Relationship Between CT Head Findings and Long-Term Recovery in Children with Complicated Mild Traumatic Brain Injury

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Introduction

Traumatic brain injury (TBI) is the leading cause of disability in children and young adults.

A majority of TBIs are considered mild TBIs (GCS 13-15), with complicated mild TBIs (c-mTBI) being a subset of mild TBI with the addition of intracranial abnormality on neuroimaging¹.

Many patients with c-mTBI will make a full recovery, however a group of patients continue to have long-term adverse outcomes².

Identifying prognostic factors at the time of injury can help clinicians choose therapies and medical interventions to optimize recovery.

Despite a movement to identify prognostic factors that can predict long-term functional outcomes after TBI, there continues to be a paucity of research in this area.

Objectives

To investigate the association between CT head findings at the time of injury and long-term recovery of patients with c-mTBI.

Methods

A retrospective survey and chart review of pediatric TBI patients (age 5-18) and their parents were identified from 2010-2013 hospital data.

Caregivers of children with mTBI were mailed a questionnaire on pre-injury health, post-injury recovery, and activity patterns before and after injury.

Of the 285 survey responses, 77 children were classified as c-mTBI.

Associations of imaging findings to degree (0-10 scale) and length (months) of recovery were analyzed using Fisher's exact test.

Degree of recovery

Length of recovery

Imaging	Degree of recovery				Length of recovery				
	0-6	7-9	10: Completely recovered	P	0-1 month	1-3 months	> 3 months	Not yet completely recovered	p
Extra-axial injury ALL types	4 (40.0)	17 (58.6)	20 (55.6)	0.605	3 (42.9)	5 (45.5)	20 (60.6)	12 (52.2)	0.887
Cortical injury ALL types	4 (40.0)	10 (34.5)	14 (38.9)		4 (57.1)	5 (45.5)	10 (30.3)	9 (39.1)	
Subarachnoid hemorrhage	2 (20.0)	2 (6.9)	2 (5.5)		0 (0.0)	1 (9.0)	3 (9.1)	2 (8.7)	
Epidural hematoma	2 (40.0)	5 (25.0)	6 (30.0)	0.897	0 (0.0)	4 (66.7)	4 (17.4)	5 (35.7)	0.074
Subdural hematoma	3 (60.0)	15 (75.0)	14 (70.0)		1 (100.0)	2 (33.3)	19 (82.6)	9 (64.3)	
Single hemorrhagic contusion, small (<= 5 mm)	0 (0.0)	2 (50.0)	6 (54.5)	0.620	2 (50.0)	2 (50.0)	3 (75.0)	1 (20.0)	0.497
Single hemorrhagic contusion, large (> 5mm)	2 (100.0)	2 (50.0)	5 (45.5)		2 (50.0)	2 (50.0)	1 (25.0)	4 (80.0)	
Single hemorrhagic contusion (all sizes)	2 (50.0)	4 (44.4)	11 (84.6)	0.088	4 (100.0)	4 (80.0)	4 (44.4)	5 (62.5)	0.287
Multiple hemorrhagic contusions (all sizes)	2 (50.0)	5 (55.6)	2 (15.4)		0 (0.0)	1 (20.0)	5 (55.6)	3 (37.5)	
Depressed or complex skull fractures	5 (83.3)	8 (36.4)	12 (46.1)	0.127	1 (25.0)	3 (37.5)	12 (44.4)	8 (57.1)	0.743
Simple skull fractures	1 (16.7)	14 (63.6)	14 (53.9)		3 (75.0)	5 (62.5)	15 (55.6)	6 (42.9)	
Frontal contusions	1 (100.0)	2 (66.7)	0 (0.0)	0.400	-	0 (0.0)	1 (33.3)	2 (100.0)	0.400
Other locations (e.g. parietal or temporal contusions)	0 (0.0)	1 (33.3)	2 (100.0)		-	1 (100.0)	2 (66.7)	0 (0.0)	
Multiple imaging findings*	2 (20.0)	5 (17.2)	10 (27.0)	0.649	3 (42.9)	3 (27.3)	6 (17.6)	5 (21.7)	0.481
Single imaging finding	8 (80.0)	24 (82.8)	27 (73.0)		4 (57.1)	8 (72.7)	28 (82.4)	18 (78.3)	

Table 1. Degree and length of recovery after c-mTBI according to findings on CT head.

*Of any combination – hemorrhagic contusion single or multiple, hemorrhagic shear or axonal injury, subarachnoid hemorrhage, subdural hematoma, epidural hematoma, extra-axial hematoma, cerebral edema.
p value from Fisher's exact test.

Results

Overall, 48% ($n = 37$) of patients were reported to have completely recovered at the time of the survey.

Close to half of patients (44%, $n = 34$) required more than three months for complete recovery, while 30% ($n = 23$) reported that they had yet to completely recover at the time of the survey.

There were no significant differences in degree or length of recovery based on CT head findings ($p > 0.05$).

Conclusions

Degree and length of recovery in pediatric patients with complicated mTBI may not be substantially influenced by imaging findings at the time of injury.

There continues to be a need to identify factors predictive of long-term recovery in pediatric mTBI.

References

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2. Gardner JE, Teramoto M, Hansen C. Factors associated with degree and length of recovery in children with mild and complicated mild traumatic brain injury. Neurosurgery. In press.