



Role of the Multi Detector Computed Tomography Imaging For Traumatic Head Injury in Rural Area

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Abstract: The aim of emergency Multidetector CT Scan imaging is to detect treatable lesions (Bleed and Fracture) before secondary neurological damage occurs. CT Scan mostly plays a primary and secondary role in the acute setting of head trauma and fracture, allowing accurate detection of lesions requiring immediate neurosurgical treatment. CT Scan is also accurate in detecting secondary injuries in the brain and is therefore essential in follow-up. This Study discusses the main characteristics of primary and secondary brain injuries.

Aim and Objectives – The main objective of this study is that MDCT scan can detect head injuries like falling from the roof, accident, falling from a tree and getting head injury etc. Why is CT scan required at this time? Can this medical examination help in properly examining and treating various types of head injuries?

Methods – To complete this study, 60 patients who were suffering from head injury were taken from the Department of Radiology. Studies have been done on them. It took 2 years and 6 months to complete the study.

Result - MDCT is a very good scanning system. Patients benefit greatly from this. Due to good report, the patient can get good treatment, and the lives of hundreds of patients can be saved due to good and fast scanning.

Conclusion – MDCT scanning is faster than other scanning CT scans. There is very little radiation in this. Image quality is very good. Even small haemorrhages can be easily seen, hairline fractures can be easily seen. We can say that MDCT scan has proved to be very effective for trauma patients.

Keyword – *Emergency, Injury, Head, MDCT, Scan, Primary, Secondary etc.*

INTRODUCTION –

Traumatic head injury (THI) is a major health problem responsible for considerable mortality and long-term morbidity worldwide, particularly in people under 35 years of age. The incidence of traumatic brain injuries in India is approximately 1 million per year. Resulting in >54,000 deaths and >72,000 patients suffering permanent disability.

The main purpose of Multidetector CT scan emergency imaging is to detect treatable lesions before they cause secondary neurological damage (bleeding, head fractures and various types of hemorrhages , etc.).

CT scan is the main investigation in the evaluation of a patient with severe head injury. Which is the doctor's preferred imaging method. Because this test is quick, non-invasive and widely available, it has few contraindications. The advantages of CT scanning for the evaluation of head injuries include its high sensitivity for demonstrating acute intra-axial and extra-axial haemorrhage, mass effect, ventricular size, and bone fractures .This review discusses the role of imaging in head injury with a particular focus on CT scanning and outlines the main characteristics of primary and secondary brain injuries. We can say that CT scan examination is very beneficial in trauma, it makes it easier for the neurologist to do treatment and the patient also starts getting treatment immediately. And sometimes the lives of patients can be saved by adding treatment after this investigation.

Types of the Head Injury -

- ✓ Scalp injuries
- ✓ Bony cranium injuries
- ✓ Injuries to the cranial contents eg. brain
- ✓ Facial injuries & ocular injuries
- ✓ Ontological injuries
- ✓ Upper respiratory/GI tract injuries
- ✓ Cranio-cervical junction injuries etc.

Head Injury -

Broad and Inclusive Term

- Traumatic insult to the head that may result in injury to soft tissue, bony structures, and/or brain

Blunt Trauma

- more common
- Dura intact
- fractures, focal brain injury, DAI

Penetrating Trauma

- less common (Gun Shot Wound , most common)
- Dura and cranial contents penetrated
- fractures, focal brain injury
- Leading cause of mortality and morbidity
- Etiology associated with patient's age

Important ones are –

- Children – Abuse and Neglect
- Young Adults – Motor Vehicle Crashes
- Elderly Accident Falls

Epidemiology -

- 2,200 people /100,300/year attend hospital
- 302 of these get admission
- Prevalence of significant disability estimated at 150/100,000
- 4.2million head injuries in US per year
- ~ 451, 000 require hospitalization - Most are minor injuries
- Major head injury most common cause of trauma deaths in trauma centers (>50-05%)

- Age: 16-26years
- Sex: M:F ~ 3:2
- Causes: Road Traffic Accidents
- Falls
- Assault
- Sports
- Work eg. Mining
- Alcohol: ~ 50%

Classification of the Head Injury –

Cerebral lesions can be classified into Two part - primary and secondary.

