

Read all about it! Why TBI is big news

According to the Centre for Disease Control and Prevention, each year in the USA alone, around 1.7 million people sustain a traumatic brain injury (TBI), resulting in 52,000 deaths. TBI is often termed a 'silent epidemic', however, as many people are unaware of the magnitude of morbidity and mortality that is associated with these injuries. The past few years have seen an increase in public interest with regard to the long-term effects of brain injury—particularly in the context of high-impact sports such as American football and boxing, and in military personnel with blast-related injuries sustained while in active combat—and an explosion in the number of reports on such TBIs in the media.

Translational and clinical research has revealed that TBI can no longer be regarded as a single clinical entity with a defined outcome. A spectrum of brain injuries—from a mild concussion following a single high-impact head trauma, to chronic traumatic encephalopathy (CTE), a neurodegenerative disorder linked to repetitive brain injuries—is now recognized. Each type of injury can lead to a distinct clinical condition that requires careful assessment and appropriate management to prevent long-term neurological deficits.

Notably, diagnosis of CTE can only be made at post-mortem examination, highlighting the need for improved understanding of the pathophysiology of this disorder in living people. In recognition of this need, the NIH hosted a workshop in December 2012 (supported by the Sports Health Research Program and the National Football League) on the neuropathology of CTE. As the meeting report shows, our understanding of the neuropathology, risk factors and symptoms of CTE has improved in recent years (http://www.ninds.nih.gov/news_and_events/proceedings/201212_CTE_workshop_report.htm). The report concludes, however, that further coordinated efforts are needed to understand how impact to the head can cause symptomatic changes in brain function. Numerous questions remained: are CTE and single-exposure TBI distinct pathological processes? Are there genetic susceptibilities to CTE? How can CTE be diagnosed in living people? What is the population prevalence and incidence of TBI?

This aim of this focus issue is to provide a step towards answering some of these questions, with five Review articles and one Perspectives piece in which experts in TBI and CTE summarize current knowledge and recent advances in various aspects of brain-injury research.

First, Sam Gandy and colleagues provide an introduction to the pathophysiology of acute and chronic traumatic encephalopathies. They describe the distinct

pathological changes that accompany each type of TBI, highlighting the similarities and differences with chronic neurodegenerative disorders such as Alzheimer disease. Furthermore, they highlight the key issues that are challenging clinical and research communities, including quantification of the risk of CTE, and development of reliable biomarkers for TBI.

Next, Smith *et al.* describe the chronic pathologies that are observed in patients with single and repetitive TBI, and ask: are these pathologies substrates for dementia? They discuss the possible dose and frequency-dependent association between TBI and risk of neurodegenerative disease, and consider the role of tissue banks dedicated to TBI, highlighting a need to establish networked archives to provide broad international research access.

Detection and monitoring of TBI in living individuals are vital to improvement of outcomes. In their Review, Henrik Zetterberg and colleagues discuss advances in research to find biomarkers of mild TBI in the blood and cerebrospinal fluid. They highlight the need for further development and validation of TBI biomarkers, in particular for the management of sports-related concussion—the most common form of brain injury in young people.

Continuing on the theme of sport-related TBI, Barry Jordan outlines the spectrum of brain injuries that are sustained in high-impact sports, in particular boxing and American football. From concussion to CTE, he describes how sport-related brain injuries can be monitored, assessed and prevented, and discusses how appropriate medical assessments in athletes with any form of head injury can prevent long-term neurological damage.

Poor epidemiological monitoring of TBI is one of the biggest hurdles that remain to be overcome before the worldwide burden of these injuries can be fully understood. In their Perspectives article, Bob Roozenbeek and colleagues outline how epidemiological patterns of TBI have changed over the past few decades in both developed and developing countries, and discuss what can be done to improve monitoring and reporting of these injuries.

After many years of being labelled as a silent epidemic, TBI is now being given a voice. Continued research efforts to understand the pathophysiological changes that occur across the spectrum of TBI-related disorders will hopefully identify therapeutic targets and lead to reduction of TBI-related morbidity. Only with improved education on the causes and consequences of TBI, however, can such injuries be prevented.

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Katy Malpass is an Associate Editor of *Nature Reviews Neurology*.

Competing interests
The author declares no competing interests.