ICU
MANAGEMENT & PRACTICE

Endotypes of Traumatic Brain Injury

Traumatic brain injury (TBI) is a heterogeneous disease. It has various injury mechanisms and tissue

pathologies. It is a leading cause of mortality and morbidity in young individuals globally. In addition, the incidence of TBI in older patients is an area of concern with an increase in an ageing population that is more likely to be multi-morbid and fall-prone.

Mortality from TBI has decreased over the years. However, the proportion of patients with favourable

outcomes remains unchanged despite developments such as intracranial pressure (ICP) monitoring. A recent report found significant variation in TBI management in a European multi-centre cohort, without a corresponding variation in outcomes. This may be due to the heterogeneity of the disease masking treatment effect in relevant subgroups.

The Glasgow coma scale (GCS) is a strong outcome predictor in TBI. However, the current classification of TBI as mild, moderate or severe based on this scale fails to capture the heterogeneity in pathophysiology and treatment response for this condition.

In this study, the researchers hypothesise that data-driven characterisation of TBI could identify distinct endotypes and provide greater insight. They developed a statistical clustering model based on probabilistic graphs using demographic, clinical, physiological, imaging and laboratory data to identify subgroups of TBI patients.

The researchers identified six stable endotypes with distinct GCS and composite systemic metabolic stress profiles, distinguished by GCS, blood lactate, oxygen saturation, serum creatinine, glucose, base excess, pH, arterial partial pressure of carbon dioxide, and body temperature. They report that a cluster with moderate TBI by traditional classification and deranged metabolic profile had a worse outcome than a cluster with severe GCS and a normal metabolic profile. Hence, the addition of cluster labels significantly improved the prognostic precision of the “International Mission for Prognosis and Analysis of Clinical Trials in TBI” (IMPACT) variables for the prediction of unfavourable outcomes and mortality.

These findings show that six clinically distinct TBI endotypes were identified using probabilistic clustering. In addition to presenting neurology, a profile of biochemical derangement was found to be an important distinguishing feature associated with outcome. This suggests a need to further refine current TBI classifications with factors describing metabolic stress to improve treatment strategies and care.

Source: Critical Care

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