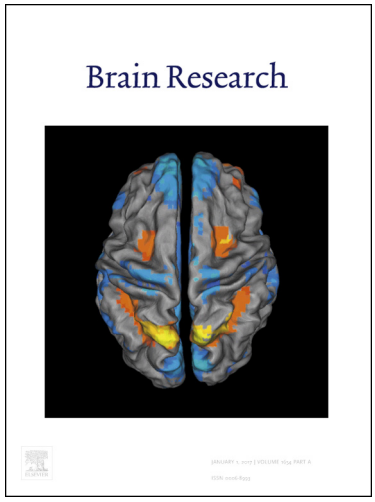

Research report

Evolution of Cerebral Perfusion in the Peri-contusional Cortex in Mice Revealed by in vivo Laser Speckle Imaging after Traumatic Brain Injury

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ABSTRACT

The role of the cerebrovascular network during the acute and chronic phases after traumatic brain injury (TBI) is poorly defined and emerging evidence suggests that cerebral perfusion is altered. The purpose of this study is to explore how the cortical blood flow is pathologically altered following TBI using a newly developed technique, laser speckle imaging. The controlled cortical impact (CCI) model was established in mice. Then, cerebral blood flow was monitored in vivo laser speckle imaging and vessel painting was labeled by Lectin in the peri-contusional cortex. Lastly, mice were assessed for lesion size and neurological functions. Our results indicated that: 1) In the acute phase of TBI, cerebral blood flow and microvessel counts decreased significantly ($P < 0.05$) 2) In the chronic phase of TBI, cerebral blood flow and microvessel counts recovered gradually ($P < 0.05$) 3) Cortical lesion volume reduced significantly in the chronic phase of TBI ($P < 0.05$) 4) Spontaneous neurocognitive recovery occurred following CCI in mice ($P < 0.05$). In the acute phase of TBI, there is a reduction in cerebral perfusion at the lesion site. However, this reduction recovers in the chronic phase of TBI ultimately, followed by an improvement of ameliorated neurobehavioral functions and a decrease in the lesion size. The novel approach for cerebral blood flow monitoring by laser speckle imaging can be extended from bench to bedside and provide potential therapeutic strategies for TBI patients.