Among non-hospitalized patients, self-reported head injury with loss of consciousness or amnesia is associated with persistent symptoms, but TBI is not: Results from a large-scale prospective study

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Introduction

- In both military and non-military populations, the overwhelming majority of studies attempting to assess the effects of traumatic brain injury (TBI) have used self-report.
- A common self-report criteria for TBI is head injury with loss of consciousness (LOC) or amnesia[1] ("Self-report History").
- Recent advances in peritraumatic blood-based biomarkers such as Glial Fibrillary Acidic Protein (GFAP) allow objectively assessment of mechanical brain trauma ("Biomarker TBI").[2]
- We used data from a large-scale emergency department (ED)-based cohort study to evaluate the influence of biomarker TBI vs. self-report history of TBI on the development of mental health and somatic symptom sequelae 3 months after trauma.

Methods

- All participants were assessed in the ED for history of head trauma, loss of consciousness, and amnesia via standardized questionnaire.
- Blood samples were taken, and Plasma Glial Fibrillary Acidic Protein (GFAP) levels were estimated using a four-parameter logistic calibration curve (assay range 0-4,000 pg/mL)
- Continuous GFAP values and several GFAP cut-offs (268, 360, and 695 pg/mL) were used to evaluate TBI (Figure 1).
- Three-month follow-up survey assessments evaluated somatic, posttraumatic stress (PTS), and depressive symptoms
- Logistic regression modeling in multiply-imputed datasets (n=20) was used to evaluate the influence of biomarker TBI vs.self-report history of TBI on the development of mental health and post-concussive symptom sequelae 3 months after trauma.

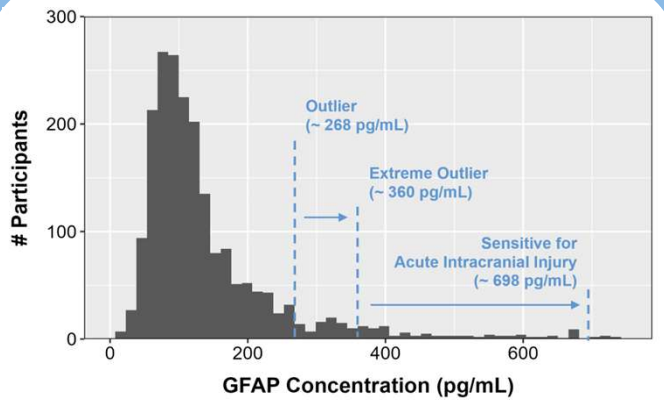


Figure 1. GFAP distribution and cutoff values. Outliers were determined assuming a healthy control concentration of ~ 60 pg/mL and Tukey's fence method. Histogram shows only the bottom 95% of values for clarity.

Table 1. TBI, assessed via objective biomarker, is not associated with increased posttraumatic stress disorder (PTSD) symptoms 3 months after trauma. Self-reported history is associated, *but this is due to confounding between self-report and pre-trauma risk factors.*

	Estimate	Std. Error	p-value
Model 1:			
TBI (Biomarker)	0.076	0.150	0.61
Model 2			
TBI (Biomarker)	-0.035	0.153	0.82
Self-Report History	0.478	0.110	< 0.001
Model 3			
TBI (Biomarker)	0.159	0.172	0.35
Self-Report History	0.219	0.125	0.08
PTSD (Lifetime)	0.090	0.008	< 0.001
PTSD (Last 30 Days)	0.032	0.004	< 0.001

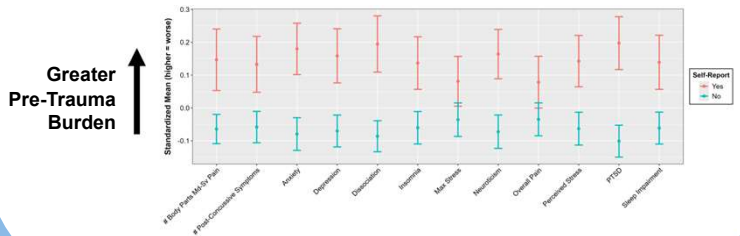
Table 2. TBI, assessed via objective biomarker, is not associated with increased depressive symptoms 3 months after trauma. Self-reported history is associated, *but this is due to confounding between self-report and pre-trauma risk factors.*

	Estimate	Std. Error	p-value
Model 1:			
TBI (Biomarker)	0.152	0.145	0.29
Model 2			
TBI (Biomarker)	0.055	0.148	0.71
Self-Report History	0.417	0.111	< 0.001
Model 3			
TBI (Biomarker)	0.179	0.169	0.29
Self-Report History	0.194	0.128	0.13
Depression (Last 30 Days)	0.076	0.008	< 0.001
Neuroticism (Big Five Index)	0.067	0.007	< 0.001

Table 1. TBI, assessed via objective biomarker, is not associated with post-concussive symptoms 3 months after trauma. Self-reported history is associated, *but this is due to confounding between self-report and pre-trauma risk factors.*

	Estimate	Std. Error	p-value
Model 1:			
TBI (Biomarker)	0.036	0.142	0.80
Model 2			
TBI (Biomarker)	-0.056	0.143	0.69
Self-Report History	0.401	0.114	< 0.001
Model 3			
TBI (Biomarker)	0.119	0.161	0.46
Self-Report History	0.216	0.128	0.09
Post-Concussive sxs (Last 30 Days)	0.236	0.024	< 0.001
PTSD (Lifetime)	0.076	0.008	< 0.001

Figure 2. Self-report TBI is associated with many risk factors for posttraumatic stress-related symptoms



Results

- 2,143 trauma patients enrolled in the emergency department, mean age 36 years, 62% female, 50% non-Hispanic Black, 40% with less than college education.
- TBI itself not associated with PTSD, depressive, or post-concussive symptoms. In contrast, self-report history of TBI was associated with these outcomes, this relationship was due to confounding of the relationship between self-report history and posttraumatic outcomes by pre-trauma risk factors (Tables 1-3, Figure 2).

Conclusions

- The overwhelming majority of studies that have evaluated associations between TBI and adverse posttraumatic neuropsychiatric sequelae have used self-report history. These data suggest that, within the range of GFAP values evaluated (equivalent to iSTAT levels of 100 or less, representing the great majority of TBI), such sequelae are not caused by mechanical brain trauma but instead by enduring changes caused by the activation of physiologic systems involved in the response to life-threatening stress.

References

1. ACRM Mild Traumatic Brain Injury Committee of the Head Injury Interdisciplinary Special Interest Group. Definition of mild traumatic brain injury. Journal of Head Trauma Rehabilitation. 1993; 8(3) 86-87
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