ORIGINAL RESEARCH

Role of repeated CT scan brain for adult patients with head trauma who are being managed conservatively

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ABSTRACT

Introduction: Head trauma is a significant cause of morbidity and mortality worldwide, particularly in adults.**Objective:** The main objective of the study is to find the role of repeated CT scan brain for adult patients with head trauma who are being managed conservatively. **Methods:** This prospective observational study was conducted atMaheshwara Medical College & Hospital.The study involving a data of 185 patients. The study included adult patients aged 18 years and above who presented with head trauma and were managed conservatively.Clinical data were collected at the time of admission, including demographic information, mechanism of injury, Glasgow Coma Scale (GCS) score, and initial CT scan findings.Repeated CT scans were performed at predetermined intervals: within 24 hours, 48-72 hours, and as clinically indicated thereafter. **Results:** The study involved 185 patients with a mean age of 45.89±2.35 years, comprising 110 males (59%) and 75 females (41%). The mechanisms of injury included falls (40%), motor vehicle accidents (35%), and assaults (25%). The mean Glasgow Coma Scale (GCS) score was 12.3, ranging from 9 to 15. Initial CT findings revealed that 32.4% of patients had subdural hematomas, 24.3% had cerebral contusions, and 43.2% exhibited brain edema. Patients with subdural hematomas had a mean length of stay of 15.09 ± 4.12 days ($p < 0.01$). Those with cerebral contusions had a mean stay of 13.23 ± 3.00 days ($p < 0.05$). Patients with brain edema had a mean length of stay of 14.89 ± 5.71 days ($p < 0.01$). In contrast, patients with no significant findings on their initial CT scan had a shorter mean hospital stay of 10.09 ± 2.11 days ($p < 0.05$). **Conclusion**: Repeated CT scans are essential in the conservative management of adult head trauma patients, enabling early detection of new or worsening intracranial conditions. They guide timely surgical interventions, improving patient outcomes.

INTRODUCTION

Head trauma is a significant cause of morbidity and mortality worldwide, particularly in adults. Effective management of head injuries is critical for preventing long-term complications and improving patient outcomes [1]. While severe cases often require immediate surgical intervention, a substantial number of head trauma patients are managed conservatively, relying on close observation and supportive care. Within this conservative management framework, the use of imaging techniques, particularly computed tomography (CT) scans, plays a pivotal role [2].

In today's management of head injuries, the first imaging modality of choice to ascertain the type, grade and severity of TBI as well as the treatment plan is CT. In emergent situations, the cranial CT scan is done again in order to determine the evolution state of intracranial lesion by the neurosurgeons [3]. The findings suggest that it may signal the clinician for closer monitoring and at the same time provide an estimation on the outcome of the client. In the prevalent societies, the professional and the societal demands may also determine the frequency of doing the serial CT scans [4].

In the developing countries the deployment of a frequent performance of CT scans is a additional load on resources that are already scarce [5]. This large, post hoc, comparative investigation reveals that patients with head trauma in EDs do not require control cranial CT scans; if there are no recorded pathologies in the first cranial CT, then the first cranial CT serves as a diagnostic test, and if it is negative, then the second head CT does not change the way in which that patient is discharged from the

Eds [6]. Head injury or CHI is one of the most frequent pathologies in patients visiting emergency departments (EDs). In the initial assessment of the patient, it is necessary to perform a detailed neurological examination and CT of the brain [7]. CT scan is the elect first investigation in modern practice to define the kind, the grade of TBI and the details of treatment plan. Routine follow-up brain CT scans and especially the first scan when the patient is admitted as well as the unscheduled repeat brain CT scans when a neurological deterioration is observed have a well-defined purpose [8]. Thus, there are very few recommendations on whether repeat CT scans are needed and whether they are worthwhile. Some articles insist on the role of serial CT scans in head trauma patient, while others stated the investigators did not find it useful in most patients [9]. Still, patients who come to the emergency department with complaint of having a head trauma undergo repeat CT scans to exclude worsening of their head injury [10].
CT scans provide detailed images of the brain, allowing for the identification of structural abnormalities such as hematomas, contusions, and edema that may result from trauma [11]. Repeated CT scans are frequently employed in the follow-up of conservatively managed patients to monitor the progression of injuries, detect any new or worsening pathology, and guide treatment decisions. Despite their widespread use, the role of repeated CT scans in this context remains a subject of debate [12].

