SKULL RADIOGRAPH IN HEAD INJURIES

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SUMMARY

A total of 127 radiographs were studied. There were 55 positive findings. 30 of these showed pathological findings while 72 cases were negative and comprised both adult and paediatric patients' skull radiographs.

The authors concluded that skull radiography remains a very important diagnostic tool in management of head injury but should be requested for with certain guidelines in the text.

INTRODUCTION

A body of opinion believes that skull radiography is outmoded in the wake of contemporary radiology. We hope to study plain skull radiographs (PSR) and review of previous works in management of patients with head injury in contemporary imaging. Positive findings in head injury are characterized by various types of fractures. Subdural and intradural collections are not shown in PSR. Aerocoeles are seen in PSR. It is important to know the status of a fracture when it is seen on PSR. Changes in scalp fullness are recognized easily with bright light facilities. The fact that there should be a cut down on number of PSR does not mean that some other indications of PSR are ignored.

Certain features are peculiar to the skull, and one of them is that the skull bone does not produce periosteal reaction in response to injury.

Tress[1] advocates the importance of preliminary skull radiography prior to computed tomography. The authors were compelled to initiate this study because of the numerous apparently "unnecessary" and untimely requests of plain skull radiographs in this centre. Boulis et al[2] indicated that 44% of all skull radiography requests from the casualty department were made as a result of fear of legal repercussions. Bell and Loop[3] advocated that more stringent use of skull radiographs in trauma will increase yearly national savings.

However, it has been observed that clinicians faced with large numbers of patients in the casualty department depend on the presence or absence of a skull fracture to decide on the patient that actually requires admission.

Galbraith et al[4] are of the opinion that the presence of skull fracture is associated with a 200 fold increase in the risk of intracranial haematoma. These authors were worried by the fact that a reduction in skull radiography would result in more admissions thereby increasing cost.[5]

Jennet[6] is of the opinion that a patient who is restless and unfit to undergo skull radiography should not be discharged home.

The authors agree with Khalili[7] who believes that PSR is important in early management of head injuries and that this investigation should be deferred till the patient is fit for compliance. He presented certain guidelines required to select patients who genuinely needed PSR as follows:

Loss of consciousness or amnesia at any time, Neurological signs and symptoms, scalp bruise or swelling, suspected penetrating injuries, cerebrospinal fluid or blood from the nose or ear.

He went further to state that PSR carried out when the patient is restless or in a confused state is responsible for production of many poor quality films.

Hackney[8] in his study in 53 hospitals showed that 94% of them used skull radiographs routinely in spite of the availability of computerised tomography in those centres. Some workers in the United States and Britain however,

believe that a reduction in the routine use of skull radiographs in management of head injury would not increase the incidence of missing brain injury.[10-12] Loftstrom[13] from post mortem statistics showed that head injury is the most common cause of death in road traffic accident victims. The significant factor is the degree of damage to intracranial structures and not the fracture of the cranium itself. , Multiple fracture lines, linear, depressed, diastatic, compound, or craniofacial fractures are the different types of fractures that may arise in trauma to the skull. Linear fractures are usually radiolucent, sharp edged, do not branch and are not serrated like suture shadows. Depressed fractures are seen as bone condensation; linear or curvilinear when seen enface and as depression tangentially. A depression of more than 0.5cm along one edge of a depressed bone fragment indicates a dural tear.[13]

Diastatic fractures are diagnosed when there is more than 2mm in between two sutures. They are often unilateral and the change is abrupt.

Compound fractures in the basal or sinusoidal aspect of the skull are types of fractures which depend on radiography for diagnosis and clinical management. Clinicians depend greatly on their clinical signs in diagnosing head injury.

In craniofacial fractures, involving the air sinuses, signs of meningeal tear should be looked for as this is not uncommonly associated with this type of fracture. The causes of head injury include: fall from height, road traffic accident, assault, or birth injuries.