Primary lesions - occur as a direct result of a trauma to the head and include scalp injuries , Skull fractures , extra-axial hemorrhage and intra-axial lesions.

Secondary - Brain injury occurs as a complication of primary lesions and includes ischemic and hypoxic damage, cerebral edema and brain Herniation's. Extra-axial hemorrhage includes epidural hematoma (EDH), subdural hematoma (SDH), and Subarachnoid (SAH) and Intraventricular (IVH) hemorrhage.

Scalp injuries- Laceration , Subgaleal hematoma , Cephalhematoma and Caput succedaneum .

Lacerations – Very vascular area , Can distract EMT from possible underlying injuries

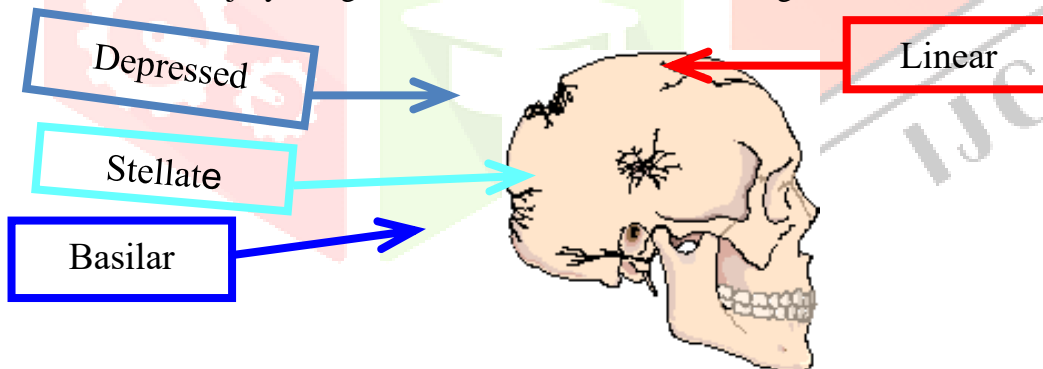
Care for laceration, but ask, “WHAT HAPPENED TO BRAIN AND NECK?” , Bleeding usually NOT severe enough to produce hypovolemic shock , If shock present, think about other injuries , Exceptions , Laceration that involves a large artery, Scalp injuries in children.

Caput Succedaneum - soft, superficial, pitting, hemorrhagic scalp edema , within the fibro fatty layer . Localized at the vertex associated with molding , self resolving .

Subgaleal Hematoma - Hyperdense fluid collection between galena aponeurotica and periosteal of calvarias that extends across suture lines

Cephalhematoma - Crescentic hyperdense subperiosteal collection confined to one bone .

Skull Fractures - Injury to rigid box around brain , Indicates significant force .



Structure of the Skull Fractures

Skull Fracture - 82% in parietal bones , **Simple linear fracture** - (m/c,82%) , single fracture line , extends either straight, jagged , or curved within a single bone . **Complex fractures** ≥ 1 fracture lines , may have branching's, can involve more than one bone by crossing sutures .