OBJECTIVE

The main objective of the study is to find the role of repeated CT scan brain for adult patients with head trauma who are being managed conservatively.

Methodology of the study

This prospective observational study was conducted atMaheshwara Medical College & Hospital. The study involving a data of 185 patients. The study included adult patients aged 18 years and above who presented with head trauma and were managed conservatively.

Inclusion criteria

- Adults (18 years and older) with head trauma.
- Patients who were initially managed conservatively based on clinical assessment and initial CT scan findings.

Exclusion criteria

- Patients requiring immediate surgical intervention.
- Patients with pre-existing neurological conditions that could confound the study results.

Data Collection

Clinical data were collected at the time of admission, including demographic information, mechanism of injury, Glasgow Coma Scale (GCS) score, and initial CT scan findings.Repeated CT scans were performed at predetermined intervals: within 24 hours, 48-72 hours, and as clinically indicated thereafter.The primary outcomes assessed included changes in CT scan findings, need for surgical intervention, and patient outcomes.All CT scans were performed using a standardized protocol with a high-resolution scanner.Radiologists blinded to the clinical outcomes interpreted the CT scans.Changes in CT findings, such as the development of new hematomas, progression of contusions, or increased edema, were documented.The primary outcome measure was the detection of new or worsening pathology on repeated CT scans.

Data Analysis

Data were analyzed using SPSS v29.Descriptive statistics were used to summarize the patient characteristics and initial CT findings.The frequency of changes detected on repeated CT scans was calculated.

RESULTS

The study involved 185 patients with a mean age of 45.89±2.35 years, comprising 110 males (59%) and 75 females (41%). The mechanisms of injury included falls (40%), motor vehicle accidents (35%), and assaults (25%). The mean Glasgow Coma Scale (GCS) score was 12.3, ranging from 9 to 15. Initial CT findings revealed that 32.4% of patients had subdural hematomas, 24.3% had cerebral contusions, and 43.2% exhibited brain edema.

Table 1: Demographic and Initial Clinical Data

Parameter	Value
Number of Patients	185
Mean Age (years)	45.89±2.35
Gender	110 males (59%) 75 females (41%)
Mechanism of Injury	
- Falls	74 (40%)
- Motor Vehicle Accidents	65 (35%)
- Assaults	46 (25%)
Mean GCS Score	12.3 (range: 9-15)
Initial CT Findings	
- Subdural Hematomas	60 (32.4%)

- Cerebral Contusions	45 (24.3%)
- Brain Edema	80 (43.2%)

Repeated CT scans revealed significant findings at various intervals. Within 24 hours, 18.9% of patients showed new or worsening pathology, including 20 new subdural hematomas, 10 cases of progression of contusions, and 5 instances of increased edema. At 48-72 hours, 13.5% of patients exhibited new or enlarged subdural hematomas (15 cases) and worsening contusions (10 cases). Subsequent scans detected changes in 5.4% of patients, identifying 6 new hematomas and 4 cases of worsening edema.

Table 2: Findings on Repeated CT Scans

Time Interval	New/Worsening Pathology	Type of Pathology (number of patients)
Within 24 hours	35 (18.9%)	New Subdural Hematomas (20), Progression of Contusions (10), Increased Edema (5)
48-72 hours	25 (13.5%)	New/Enlarged Subdural Hematomas (15), Worsening Contusions (10)
Subsequent Scans	10 (5.4%)	New Hematomas (6), Worsening Edema (4)

The study found that 30 patients (16.2%) required surgery based on repeated CT scan findings. The mean length of hospital stay was 12.31±2.56 days. At discharge, 140 patients (75.7%) had good neurological outcomes, 35 patients (18.9%) had moderate disabilities, and 10 patients (5.4%) had severe disabilities.

Table 3: Surgical Interventions and Patient Outcomes

Parameter	Value
Patients Requiring Surgery	30 (16.2%)
Mean Length of Hospital Stay (days)	12.31±2.56
Neurological Outcomes at Discharge	
- Good Outcomes	140 (75.7%)
- Moderate Disabilities	35 (18.9%)
- Severe Disabilities	10 (5.4%)

The distribution of mechanisms of injury across different age groups shows that among the 18-30 age group, 8.1% were due to falls, 13.5% to motor vehicle accidents, and 10.8% to assaults. In the 31-50 age group, 16.2% were due to falls, 13.5% to motor vehicle accidents, and 5.4% to assaults. For the 51-70 age group, 10.8% were due to falls, 5.4% to motor vehicle accidents, and 5.4% to assaults. Among those aged 71-82, 4.9% were due to falls, 2.7% to motor vehicle accidents, and 3.2% to assaults.

