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Sommario/riassunto

Traumatic brain injury (TBI) is traditionally viewed as an anatomic and neuropathological condition. Caring for TBI patients is a matter of defining the extent of an anatomical lesion, managing this lesion, and minimizing secondary brain injury. On the research side, the effects of TBI often are studied in the context of neuronal and axonal degeneration and the subsequent deposition of abnormal proteins such as tau. These approaches form the basis of our current understanding of TBI, but they pay less attention to the function of the affected organ, the brain. Much can be learned about TBI by studying this disorder on a systems neuroscience level and correlating changes in neural circuitry with neurological and cognitive function. There are several aspects of TBI that are a natural fit for this perspective, including post-traumatic epilepsy, consciousness, and cognitive sequelae. How individual neurons contribute to network activity and how network function responds to injury are key concepts in examining these areas. In recent years, the available tools for studying the role of neuronal assemblies in TBI have become increasingly sophisticated, ranging from optogenetic and electrophysiological techniques to advanced imaging modalities such as functional magnetic resonance imaging and magnetoencephalography. Further progress in understanding the disruption and subsequent reshaping of networks is likely to have substantial benefits in the treatment of patients with TBI-associated deficits. In this Frontiers Topic, we intend to highlight the systems

neuroscience approach to studying TBI. In addition to analyzing the clinical sequelae of TBI in this context, this series of articles explores the pathophysiological mechanisms underlying network dysfunction, including alterations in synaptic activity, changes in neural oscillation patterns, and disruptions in functional connectivity. We also include articles on treatment options for TBI patients that modulate network function. It is our hope that this Frontiers Topic will increase the clinical and scientific communities' awareness of this viable framework for deepening our knowledge of TBI and improving patient outcomes.