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Choroid Plexus Versus Intracranial Foreign Body: Importance of a Radiologist's Report

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Abstract

Intracranial foreign bodies are often due to penetrating missile injuries arising from gunshot, criminal assaults and industrial accidents and rarely from non-missile skull penetrations. Iatrogenic sources other than in neurosurgical therapeutic interventions seldom occur. Penetrating foreign bodies require prompt surgical attention. Formal exposure of the brain must be assisted or guided by prior imaging to foreclose intra and postoperative concerns including additional brain trauma, fatal intracranial hemorrhage or infection of the central nervous system.

Computed Tomography (CT) scan is an invaluable imaging tool in cases of acute brain trauma and suspected intracranial foreign body compared to plain radiography or magnetic resonance imaging. It is important that the interpretation of the CT scan images be carried out by a Radiologist to avoid misconstruing of incongruous densities and artifacts which often supervene in such instances.

Keywords: Interstitial Cystitis; Painful bladder syndrome; Urinary tract infection; Pentosan polysulfate sodium; Familial crohn's disease

Introduction

A 27 year old male plumber was brought to the Accident and Emergency unit of a tertiary hospital in North Central Nigeria, unconscious, with open wounds on the left occipital aspect of the head. According to the accompanying relatives, he was at the scene of a fracas between policemen and a group of tricycle riders. Gun shots were said to have been fired and after the mob was dispersed, he was discovered lying in a pool of blood presumably hit by a stray bullet. Same story was corroborated by policemen who also came along to the hospital. He was said to have lost consciousness instantly and remained so until presentation to the hospital.

On examination, a young man was seen in some respiratory distress, unconscious with a Glasgow Coma Scale of 10/15. The pupils were 4 mm dilated and slowly reactive to light. He had a left occipital area laceration measuring about 8 x 2 cm with ragged edges and a deep laceration in the nasal bridge, multiple bruises on the face. There was evidence of bleeding from the nostrils, mouth and left ear. He had normal vital signs except a blood pressure of 145/105 mm Hg. There was hypertonia and hyper-reflexia in all the limbs. The other systems were normal.

A diagnosis of acute moderate open head injury secondary to gunshot was made. An urgent CT scan was ordered for. It revealed a depressed left occipital comminuted skull fracture with associated intracerebral hematoma and contusion, subarachnoid hemorrhage and ipsilateral acute subdural hematoma.

The patient subsequently deteriorated after the CT scan. He was transferred to the high dependency unit and placed on close observation, but his condition continued to deteriorate despite resuscitative measures until he died the following day after admission and was taken for burial immediately in accordance with his faith.

The CT scan of the patient which was done during the call hours was hurriedly assessed by the accompanying Surgery team on call and the Radiology resident on call and all parties agreed that there was in addition to the other findings, and importantly, a lodged intracranial bullet pellet in keeping with what was suggested in the provided history and corroborated by the policemen who were at the scene of the fracas. And this was so documented.

However, following the death of the patient and the threat by the patient's relatives to pursue a legal course to demand justice over the case, an inquest was requested for by higher authorities in the Police department [1,2]. This necessitated further review of the CT scan result by a Consultant Radiologist in view of medico-legal implications.

Findings on CT Scan review

- Left occipital region cortical and sub cortical conglomerate of patchy hyperdensities with surrounding hypodense areas consistent with intracerebral hematoma and contusion [3].
- Ipsilateral hyperdense crescentic collection over the cerebral convexity extending from the frontal to the parietal area in keeping with an acute subdural hematoma. A mild collection extends over the occipital cortex and along the posterior midline falx.

- Associated effacement of adjacent sulci and gyri as well as effacement of the ipsilateral Sylvian fissure and the body and horns of the left lateral ventricle with significant subalpine shift of midline to the contralateral side.
- A hyperdense focus in oblique disposition within the long axis of the effaced occipital horn of the left lateral ventricle. This was valued with a Hounsfield Unit of 67.
- Bone window revealed a depressed comminuted left occipital fracture beneath an overlying area of scalp swelling.

Results and Discussion

A number of factors contributed to the initial incorrect impression of an intracranial foreign body. The attendant history was compelling. Being the call hours, the first resident on call duty, with inexperience, was perhaps overwhelmed with the exasperating presence of the team of doctors who accompanied the patient to the scan room to conclude along with them on the presence of an intracranial foreign body.

Suboptimal patient positioning as is often obtained in cases of head injury results in some asymmetry in the disposition of the axial cerebral hemispheric anatomy and so bilateral structures may not be seen at same level [4]. However, upon review by the Consultant Radiologist, it was evident first of all that the scan grams were not remarkable. An intracranial foreign body, in the form of a bullet pellet being suspected, will be seen as a high density focus in the scan gram, whose site is usually confirmed in two orthogonal views.

On serial images, the expected streaks that usually accompany high density foreign objects like bullet pellet on axial scan were absent. On serial images, the expected streaks that usually accompany high density foreign objects like bullet pellet on axial scan were absent. A combination of asymmetry of the axial slice and the effacement of the posterior horn of the left lateral ventricle with compression of the choroid plexus and its increased density led to the appearance and false impression of a “bullet-form” intracranial foreign body in a patient with suspected gunshot head injury.

The Hounsfield Unit (HU) of the dense ‘foreign body’ was measured to be 67. The HU of the normal choroid plexus is in the range of 50–55. With calcification its HU increases to between 140 and 150.

The compression of the ipsilateral choroid plexus in this patient accounted for the moderate increase in its density and HU to about 67. There was no layering even on the reformatted sagittal and coronal views to suggest an acute intraventricular hemorrhage. Bone window interrogation of the axial images did not reveal the expected highlight of either a calcific or a metallic density of the object.

In addition, the intracranial trajectory of the so called bullet was uncharacteristically ‘off course’ when a linear trajectory was expected. Worse commination and more brain parenchymal damage than present should have been seen between the lodging site of a high velocity skull penetrating object and its entry point. The conclusion finally was that the patient was bluntly assaulted resulting in depressed left occipital comminuted skull fracture with associated cerebral contusion, subarachnoid hemorrhage and ipsilateral acute subdural hematoma. The additional facial injuries corroborate this conclusion.

It was professionally established beyond any doubt that there was no lodged intracranial foreign body and that gunshot injury to the brain was not the primary cause of death.

The radiologist’s report is a legal document [4]. Critical care professionals including emergency room physicians, neurologists and neurosurgeons are expected to have some appreciable knowledge of neuroimaging. In many institutions, the emergency room physicians initiate the treatment of patients based on their interpretation of radiographic images, including CT scan, which are then reviewed by a Radiologist [5]. A synergetic effort aimed at quick dispatch of reports should be adopted between the Accident and Emergency room and the Radiology department in order to achieve the overall benefit of the patient.

Though the analysis of neuroimaging examinations by non-radiologist health care professionals has been shown to steadily improve in recent years [6], areas of discrepancies with the Radiologist still occur however [7]. It has indeed been noted that the Radiologist always identified a greater number of changes than the Neurosurgeon for all pathologies studied [6]. Arising from their findings also, [8] discouraged the practice of neurosurgical registrars informally 'reporting' on emergency head CT scans due to discrepancies with the Radiologists’ report on the presence of subtle abnormalities. It is important that the input of a Radiologist be sought in establishing final diagnoses on radiological investigations for medico-legal reasons as in the index case.

Conclusion

A compressed choroid plexus on CT scan may lead to a false impression of intracranial foreign body in the face of suggestive history in a patient with traumatic head injury. A Radiologist’s report should always be sought in all imaging examinations in view of any medico-legal consequences.

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