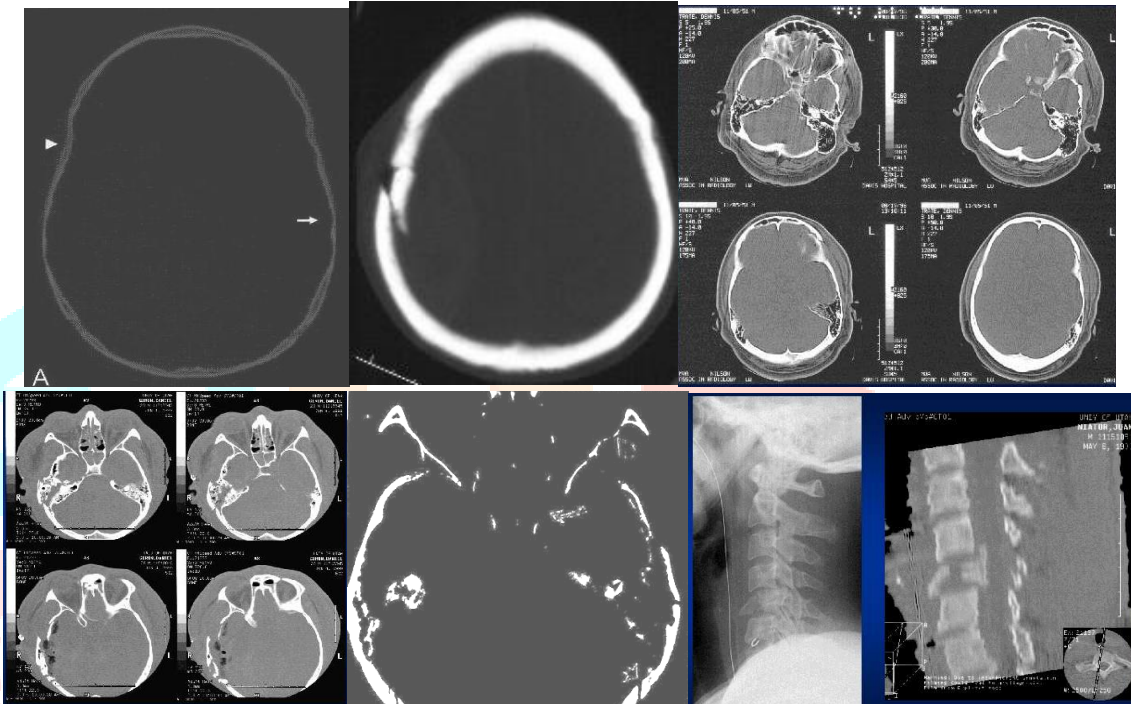
Comminuted fractures - more or more bone fragments. **Depressed fracture** - inward displacement (≥ 2 mm), dense line on plain x-ray. **Elevated fracture** outward , displacement (≥ 2 mm) , **Diastasis** - widened suture line with (> 3 mm) .

Basilar - Fractures in floor of skull , Diagnosis made clinically , Signs and symptoms

Perioral ecchymosis (Raccoon eyes) , Battle's sig , CSF drainage from nose, ears.



Identifying skull fractures - Perform X-ray of the skull , Correlate with head CT, clinical history & physical examination , Skull fractures may be missed on axial head CT images if fracture is parallel to the imaging plan , 3D reconstruction of Head CT useful . Standard skull radiographic series , Anteroposterior , lateral Towne Poster anterior, standard trauma series , skull radiograph , Cross-table lateral cervical spine radiograph , Chest radiograph , Pelvis radiograph .



Fracture – Bone Window and seen fracture on Axial Section
Significant Head Injury = Neck Injury Until Proven Otherwise

Material And Methods –The research was conducted in the Department of Radiodiagnosis , UPUMS with Collaboration District Hospital Etawah , U.P. in collaboration between 10 December 2023 to 11 April 2024 . All patients with Brain Injury who fit in the inclusion and Exclusion criteria were selected in the study .The patient's detail history was taken clinical examination was done and baseline investigation according to the Trauma protocol.

DISCUSSION - Emergency radiography with a Multidetector tomography machine sometimes results in faster radiography. Patients benefit greatly from Multidetector CT scanning. Radiation seems to be less. Even small fractures and bleeds can be easily seen. MDCT is very beneficial in accidents. By doing CT scan with this machine, axial, coronal and sagittal sections can be seen at once. Due to which the reporting of patients becomes faster, after fast reporting one can get fast treatment. We can tell from this study that MDCT is very good for patients.

RESULT - With Multidetector tomography the scan is very fast. Even the smallest fractures can be easily seen. There is a lot of benefit in scanning in trauma patients as the quality of the image appears good. The quality of pixels and voxels in the image also increases. Due to which even the smallest fractures and bleeds can be easily seen. Bleed can be measured quickly. Compared to spiral scanning, MDCT is a very good scanning system. Patients benefit greatly from this. Due to good report, the patient can get good treatment, and the lives of hundreds of patients can be saved due to good and fast scanning.

CONCLUSION – MDCT scanning is faster than other scanning CT scans. There is very little radiation in this. Image quality is very good. Even small haemorrhages can be easily seen, hairline fractures can be easily seen. We can say that MDCT scan has proved to be very effective for trauma patients.

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