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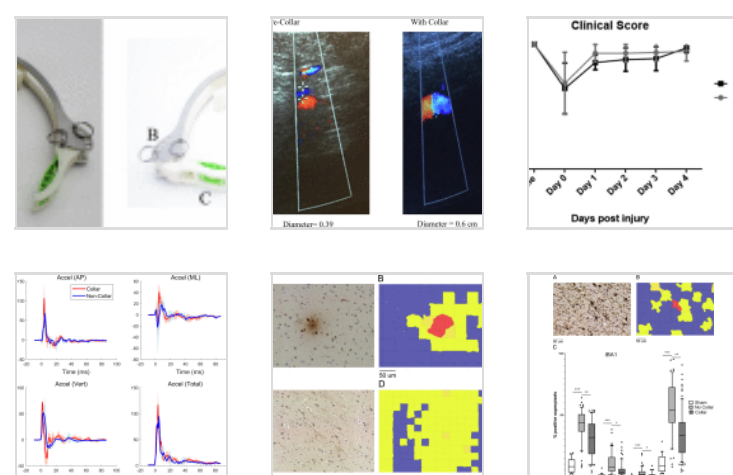
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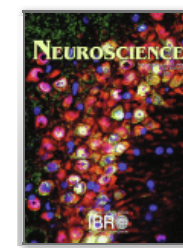
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Neuroscience

Volume 437, 15 June 2020, Pages 132-144



Research Article

Internal Jugular Vein Compression Collar Mitigates Histopathological Alterations after Closed Head Rotational Head Impact in Swine: A Pilot Study

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<https://doi.org/10.1016/j.neuroscience.2020.04.009>

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Abstract

Recently, there has been increased concern about microstructural brain changes after head trauma. Clinical studies have investigated a neck collar that applies gentle bilateral jugular vein compression, designed to increase intracranial blood volume and brain stiffness during head trauma, which neuroimaging has shown to result in a reduction in brain microstructural alterations after a season of American football and soccer. Here, we utilized a swine model of mild traumatic brain injury to investigate the effects of internal jugular vein (IJV) compression on histopathological outcomes after injury. Animals were randomized to collar treatment ($n = 8$) or non-collar treatment ($n = 6$), anesthetized and suspended such that the head was supported by breakable tape. A custom-built device was used to impact the head, thus allowing the head to break the tape and rotate along the sagittal plane. Accelerometer data were collected for each group. Sham injured animals ($n = 2$) were exposed to anesthesia only. Following single head trauma, animals were euthanized and brains collected for histology. Whole slide immunohistochemistry was analyzed using Qupath software. There was no difference in linear or rotational acceleration between injured collar and non-collar animals ($p > 0.05$). Injured animals demonstrated higher levels of the phosphorylated tau epitope AT8 ($p < 0.05$) and the inflammatory microglial marker IBA1 ($p < 0.05$) across the entire brain, but the effect of injury was markedly reduced by collar treatment ($p < 0.05$) The current results indicate that internal jugular venous compression protects against histopathological alterations related to closed head trauma exposure.

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Abbreviations

CTE, chronic traumatic encephalopathy; IJV, internal jugular vein; mTBI, mild traumatic brain injury; PBS, phosphate buffered saline; WM, white matter

Key words

mild traumatic brain injury; immunohistochemistry; phosphorylated tau

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[Determining rigid body motion from accelerometer data through the square-root of a negative semi-definite tensor, with applications in mild traumatic brain injury](#)

2022, Computer Methods in Applied Mechanics and Engineering

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[Consider the woodpecker: The contested more-than-human ethics of biomimetic technology and traumatic brain injury](#)

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[The effects of internal jugular vein compression for modulating and preserving white matter following a season of American tackle football: A prospective longitudinal evaluation of differential head impact exposure](#)

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