Traumatic Brain Injury and Mood Disorders

Emma Duprey, PA-S2; William Schweinle, PhD, Nancy Trimble PA-C

University of South Dakota, Physician Assistant Studies Program

UNIVERSITY OF SOUTH DAKOTA

Background

- Traumatic brain injury (TBI) is a common and large public health concern. TBI is the leading cause of disability or death in those younger than 45 years old.
- TBI is often correlated to persistent cognitive disability or impairment with psychiatric symptoms that exert a negative impact on the quality of life and rehabilitation following injury.

Objectives

- The primary objective of this study is to determine if brain structure following TBI is correlated with mood disorders and how this correlation can improve outcomes on quality-of-life post-TBI.
- There is significant heterogeneity in clinical presentations in TBI, so this study will look at white matter, grey matter, network dysfunction, hippocampal volume, and where lesions occur to predict outcomes.
- Various brain regions are associated with mood disorders post-TBI. Interventions that target these regions may help improve mood and overall quality of life outcomes.

Methods

- The University of South Dakota Library databases (Access Medicine, Google Scholar, Pub Med- primary, and Wiley Online Library) were searched for articles using "traumatic brain injury", "traumatic brain injury and mood disorders", "structure of the brain after traumatic brain injury", and other searches using similar wording.

An Inspiring Case: A 19-year-old male with diffuse axonal injury following a traumatic brain injury

The patient was struck by a semi-truck going 45mph while moving cones off the road at his job. His immediate injuries included a broken left scapula, torn ACL and MCL, and head injury. He was in the ICU for two weeks then moved to inpatient rehab and discharged two weeks later.

Brain MRI showed: Scattered punctate areas of low gradient signal and diffusion hyperintensity involving the subcortical white matter of both cerebral hemispheres, as well as the right external capsule, adjacent or within the right caudate nucleus, splenium of the corpus callosum, and left dorsal lateral midbrain. Findings are compatible with traumatic axonal injury. A small amount of subarachnoid and intraventricular hemorrhage. Small hemorrhagic contusions in the lateral temporal lobes bilaterally with the hemorrhagic components measuring approximately 3 mm.

This patient developed major depressive disorder two months after his discharge date and landed in multiple psychiatric rehab facilities for the next two years.

This patient inspired this research to dive deeper into protocols in place for protecting those with TBIs against developing mood disorders.

Results

Mood disorders following TBI:

- Depression is the most common post-TBI mood disorder.
- Alway et al. (2016) found a psychiatric diagnosis rate of 75.2% with most emerging in the first year post-injury.
- Depression, anxiety, and aggression have been correlated to each other post-injury.

The structure of the brain following TBI:

- G. Spitz et al. (2017) found those with diagnosed mood disorders had significantly lower white-matter microstructure in many lobes of the brain.
- Mohamed et al. (2021) found gray matter atrophy, low white matter structure, and high diffusivity of white matter in lobes correlated to the severity of cognitive deficits.
- Paroxysmal sympathetic hyperactivity (PSH) is a main cause of secondary neuronal injury in TBI patients as seen in Figures 2 and 3. These elements affected by trauma are further compromised by functional changes associated with mood disorders.

Quality of Life following TBI with mood disorders:

- Higher cognitive functioning, lower levels of depression or anxiety, and greater social support positively influence quality of life.
- Tailored rehab programs improve outcomes by addressing the individual's specific deficits and challenges.

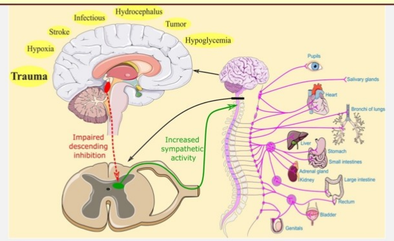

Figure 2. The summary of paroxysmal sympathetic hyperactivity pathophysiology in the TBI (Jafari et al. 2022).

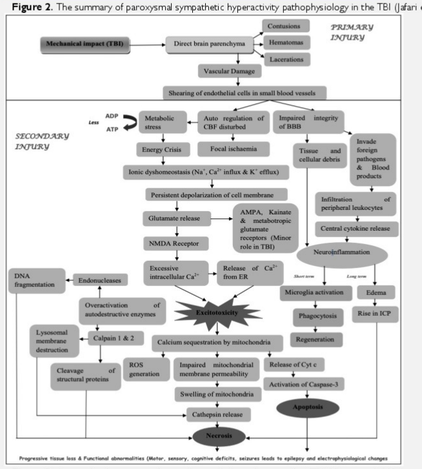

Figure 3. A cascade of primary and secondary pathological events after TBI (Khatri et al. 2021)

Conclusions

- Lesions, location, severity, and individual characteristics can influence the progression, prevalence, and severity of mood disorders.
- Early interventions, especially within the first-year post-injury, with psychotherapy and pharmacological therapy can reduce the risk of developing disorders and improve patient outcomes and quality of life.
- There is a need for more extensive and comprehensive research on the subject to improve the understanding of pathophysiology. This would also give insight into the best strategies to manage and prevent mood disorders in TBI patients.
- This study's findings highlight the importance of a multidisciplinary approach integrating medical, social, and psychological interventions to improve outcomes.

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