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Does Routine Repeat CT at 24 and 48 Hours Alter Management in Clinically Stable Mild and Moderate Head Injury? A Prospective Observational Study

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Abstract

Background*: Computed tomography (CT) is central to the evaluation of traumatic brain injury (TBI). While repeat CT imaging is routinely recommended in severe head injury, its role in clinically stable mild and moderate TBI remains controversial, particularly in the absence of neurological deterioration.*

Methods: *This prospective observational study included 177 adult and pediatric patients with mild (Glasgow Coma Scale [GCS] 13–15) and moderate (GCS 9–12) head injury who remained clinically stable. CT brain was performed at admission, followed by routine repeat CT at 24 hours and selective repeat CT at 48 hours. Radiological progression, impact on medical or surgical management, and outcomes were analyzed.*

Results: *Radiological lesion progression without neurological deterioration was observed in 30 patients (16.9%). Repeat CT at 24 hours detected lesion enlargement in 25 patients (14.1%), while repeat CT at 48 hours detected progression in an additional 5 patients. Overall, repeat CT resulted in a change in management in 18 patients (10.2%), including surgical intervention in 13 patients (7.3%) and escalation of medical therapy in 5 patients (2.8%). Most management changes were prompted by the 24-hour repeat CT. Favorable outcomes (Glasgow Outcome Scale 4–5) were observed in 87% of patients.*

Conclusion: *Routine repeat CT imaging at 24 hours, with selective imaging at 48 hours, can detect clinically silent but significant lesion progression and influence management in a meaningful proportion of clinically stable mild and moderate head injury patients.*

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Introduction

Traumatic brain injury (TBI) is a major cause of mortality, morbidity, and long-term disability worldwide, with a disproportionately high burden in low- and middle-income countries such as India [1]. The majority of patients presenting with head injury fall into the mild and moderate categories based on the Glasgow Coma Scale (GCS), accounting for nearly 70–80% of all TBI cases [2].

Computed tomography (CT) of the brain is the investigation of choice in acute head injury due to its rapid acquisition, widespread availability, and high sensitivity for detecting intracranial hemorrhage [3]. The role of the initial CT scan in guiding management is well established. However, the utility of routine repeat CT imaging in clinically stable mild and moderate head injury patients remains controversial. Current guidelines emphasize repeat imaging primarily in patients with neurological deterioration, while offering limited direction regarding asymptomatic or clinically stable patients [4].

Secondary brain injury following trauma is a dynamic process involving hemorrhagic progression of contusions, delayed hematoma expansion, cerebral edema, and evolving mass effect [5]. These changes may occur without obvious clinical deterioration, particularly in patients who are elderly, pediatric, sedated, or unable to reliably report symptoms [6]. Reliance solely on clinical examination may therefore delay detection of potentially treatable intracranial pathology.

Several studies have questioned the value of routine repeat CT in mild head injury due to low rates of management change and concerns regarding radiation exposure and cost [7,8]. Conversely, other investigations have demonstrated radiological progression and the need for intervention even in neurologically stable patients [9-11]. Much of the existing literature is retrospective, heterogeneous, or includes patients with neurological deterioration, limiting definitive conclusions.

In resource-limited settings, where invasive intracranial pressure monitoring and continuous neuromonitoring are not universally available, repeat CT imaging may serve as a pragmatic tool for early detection of secondary injury. This prospective observational study was undertaken to evaluate the role of routine repeat CT brain scans performed at 24 and 48 hours in clinically stable patients with mild and moderate head injury, with particular emphasis on radiological progression, impact on management, and short-term outcomes.

Materials and Methods

Study Design and Setting

This prospective observational study was conducted at a tertiary care referral center with dedicated neurosurgical emergency services, neuro-intensive care, and operative facilities.

Study Population

All adult and pediatric patients presenting with mild (GCS 13–15) and moderate (GCS 9–12) traumatic brain injury were screened.

