



Articles

Characterisation of interface astroglial scarring in the human brain after blast exposure: a post-mortem case series

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Summary

Background

No evidence-based guidelines are available for the definitive diagnosis or directed treatment of most blast-associated traumatic brain injuries, partly because the underlying pathology is unknown. Moreover, few neuropathological studies have addressed whether blast exposure produces unique lesions in the human brain, and if those lesions are comparable with impact-induced traumatic brain injury. We aimed to test the hypothesis that blast exposure produces unique patterns of damage, differing from that associated with impact-induced, non-blast traumatic brain injuries.

Methods

In this post-mortem case series, we investigated several features of traumatic brain injuries, using clinical histopathology techniques and markers, in brain specimens from male military service members with chronic blast exposures and from those who had died shortly after severe blast exposures. We then compared these results with those from brain specimens from male civilian (ie, non-military) cases with no history of blast exposure, including cases with and without chronic impact traumatic brain injuries and cases with chronic exposure to opiates, and analysed the limited associated clinical histories of all cases. Brain specimens had been archived in tissue banks in the USA.

Findings

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We analysed brain specimens from five cases with chronic blast exposure, three cases with acute blast exposure, five cases with chronic impact traumatic brain injury, five cases with exposure to opiates, and three control cases with no known neurological disorders. All five cases with chronic blast exposure showed prominent astroglial scarring that involved the subpial glial plate, penetrating cortical blood vessels, grey–white matter junctions, and structures lining the ventricles; all cases of acute blast exposure showed early astroglial scarring in the same brain regions. All cases of chronic blast exposure had an antemortem diagnosis of post traumatic stress disorder. The civilian cases, with or without history of impact traumatic brain injury or a history of opiate use, did not have any astroglial scarring in the brain regions analysed.

Interpretation

The blast exposure cases showed a distinct and previously undescribed pattern of interface astroglial scarring at boundaries between brain parenchyma and fluids, and at junctions between grey and white matter. This distinctive pattern of scarring may indicate specific areas of damage from blast exposure consistent with the general principles of blast biophysics, and further, could account for aspects of the neuropsychiatric clinical sequelae reported. The generalisability of these findings needs to be explored in future studies, as the number of cases, clinical data, and tissue availability were limited.

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