

Role of repeat CT scan brain in mild to moderate head injury

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Abstract

OBJECTIVE: The goal of this study is to see the role of repeat CT Scan Brain in mild to moderate head injury

MATERIAL AND METHODS: A retrospective analysis of patients who were presented to the Neurosurgery Department at Hayatabad Medical Complex in Peshawar's emergency department (ED). The study comprised 1055 patients with a GCS of 8 or higher who received in-hospital medical care after an abnormal CT and had a repeat CT during their hospital stay. Details about the patient's demographics, medical history, and physical examination were gathered, as well as CT scans. The most common symptoms were radiological worsening, neurological deterioration, and/or the necessity for neurosurgical intervention.

RESULTS: During the three-year study period, 3456 patients with suspected head injury were presented to the emergency department, and 1055 of them met the inclusion criteria. The average patient age was 39.5 years, and 67.7% of the patients (n = 715) were men. A total of 2743 scans were performed on 1055 individuals, with an average of 2.6 scans per patient. All patients in our study group underwent a second (repeat) CT scan after the initial abnormal CT scan. The study group contained 95 patients (9.0%) with radiological deterioration, 40 patients (3.7%) with neurological deterioration, and 110 patients (10.4%) with neurosurgical intervention.

CONCLUSION: The role of repeat CT scan of the head is to detect early traumatic intracranial disease before neurological deterioration. This process will aid in prompt treatment and better outcomes.

KEY WORDS: Computed tomography Brain, Traumatic brain injury, repeat imaging.

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Introduction

Traumatic Brain Injury (TBI) is a non-degenerative, acquired insult to the brain resulting from an external mechanical force. This may be accompanied by loss or alteration of sensorium. It remains to be one of the leading causes of morbidity, mortality, and economic losses worldwide.¹

Detecting life-threatening intracranial hemorrhage and skull fractures, as well as preventing and minimizing secondary brain injury from hypoxia, poor cerebral perfusion, cerebral bleeding, hypoglycemia, seizures, and fever, are all important goals in the care of any head

injury.²

The annual incidence of head injury in Pakistan has been estimated as 50/100,000 population based on data from public sector hospitals⁽³⁾. For patients with physical trauma and a suspected head injury, computed

tomography (CT) is the conventional initial diagnostic tool. Patients are admitted to the hospital after a CT scan reveals an intracranial abnormality, for observation, monitoring, and maybe medicinal and surgical treatment for severe injuries.³ The repeat CT scan is obtained to assess for the progression of injury with the expectation that a radiographic change alone might lead to a medical or surgical intervention.^{5,6}

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Several adult studies have cast doubt on the need for routine CT in mild and moderate TBI patients. In severe TBI, the request for a routine CT may be driven by the lack of improvement in neurologic status or inability to clinically assess neurologic status. However, in patients with mild-to moderate TBI and reliable neurologic examination, routine may not provide any additional information. Moreover, there are no current accepted standards or guidelines on the question of whether repeat CT scan of the head should be performed routinely⁽⁷⁾⁽⁸⁾⁽⁹⁾

The goal of this study was to see how useful repeat CT imaging is in individuals who have had a mild to moderate head injury and have been treated medically. We also investigated the factors linked to radiological development that could indicate the need for neurosurgical intervention.

Material and Method

A retrospective study of patients presenting to the emergency department (ED) at Neurosurgery Department Hayatabad Medical Complex, Peshawar with suspected head injury from February 2018 to January 2020. The study group included 1055 patients having GCS >8 and who underwent in-hospital medical management after initial abnormal CT and underwent repeat CT during their hospital stay. Patients who underwent surgery soon after their first CT scan were omitted from the study. Patients who had a normal CT scan, an initial abnormal CT scan with minimal injuries, isolated subarachnoid hemorrhage (SAH), isolated cranial vault fractures, and faciomaxillary injuries without intracranial injury, as well as those who had their first scan more than 72 hours after the injury, were also excluded.

Neurological worsening, radiological deterioration, and/or the requirement for neurosurgical intervention were the key outcome factors.

All the individuals in the study had their medical records and CT images evaluated. Age, sex, mode of injury, and time of injury were all variables extracted from case files. The initial CT scan and subsequent CT scans were investigated for worsening of the lesion, the formation of a new lesion, increased midline shift, mass effect, effacement of the basal cisterns, SAH, and a variety of other abnormalities. Demographic variables were analyzed using Software SPSS Version 20.0 and Categorical variables were analyzed using the chi-square and Fisher's exact tests. The student t-test was

used to assess numerical data. For all comparisons, statistical significance was retained at $P < 0.05$.

