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Hydrogen-rich water attenuates brain damage and inflammation after traumatic brain injury in rats

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Abstract

Inflammation and oxidative stress are the two major causes of apoptosis after traumatic brain injury (TBI). Most previous studies of the neuroprotective effects of hydrogen-rich water on TBI primarily focused on antioxidant effects. The present study investigated whether hydrogen-rich water (HRW) could attenuate brain damage and inflammation after traumatic brain injury in rats. A TBI model was induced using a controlled cortical impact injury. HRW or distilled water was injected intraperitoneally daily following surgery. We measured survival rate, brain edema, blood-brain barrier (BBB) breakdown and neurological dysfunction in all animals. Changes in inflammatory cytokines, inflammatory cells and Cho/Cr metabolites in brain tissues were also detected. Our results demonstrated that TBI-challenged rats exhibited significant brain injuries that were characterized by decreased survival rate and increased BBB permeability, brain edema, and neurological dysfunction, while HRW treatment ameliorated the consequences of TBI. HRW treatment also decreased the levels of pro-inflammatory cytokines (TNF-α, IL-1β and HMGB1), inflammatory cell number (Iba1) and inflammatory metabolites (Cho) and increased the levels of an anti-inflammatory cytokine (IL-10) in the brain tissues of TBI-challenged rats. In conclusion, HRW could exert a neuroprotective effect against TBI and attenuate inflammation, which suggests HRW as an effective therapeutic strategy for TBI patients.

Keywords: Anti-inflammatory; Controlled cortical impact; Hydrogen-rich water; Neuroprotective effect; Traumatic brain injury.

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