brain K, John S. Intracranial lesions 2. In: Sutton D (Editor). A textbook of radiology and imaging. 6th ed, London: Churchill Livingstone; 2000. p. 1619-60.
8. Obajimi MO, Shokunbi MT, Malomo AA, Agunloye AM. Computed Tomography in civilian gunshot injuries in Ibadan. West Afr J Med 2004:23:58-61.
9. Ogunseyinde AO, Obajimi MO, Ogundare SM. Radiological evaluation of head trauma by computed tomography in Ibadan, Nigeria. West Afr J Med 1999;18:33-8.
10. Ashaleye CM, Famurewa OC, Komolafe EO, Komolafe MA, Amusa YB. The pattern of computerised tomographic findings in moderate and severe head injuries in Ile-Ife, Nigeria. West Afr J Radiol 2005;12:8-13.
11. Akang EE, Kuti MA, Ogunkoya AO, Komolafe EO, Malomo AO, Shokunbi MT, *et al*. Pattern of fatal head injuries in Ibadan- a 10-year review. Med Sci Law 2002;42:160-6.
12. Johnstone AJ, Zuberi SH, Scobie WG. Skull fractures: A population study. J Accd Emerg Med 1996;13:386-9.
13. Emejulu JK, Shokunbi MT. Aetiological patterns and management outcomes of paediatric head trauma: One year prospective study. Nig J Clin Pract 2010;13:276-9.
14. Thanni LO. Evaluation of Guidelines for Skull Radiography. The Nig Postgrad J Med 2003;10:231-3.
15. Emejulu JK. Epidemiological patterns of head injury in a newly established neurosurgical centre: One year prospective study. Afr J Med Sci 2008;37:283-8.
16. Adeleye AO, Olowookere KG, Olayemi OO. Clinicoepidemiological profiles and outcomes of head injury patients in Ikeja, Nigeria. Neuroepidemiology 2009;32:136-41.

How to cite this article: Adeyekun AA, Obi-Egbedi-Ejakpovi EB. Computerised tomographic patterns in patients with head injury at the university of Benin teaching hospital. Niger J Clin Pract 2013;16:19-22.
Source of Support: Nil, **Conflict of Interest:** None declared.