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EVALUATION OF MIDLINE SHIFT AND BASAL CISTERN EFFACEMENT ON COMPUTED TOMOGRAPHY AS PREDICTORS OF OUTCOME IN TRAUMATIC BRAIN INJURY

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ABSTRACT Traumatic Brain Injury (TBI) remains a major contributor to global morbidity and mortality. Rapid and reliable prognostic markers are essential for effective clinical management. **Objectives:** To evaluate the prognostic value of Midline Shift (MLS) and Basal Cistern Effacement (BCE) on initial Computed Tomography (CT) scans in patients with TBI. **Methods:** A prospective observational study was conducted on patients presenting with TBI. CT parameters, including the degree of MLS and the status of basal cisterns (categorized as normal, compressed, or obliterated), were correlated with clinical outcomes using the Glasgow Coma Scale (GCS) at admission and Glasgow Outcome Scale (GOS) at discharge. **Results:** An MLS >10 mm was associated with poor outcomes in 75% of cases. Complete obliteration of basal cisterns was a strong predictor of mortality, whereas patients with normal cisterns consistently demonstrated favorable outcomes. **Conclusion:** The combination of MLS and BCE provides a simple, rapid, and reliable tool for predicting outcomes and guiding early management in patients with TBI.

KEYWORDS : Traumatic Brain Injury, Computed Tomography, Midline Shift, Basal Cistern Effacement, Prognosis, Glasgow Outcome Scale

INTRODUCTION

Traumatic Brain Injury (TBI) is a significant public health concern requiring prompt diagnostic intervention to reduce long-term neurological deficits and mortality. Computed Tomography (CT) is the gold standard for the initial assessment of acute head trauma due to its rapid acquisition and wide availability. Among various radiological indicators, Midline Shift (MLS) and Basal Cistern Effacement (BCE) are particularly important.

MLS serves as a direct indicator of mass effect and possible brain herniation, while the status of the basal cisterns provides an indirect but reliable assessment of intracranial pressure (ICP). This study evaluates the role of these CT markers in predicting patient outcomes and aiding clinical decision-making.

Aims and Objectives

The objectives of this study were:

1. To quantify the degree of midline shift in patients with acute TBI.
2. To categorize basal cistern status into three groups: normal, compressed, and obliterated.
3. To determine the correlation between CT findings and clinical outcomes using the Glasgow Coma Scale (GCS) at admission and Glasgow Outcome Scale (GOS) at discharge.

MATERIALS AND METHODS

This observational study included 13 adult patients who underwent CT imaging within six hours of sustaining traumatic brain injury.

Inclusion Criteria

- Adult patients with acute TBI
- Availability of initial CT scan

Exclusion Criteria

- History of prior neurosurgical procedures
- Known congenital intracranial anomalies

Imaging Evaluation

- Midline shift (MLS) was measured at the level of the foramen of Monro as the perpendicular distance between the displaced septum pellucidum and the mid-sagittal line.
- Basal cisterns (including suprasellar and perimesencephalic cisterns) were assessed and categorized qualitatively as normal, compressed, or obliterated.

Outcome Measures

Clinical status was assessed using GCS at admission, and outcomes were evaluated using GOS at discharge. GOS scores of 4–5 were considered good outcomes, while scores of 1–3 were considered poor outcomes.

RESULTS

Table 1: Correlation of CT Findings with Clinical Outcomes

Patient	MLS (mm)	Basal Cisterns	GCS (Admission)	GCS (Discharge)	GOS	Out-come
1	3	Normal	13	15	5	Good
2	6	Compressed	10	13	4	Good
3	12	Obliterated	6	7	2	Poor
4	4	Normal	14	15	5	Good
5	8	Compressed	9	11	3	Poor
6	2	Normal	15	15	5	Good
7	11	Obliterated	7	6	1	Poor (Death)
8	5	Compressed	11	13	4	Good
9	14	Obliterated	5	6	1	Poor (Death)
10	7	Compressed	12	14	4	Good
11	3	Normal	13	15	5	Good
12	9	Compressed	8	10	3	Poor
13	10	Obliterated	7	8	2	Poor

Key Findings:

- Midline shift (MLS) >10 mm was associated with poor outcomes in 75% of cases (3 out of 4 patients).
- All patients with obliterated basal cisterns had poor outcomes, including mortality.
- All patients with normal basal cisterns demonstrated good outcomes (GOS 5).
- Patients with compressed cisterns showed variable outcomes.

DISCUSSION

The present study highlights the importance of early CT-based radiological parameters in predicting outcomes in traumatic brain injury. Midline shift reflects the degree of mass effect and risk of brain herniation, while basal cistern effacement serves as an indirect marker of raised intracranial pressure.

The combination of increased MLS and obliterated basal cisterns was associated with poor clinical outcomes, emphasizing their role as complementary prognostic indicators. These observations are in concordance with established literature, reinforcing the prognostic value of CT-based parameters in acute neurotrauma.

Given their simplicity and rapid assessment, these parameters are highly useful in emergency settings for early triage and management decisions.

CONCLUSION

Midline Shift and Basal Cistern Effacement are highly reliable CT-based predictors of mortality and morbidity in Traumatic Brain Injury. Given their ease of assessment and high prognostic value, these markers should be systematically included in all emergency radiology reports for TBI. Utilizing these indicators can significantly enhance the speed and accuracy of clinical decision-making.

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