A study showed that road traffic accidents accounted for 46% of head injuries, falls from height (trees or balconies), 24%, and 13% from accidents at the play ground. Assaults accounted for 4% of head injuries while birth injuries were responsible for the remaining 2%.[14]

The authors appreciate that PSR is a preliminary requirement and an available efficacious tool in the management of head injury in view of newer imaging facilities.

MATERIALS AND METHOD

The cases were selected randomly from the University of Nigeria Teaching Hospital, National Orthopaedic Hospital and Hilltop clinics all in the city of Enugu, South Eastern zone of Nigeria.

Lateral and frontal skull views were used in most cases. Submentovertical or townes view were requested for in a few cases.

The cases which presented in the radiology department and sometimes the Accident and Emergency departments of the hospitals used were selected. The radiographs were routinely viewed with bright light facilities. Some of the patients (or their relations) were interviewed.

RESULTS

As shown in the tables and figures a total of 127 skull radiographs were studied.

55 had positive findings (43.3%). 30 of the 55 (54.5%, 23.6% of total) were specific for head injury. 72 of the 127 were negative (56.7%).

75 out of 127 cases of head injury were caused by road traffic accidents (59.1%).

Domestic injuries (injuries sustained by fall from heights e.g. palm trees, mango, cashew trees or storey buildings) were 27 (21.3% of head injuries). 5 Cases were as a result of assault (3.9% of head injuries). 4 cases of birth head injuries were recorded (3.1% of head injuries). Unclassified head injuries were 16 in number (12.6%).

Positive findings were as follows:

Changes in the scalp only 12 cases showed fullness (increased thickness) of the scalp.

Changes in the calvarium were 11 (fractures), 2 had radiological signs of osteomyelitis, copperbeaten appearance in the frontal bone of an adult skull, suture diastases in 2 cases.

A combination of scalp and calvarial changes were as follows;

2 cases of scalp fullness, fracture and osteomyelitis. In the remaining 4, incidental findings were seen. This comprised osteoporotic anterior and

posterior crinoids in 2 cases, frontal mucocoele in another case and prominent vascular grooves in the fourth skull radiograph.

The age distribution showed that in 48 cases (37.8%) their ages were not stated by the referring doctor. 36 cases (28.3%) were between the ages of 0-10 years. The age groups of 11-20 and 21-30 were both 13 in number. PSR of patients of 31-40 and 41-50 were 3 each while PSR of patients 51-60 and 60 and above were each 5 in number. The male: female sex incidence in this study was 2:1.

DISCUSSION

Only 4 patients received surgical intervention based on the radiological findings seen on PSR. Antibiotic therapy was omitted purposely since most patients with head injury received antibiotic therapy.

The male: female ratio of 2:1 may well be as a result of the more daring nature of the male species.

From the result of this study, skull radiograph is seen to be necessary in the investigation of fractures but should be guided by the following points. Suspicion of a fracture in the region of the middle meningeal artery, lateral sinus region or extending to the posterior fossa, involving sinuses, scalp laceration, over the petrous tempora, or a depressed fracture. The authors accept the suggestion by Bell and Loop that any of the following are useful in requesting for skull radiographs in trauma viz: Presence of foreign body, rhinorrhoea or otorrhoea, positive neurological findings. Leon Philips [12] included the following guidelines in his high yield criteria: Bilateral orbital ecchymosis (raccoon eyes) and Battles sign (haematoma over the mastoid process). The above high-yield criteria by different authors resulted in progressive reduction in negative yield. Initially, skull radiographs over a 9 month period without the high-yield criteria was 1472.[12] With uniform use of these criteria, PSR was reduced to 265. Bell and Loop[3] suggested that wasteful radiography should be avoided by guidelines like coma, unconsciousness or drowsiness, laceration of the scalp or in view of medico legal involvement-defensive medicine. They also proposed that it is for doctors not lawyers to determine what current practice is. It follows therefore, that lawyers can only criticise doctors for failing to carry out skull radiographs if doctors have reached a consensus about those circumstances in which skull radiographs should be carried out.[6] If no medical considerations exist to justify skull radiography in head injury it follows that no legal consideration should arise. Unfortunately, this is not the practice.