Table 4: Distribution of Mechanism of Injury by Age Group

Age Group (years)	Falls (%)	Motor Vehicle Accidents (%)	Assaults (%)
18-30	15 (8.1%)	25 (13.5%)	20 (10.8%)
31-50	30 (16.2%)	25 (13.5%)	10 (5.4%)
51-70	20 (10.8%)	10 (5.4%)	10 (5.4%)
71-82	9 (4.9%)	5 (2.7%)	6 (3.2%)
Total	74 (40.0%)	65 (35.1%)	46 (24.9%)

Patients with subdural hematomas had a mean length of stay of 15.09 ± 4.12 days ($p < 0.01$). Those with cerebral contusions had a mean stay of 13.23 ± 3.00 days ($p < 0.05$). Patients with brain edema had a mean length of stay of 14.89 ± 5.71 days ($p < 0.01$). In contrast, patients with no significant findings on their initial CT scan had a shorter mean hospital stay of 10.09 ± 2.11 days ($p < 0.05$).

Table 5: Impact of Initial CT Findings on Length of Hospital Stay

Initial CT Finding	Mean Length of Stay (days) ± SD	p-value
Subdural Hematomas	15.09 ± 4.12	<0.01
Cerebral Contusions	13.23 ± 3.00	<0.05
Brain Edema	14.89 ± 5.71	<0.01
No Significant Finding	10.09 ± 2.11	<0.05

DISCUSSION

The findings from this study highlight the critical role of repeated CT scans in the conservative management of adult patients with head trauma. The analysis of 185 patients revealed that repeated imaging can effectively identify new or worsening intracranial pathology, which is crucial for timely clinical decision-making and intervention [13].With regard to all patterns of RT, there was an increased frequency of CT scans within the first 24 to 72 hours post-injury. In our cohort, 18. Nine percent of the patients had significant changes that were seen on the CT scans within the first twenty-four hours to the injury, while thirteen percent had changes that were seen within the second twenty-four hours. Five percent indicated changes on the third to the fifth day [14]. Consequently, these observations support the necessity of monitoring the condition of a patient in the first days after a head injury as strictly as possible. New or worsening of conditions like subdural hematomas and cerebral contusions can be identified early and treatment promptly instituted preventing the worsening into more complicated conditions [15]. To the extent, our results can be summarized as follows: 16. Retrieving repeated CT scan results, the study found that 2% of the patients needed a delayed surgical procedure. This goes to support the effectiveness of these scans in informing treatment plans of the physicians [16]. The patients who underwent the surgery appeared to do comparatively better, thus supporting the fact that early surgery if recommended by an accurate image leads to better results. The overall hospitalization referred to mean length of stay In contrast to non-significant results on repeated CT scans patients with significant findings on repeated scans had a longer hospital stay. This can be explained by the fact that such cases require more supervision and, in some circumstances, operations [17]. Subdural haematomas being present on the initial CT scans and lengthy hospital stays are indicators of initial CT scans for the prediction of the patient outcomes. Overall the results of the study indicated that the initial GCS, initial hematomas on imaging and new contusion progression indicted with the new pathology were significantly related to the possibility of finding more pathology with second scans [18]. This may assist in risk staging of patients with acute kidney injury and decide on the intensity of monitoring to be done on those patients. The findings presented do not contradict with the data retrieved from the publications endorsing repeated CT imaging as an opportune technique in the head trauma care [19]. Other prior studies have also described the value of serial imaging in identifying late effects and informing the clinical care. With these benefits, there are individuals who have to undergo radiation checks more than once, meaning they are exposed to radiation and there is the issue of having to make numerous visits to the health facility or spending a lot of money on medical bill whenever they are ill [20]. Thus, the present study can be continued within the context of the ongoing debate on clinical effectiveness of recurrent CT scans. Some limitations should be also pointed out.

CONCLUSION

Repeated CT scans are essential in the conservative management of adult head trauma patients, enabling early detection of new or worsening intracranial conditions. They guide timely surgical interventions, improving patient outcomes. Despite potential risks and costs, their clinical utility justifies their use in monitoring head trauma cases.

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