Inclusion Criteria

GCS ≥9 at presentation
Mild or moderate head injury
Initial CT brain performed
Clinical stability without neurological deterioration

Exclusion Criteria

Severe head injury (GCS ≤8)
Immediate surgical indication on initial CT
Neurological deterioration within first 24 hours
Severe systemic injuries
Bleeding diathesis or major medical comorbidities
Presentation >20 hours after injury without CT
Alcohol-intoxicated patients who recovered fully before repeat imaging

Clinical Monitoring

Patients underwent structured neurological assessment and vital monitoring at 3-hour intervals. Indicators of deterioration included drop in GCS, pupillary asymmetry, worsening headache, vomiting, focal deficits, or signs of raised intracranial pressure.

Imaging Protocol

Initial CT brain was performed after hemodynamic stabilization. Routine repeat CT was performed at 24 hours in clinically stable patients. A second repeat CT at 48 hours was performed selectively based on imaging progression or clinical judgment.

Criteria for Intervention

Surgical intervention was undertaken for:
Acute SDH >1 cm
EDH >30 cc (supratentorial) or >15 cc (infratentorial)
Contusion >30 cc
Midline shift >5 mm
Escalation of medical management included intensified anti-edema therapy.

Outcome Assessment

Outcome was assessed at discharge using the Glasgow Outcome Scale (GOS).
Statistical analysis Data were analyzed using SPSS version 30. Descriptive statistics were used. A p value <0.05 was considered statistically significant.

Results

A total of 177 patients were included. The majority were males (72.9%), with the highest incidence in the 21–30-year age group. Road traffic accidents accounted for 72.3% of injuries. Mild head injury was present in 84.7% and moderate head injury in 15.3%.

Initial CT demonstrated mixed lesions in 49.7% of patients, followed by contusions (18.6%), SAH (13.6%), SDH (10.2%), and EDH (6.2%).
On repeat CT at 24 hours, lesion enlargement was observed in 25 patients (14.1%), while 73.4% showed no change. At 48 hours, among 56 rescanned patients, 5 (8.9%) demonstrated lesion progression.

Overall, repeat CT imaging resulted in a change in management in 18 patients (10.2%), including surgical intervention in 13 patients (7.3%) and escalation of medical management in 5 patients (2.8%). Most management changes (55.6%) were based on 24-hour repeat CT findings.

At discharge, favorable outcomes (GOS 4–5) were seen in 87% of patients. Mortality was 3.4%.

Discussion

This prospective study demonstrates that routine repeat CT imaging in clinically stable mild and moderate head injury patients can identify clinically silent lesion progression and lead to meaningful changes in management. Radiological progression without neurological deterioration was observed in 16.9% of patients, and management was altered in over 10%, including timely surgical intervention.

These findings align with studies by Ramesh et al. and Lee et al., who reported management changes following repeat CT imaging [9,10]. In contrast, studies reporting low utility of repeat CT often included predominantly mild head injury patients or relied solely on clinical deterioration to trigger imaging [7,8].

The majority of clinically significant changes were detected on the 24-hour repeat CT, supporting its role as a critical time point for reassessment. However, a smaller proportion of patients demonstrated progression at 48 hours, justifying selective second-stage imaging.

In the Indian context, where continuous neuromonitoring may not be universally available, repeat CT offers a practical and accessible method for early detection of secondary brain injury.

Limitations

Single-center design and lack of long-term follow-up are limitations. Cost-effectiveness and radiation exposure were not formally assessed.

Conclusion

Routine repeat CT at 24 hours, with selective imaging at 48 hours, can detect clinically silent lesion progression and influence management in clinically stable mild and moderate head injury patients. A selective, risk-based repeat CT strategy may help prevent secondary brain injury in resource-limited settings.

Declarations

Ethical considerations

This was an observational study based on standard clinical management. No additional interventions were performed for research purposes. Patient confidentiality was maintained.

Financial support and sponsorship - Nil.

Conflicts of Interest - None.

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