



## Editorial

# Serum Biomarkers are Promising Tools to Predict Traumatic Brain Injury Outcome

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Traumatic Brain Injury (TBI) is still considered a worldwide leading cause of mortality and morbidity. Within the last decades, different modalities were used to assess severity and outcome including Glasgow Coma Scale (GCS), imaging modalities, and even genetic polymorphism, however, determining the prognosis of TBI victims is still challenging requiring the emerging of more accurate and more applicable tools to surrogate other old modalities (1).

According to the Food and Drug Administration (FDA), biomarkers are defined as a “characteristic that serves as an objective indicator of normal biological processes, pathogenic processes, or response to an exposure or intervention, including therapeutic interventions”, it may include information collected from clinical findings, radiological investigations, histopathological studies, and serum or tissue biomarkers (2).

Derived from body fluid such as blood and Cerebrospinal fluid, Different Biomarkers are considered now as promising tools been investigated and researched for a possible accurate evaluation of severity and outcome variables and to improve critical care and future follow-up. Within these biomarkers, S100 calcium-binding protein B (S100 B), glial fibrillary acidic protein (GFAP), and neuron-specific enolase (NSE) are promising examples.

S100 B protein is a Calcium-binding peptide that is expressed mainly in astrocytes, it has a role in different intracellular and extracellular regulations, previous researches found an immediate surge in serum and CSF levels after neuronal damage with a direct increase relate to severity. S100 B protein has been added to Scandinavian guidelines to monitor Mild TBI to minimize to use of CT scans. Interestingly, a rise in S100 B levels could be detected before an increase in intra-cerebral pressure making it an ideal biomarker to monitor and assess the severity and outcome of TBI victims (3).

GFAP is mainly found in the astrocytes, its level is increased after TBI mainly in patients with mild to moderate injuries secondary. Following damage to the astrocytes, plasma membrane GFAP is released from the astrocytes into the interstitial fluid. GFAP is measurable in the bloodstream one hour after the injury and peaks within 20–24 hours, then decreases within 72 hours (4,5). Some studies showed that GFAP is associated with unfavorable outcomes following TBI, and may be able to predict it. Accordingly, GFAP is considered a beneficial marker for detecting patients with intracranial abnormalities following TBI. FDA had approved the use of GFAP to screen for traumatic intracranial abnormalities (6).

NSE is an isoenzyme of the enzyme enolase, it is found mainly in the cytoplasm of neurons. NSE measuring can assess neuronal damage in TBI patients; its level is increased when the axons are damaged. The NSE levels can reflect the degree of primary brain injury and the progress of secondary brain damage. Many studies have suggested the utility of NSE as a long-term prognostic biomarker following TBI (7).

## References

- [1] Slavoaca D, Muresanu D, Birle C, Rosu O, Chirila I, Dobra I et al. Biomarkers in traumatic brain injury: new concepts. *Neurological Sciences*. 2020;41(8):2033-2044.
- [2] Dadas A, Washington J, Diaz-Arrastia R, Janigro D. Biomarkers in traumatic brain injury (TBI): a review. *Neuropsychiatric Disease and Treatment*. 2018;Volume 14:2989-3000.
- [3] Oris C, Pereira B, Durif J, Simon-Pimmel J, Castellani C, Manzano S et al. The Biomarker S100B and Mild Traumatic Brain Injury: A Meta-analysis. *Pediatrics*. 2018;141(6):e20180037.
- [4] Papa L, Brophy G, Welch R, Lewis L, Braga C, Tan C et al. Time Course and Diagnostic Accuracy of Glial and Neuronal Blood Biomarkers GFAP and UCH-L1 in a Large Cohort of Trauma Patients With and Without Mild Traumatic Brain Injury. *JAMA Neurology*. 2016;73(5):551.
- [5] Huebschmann N, Luoto T, Karr J, Berghem K, Blennow K, Zetterberg H et al. Comparing Glial Fibrillary Acidic Protein (GFAP) in Serum and Plasma Following Mild Traumatic Brain Injury in Older Adults. *Frontiers in Neurology*. 2020;11.
- [6] Okonkwo D, Puffer R, Puccio A, Yuh E, Yue J, Diaz-Arrastia R et al. Point-of-Care Platform Blood Biomarker Testing of Glial Fibrillary Acidic Protein versus S100 Calcium-Binding Protein B for Prediction of Traumatic Brain Injuries: A Transforming Research and Clinical Knowledge in Traumatic Brain Injury Study. *Journal of Neurotrauma*. 2020;37(23):2460-2467.
- [7] Mercier E, Tardif P, Cameron P, Émond M, Moore L, Mitra B et al. Prognostic value of neuron-specific enolase (NSE) for prediction of post-concussion symptoms following a mild traumatic brain injury: a systematic review. *Brain Injury*. 2017;32(1):29-40.

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