

Echoes of the past: does prior TBI shape future TBI outcomes?

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To cite: Bhende BU, Muehlschlegel S. Echoes of the past: does prior TBI shape future TBI outcomes? *Trauma Surg Acute Care Open* 2024;**9**:e001569. doi:10.1136/tsaco-2024-001569

In this volume of *Trauma Surgery & Acute Care Open*, Yue and coauthors¹ publish their retrospective cohort study of 405 patients with blunt moderate-severe traumatic brain injury (msTBI) from the Transforming Research and Clinical Knowledge in Traumatic Brain Injury (TRACK-TBI) study enrolled at 18 US level 1 trauma centers, to examine the associations between prior TBI with in-hospital mortality and long-term outcomes up to 12 months after injury. Prior TBI has been shown to affect health and functioning in patients with mild TBI and also has long-term effects on chronic TBI beyond 1 year.² However, whether a history of prior TBI may be associated with short-term and long-term outcomes after blunt msTBI has not previously been studied in a large multicenter cohort. This current study suggests that prior TBI may be associated with in-hospital mortality but not unfavorable functional outcome (defined as Glasgow Outcome Scale-Extended 1–3) up to 12 months.¹ How valid are these findings, and how should we use these at the bedside or in research?

A key strength of this study is the identification of prior TBI using the validated Ohio State University TBI Identification Method.³ This self-reported or proxy-reported method, recommended by the Centers for Disease Control and Prevention and included in the National Institute of Neurological Disorders and Stroke Common Data Elements,^{4 5} gathers a lifetime history of TBI via a structured interview. Rather than asking about ‘head injury’ or ‘traumatic brain injury’, it elicits injury patterns that likely involve shear injury to the brain, reducing recall bias or misinterpretation of terms. Weaknesses of this method include the lack of information on the duration, intensity, clinical baseline, and temporal relation between prior and current TBI. It is also impractical in clinical practice due to the need for training to ensure validity and the significant time required to perform the structured interview, which clinicians often lack when admitting patients with msTBI.

In practice, simply asking about ‘prior TBI’ or ‘head injury’ may not always yield reliable histories; but this straightforward method of assessing ‘prior TBI’ warrants further study and could be equally effective in predicting mortality.

The statistical analysis approach described is not entirely plausible. The authors used a ‘competing risk regression analysis’, assuming in-hospital mortality and discharge alive were competing events. This may suit some events, but in msTBI patient care, survival and death are mutually exclusive. Even after adjusting for confounders (age, sex,

psychiatric history, Glasgow Coma Scale, Marshall CT score, polytrauma, and cranial surgery or intracranial pressure monitoring), it is difficult to explain why prior TBI was independently associated with higher in-hospital mortality but not with a higher probability of being discharged alive, given that both are mutually exclusive. Interestingly, prior TBI was not independently associated with mortality or unfavorable outcomes at 3, 6, and 12 months. This raises the question of whether clinicians and families considered the patient’s prior TBI during their prognostication and goals-of-care decision-making (including withdrawal of life-sustaining therapies) during the hospital stay. Although ‘mode of death’ was not reported, withdrawal of life-sustaining therapies was likely the most common cause of death during the index hospitalization, based on other TRACK-TBI studies.⁶

Statistical concerns aside, if validated, the current study suggests that the ‘second impact syndrome’, involving a second injury before the effects of the first have resolved, may also be clinically important for patients with msTBI, not just contact sports athletes.^{7 8} However, more research and external validation are needed to understand why prior TBI is linked to early but not late mortality or unfavorable outcomes, before incorporating ‘prior TBI’ into existing blunt TBI prediction models.

In summary, prior TBI may act like ‘echoes of the past’, potentially impacting short-term mortality in patients with blunt msTBI. Many questions remain, and we hope validation studies in other cohorts will provide answers.

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Contributors BUB drafted the first and revised drafts of the article. SM supervised and guided BUB, and edited and revised all the drafts. Both authors agreed on the final submitted version. We used ChatGPT-4o for three to four single sentences with the mere purpose of checking the grammar and correcting grammatical errors with more succinct formulation of the sentence, as both authors are not native English speakers. We did NOT use AI to generate ideas or any newly drafted sentences.

Funding This study was funded by the Department of Anesthesiology and Critical Care Medicine, The Johns Hopkins University School of Medicine (Stimulating and Advancing ACCM Research [StAAR] Investigator Award), and the National Institute of Nursing Research (R21NR020231).

Competing interests None declared.

Patient consent for publication Not applicable.

Ethics approval Not applicable.

Provenance and peer review Commissioned; internally peer reviewed.

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► <http://dx.doi.org/10.1136/tsaco-2024-001501>

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