Results

During the three-year study period, 3456 patients with suspected head injury were presented to the emergency department, and 1055 of them met the inclusion criteria (Fig. 1). The average patient age was 39.5 ± 16 years, and 67.7% of the patients ($n = 715$) were men. Table 1 contains the rest of the demographic information. At the time of admission, the median GCS score was 14. The average time from injury to first CT scan was 6.9 ± 9.3 (7 hours).

For 1055 patients, a total of 2743 scans were done, with an average of 2.6 scans per patient. After the initial abnormal CT scan, all patients in our study group had a second (repeat) CT. Three hundred and eighteen patients (30.0%) received a third CT scan, and 178 (16.8%) received additional scans before being discharged or having one of the primary outcomes.

The study group contained 95 patients (9.0%) with radiological deterioration, 40 patients (3.7%) with neurological deterioration, and 110 patients (10.4%) with neurosurgical intervention. 85 patients had surgery after their repeat CT showed progression without neurological impairment.

variables	values
Male	15(67.7%)
Female	340(32.2%)
AGE	
< 18 years	226(21.4%)
18-60 years	560(53%)
>60 year	269(25.4%)
MODE OF TRAUMA	
Road Traffic Accident	755(71.5%)
Fall	180(17%)
Assault	64(6%)
Others	35(3.3%)
GCS	
Mean GCS score at admission	13.23 ± 2.46
Mild Head injury	630(59.7%)
Moderate Head Injury	425(40.28%)
Mean time to initial scan	6.9 ± 9.3 hrs (7hours)
Interval between first and second scan	10.6 ± 5.8
Total number of scans	3.55 ± 0.9
CT FINDINGS	
SAH	164(15.5%)
contusion	228 (21.6%)

Diffuse Axonal Injury	169(16%)
intraventricular hemorrhage	69(6.5%)
EDH	313((29.6%)
Acute subdural hematoma	112(10.6%)
NEUROLOGICAL DETERIORATION	40(3.7%)
RADIOLOGICAL DETERIORATION	95(9%)
NEUROSURGICAL INTERVENTION	110(10.4%)

Discussion

The goal of TBI treatment is to prevent further neurological insult through medicinal or surgical intervention, which corresponds to less neurological deterioration. The first diagnostic technique utilized to evaluate individuals with a suspected head injury is the computed tomography (CT) scan.^{3,10} Neurosurgical intervention, if needed, lowering of intracranial pressure (ICP), and prevention of hypotension and hypoxia are among the treatments for TBI patients.¹⁰

Patients who present to the ED with a negative head CT scan, no obvious neurological deficits, and a GCS score of 15 can be discharged. Patients who have had an abnormal initial head CT scan and are being treated medically are subjected to routine neurological examination. Patients with neurological deterioration have a second head CT scan and may need neurosurgical intervention.¹¹

Routine repeat head CT has been proven to be effective in a few studies.^{12,4,13} According to Geeraerts T, Velly L, Abdennour L, et al, 37 percent (n = 22) of adult patients with GCS scores greater than 7 required surgical intervention due to radiological progression without neurological decline. On average, 17.25 hours passed between the first and second head CT scans. similar results were displayed in our study.¹⁴

Few studies, on the other hand, have questioned the use of repeat CT scans in neurologically stable patients.¹⁵⁻¹⁶ In a study by Van Ornam et al⁽¹⁶⁾ Only three patients with traumatic intracranial bleeding and GCS scores > 12 had neurosurgical surgery due to worsening of repeat CT without neurological impairment. In our study 95 patients (9.0%) in the study group had radiological deterioration, 40 patients (3.7%) had neurological deterioration, and 110 patients (10.4%) received a neurosurgical procedure (at a mean of 33.00 hours). Similar results were produced by Antoni A, Schwendenwein E et al. in 2019 and Velmahos GC, Gervasini A, Petrovick L, et al in 2006.^{16,17}

Conclusion

Patients with a lower GCS at admission, a midline shift, effaced basal cisterns, or multiple lesions on the initial CT scan should have a repeat scan to detect early traumatic intracranial disease before neurological deterioration. This method will help to speed up treatment and, as a result, improve clinical outcomes.

Conflict of Interest: No

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