The authors believe that the above guides would reduce premature request of PSR as some of the patients are very restless and uncooperative when sent for PSR.

Tress[6] carried out a comparative study of computerized Tomography (CT) and PSR. He obtained a 60.6% positive yield in CT while PSR yielded 25% positive and this is comparable to the present study. In this case the high yield criteria were not used because if they had, the positive findings would have increased.

However, he still advocated a full skull series prior to CT if specifically requested for by a neurosurgeon. Zimmerman et al[18] claim that skull radiographs are unnecessary if computerized tomography (CT) is available since CT is reliable in detection of intracranial haematoma which PSR would not reveal.

The fact that there was as much as 30% positive yield is an encouraging result. Though the management of head injury depends a lot on clinical judgement, and not just PSR save when they have positive neurological findings or guidelines in the high yield criteria. PSR as an investigation is not just set out to show linear fracture because minor intracranial traumata should be included and will usually be the sinister pathology the patient will suffer from and not just the fracture. PSR is a prerequisite of more sophisticated imaging modalities like CT,MRI.PSR is also necessary when fracture is life threatening.

In Enugu, and most other Nigerian cities, CT is only partially available; one is left with PSR and occasionally Angiography for diagnoses.

CONCLUSION

With 30% yield, PSR is a valuable investigative tool but it is advised that the high yield criteria should be used to avoid waste. It is almost mandatory to use PSR prior to CT; Angiography etc.PSR should be done as a defence investigation to avoid embarrassmet[19].PSR remains a necessary valuable tool which should be used as an efficacious investigative modality.

Table 1: Age Distribution of Head Injuries

Age	Number
0-10	36
11-20	13
21-30	13
31-40	3
41-50	3
51-60	5
60 and above	5
Age unknown	48
Total	**127**

Table 2 Sex distribution of Head Injures

Sex	Distribution of Head
Male	89
Female	38
Total	**127**

Fig. 1: Distribution of Cases seen in a total of 127 Plain Skull Radiographs of patients with Head Injury

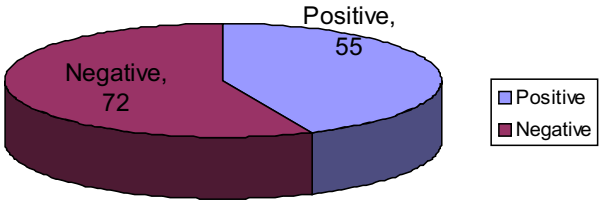


Fig. 2: Relevant Positive yield of PSR in 127 Cases

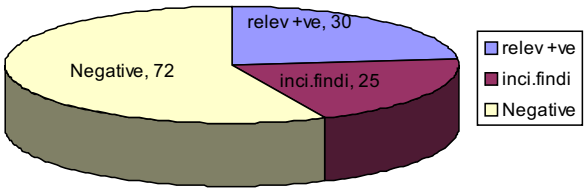
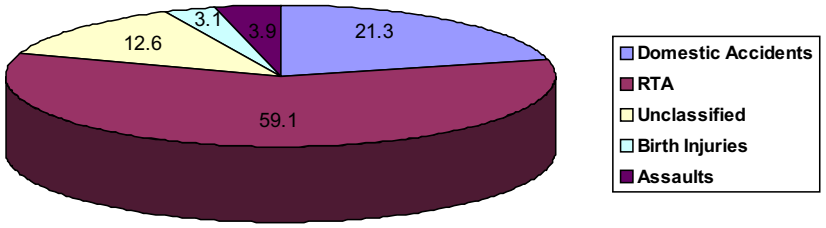


Fig. 3: Percentage Distribution of different causes of Head Injuries encountered in this study



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