

Ischemia and Seizures Negatively Impact Neurorecovery After Traumatic Brain Injury



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Introduction

- Trauma is the leading cause of pediatric morbidity and mortality in the United States.
- Traumatic brain injury (TBI) frequently leads to inpatient rehabilitation (IPR), which aims to restore functional independence through a multidisciplinary approach ¹.
- Initial management of TBI is well-documented, but less is known about neurorecovery after severe TBI ².
- The Pediatric Functional Independence Measure (WeeFIM) is used to quantify functional severity and intervention effectiveness ¹.
- This study focuses on neurorecovery in pediatric patients with severe TBI, evaluating cognition, mobility, and self-care outcomes.

Methods

- Retrospective chart review of trauma patients ≤18 years old admitted to Children's Hospital New Orleans pediatric IPR after sustaining severe TBI between January 2018 and December 2023 was performed.
- Demographics (age, sex, race), mechanism of injury, ischemia, hemorrhage, seizure, botox, Glasgow Coma Score (GCS), hospital length of stay (LOS), rehabilitation LOS, duration of coma, medications, equipment, last encounter, and WeeFIM scores were collected.
- We performed t-tests and chi-square tests to analyze outcomes.

Results

Total Patients	122
Male	88 (72%)
Black	74 (61%)
Age at Injury	8.8 ± 6 years
Mechanism of Injury	
-Motor Vehicle Collisions	49 (40%)
-Gunshot Wounds	22 (18%)
-Nonaccidental Trauma	22 (18%)
-All-Terrain Vehicle Crashes	7 (6%)
Injury Characteristics	
-Ischemic TBI	30 (25%)
-Hemorrhage	107 (88%)
-Seizures	41 (34%)
Initial GCS	5.9 ± 3.2
Hospital LOS	26.7 ± 24.2 days
IPR LOS	37.2 ± 25.0 days
Duration of Coma	8.9 ± 8.6 days

Table 1. Demographics and Clinical Characteristics

Outcome	Blunt Injury	Penetrating Injury	p-value
Cognitive WeeFIM - Admission	10.5 ± 7.3	13.5 ± 8.4	0.04
Cognitive WeeFIM - Discharge	16.3 ± 9.5	18.4 ± 10	0.18
Memory WeeFIM - Admission	2 ± 1.5	3 ± 1.9	0.004
Memory WeeFIM - Discharge	3.2 ± 1.8	4.1 ± 1.8	0.02

Table 2. Blunt versus Penetrating Injury

Outcome	Ischemic Injury	Non-Ischemic Injury	p-value
Age at injury (years)	6.6 ± 5.2	9.5 ± 5.7	0.002
Cognitive WeeFIM - Admission	8.2 ± 5.8	11.9 ± 7.8	0.01
Cognitive WeeFIM - Discharge	12.7 ± 9.5	18.2 ± 9.2	0.003

Table 3. Impact of Ischemic Injury

Outcome	Seizures Present	No Seizures Present	p-value
Cognitive WeeFIM - Admission	10.2 ± 7.9	11.4 ± 7.4	0.2
Cognitive WeeFIM - Discharge	14.9 ± 10.4	18.0 ± 9.0	0.045

Table 4. Impact of Seizures

Discussion

- Patients who sustained blunt injury had lower initial GCS and lower memory cognitive WeeFIM scores at both admission and discharge. Blunt injury patients had lower cognitive WeeFIM scores at admission but had similar cognitive scores to those with penetrating injury at discharge (Table 2).
- Patients who sustained ischemic injury were younger and had lower cognitive WeeFIM scores at both admission and discharge (Table 3).
- Patients who experienced seizures had similar cognitive scores to those without seizures at admission but lower cognitive WeeFIM scores at discharge (Table 4).

Conclusion

- Blunt injury mechanisms, ischemic injury, and seizure activity are associated with poorer neurorecovery outcomes in pediatric TBI patients.
- Targeted rehabilitation programs addressing specific cognitive and memory challenges are critical for optimizing recovery.
- Early identification of these risk factors may help guide personalized treatment plans for improved function outcomes.

References

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