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Poster Presentation

Closed Traumatic Brain Injury Model in Sheep Mimicking High-Velocity, Closed Head Trauma in Humans

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Abstract

There are only a few, non-evidence based, neuroprotective strategies for treatment and prevention of brain injuries after closed head trauma. To establish new therapy strategies, a novel animal model is needed. The aim of our investigation was to link standardized small animal models and actual patient medical care. Data of experimental small animal studies often cannot be transferred to CNS injury in humans. For standardization of high-velocity brain trauma, novel devices for initiating closed traumatic brain injury in sheep were established. The following new devices were tested: A) an anatomically shaped rubber bolt with an integrated oscillation absorber; B) stationary mounting of the bolt to guarantee stable experimental conditions; C) different degrees of trauma severity, and D) trauma analysis via high-speed video recording. Measurements of intracranial pressure, pH, brain tissue oxygen, and carbon dioxide pressure were performed. Brain injuries were documented with MRI and compared to pathological findings. Skull fractures were prevented by the new devices. Enhancement of extracellular glutamate, aspartate, and GABA concentrations began sixty min after the trauma. MRI and pathological findings showed characteristic patterns of mild and severe brain trauma. The severe closed traumatic brain injury exhibited axonal injuries, subarachnoid hemorrhage, and contusions with bleeding. The model presented here achieves a gain in standardization of severe- closed traumatic brain injury. This model seems to close the gap between experimental small animal models and clinical studies. Comparing of this model with human findings showed several similarities and suggest that this model is reliable for clinically oriented experimental studies. Details of this study were published (Grimmelt et al., 2011).

Keywords: GABA, Brain Injury, Neuroprotective.

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