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Beneficial effects of hydrogen gas in a rat model of traumatic brain injury via reducing oxidative stress

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Abstract

Traumatic brain injury (TBI) is a leading cause of mortality and disability among the young population. It has been shown that hydrogen gas (H(2)) exerts a therapeutic antioxidant activity by selectively reducing hydroxyl radical (OH, the most cytotoxic ROS). Recently, we have found that H(2) inhalation significantly improved the survival rate and organ damage of septic mice. In the present study, we investigated the effectiveness of H(2) therapy on brain edema, blood-brain barrier (BBB) breakdown, neurological dysfunction and injury volume in TBI-challenged rats. In addition, we investigated the effects of H(2) treatment on the changes of oxidative products and antioxidant enzymes in brain tissue of TBI-challenged rats. Hydrogen treatment was given by exposure to 2% H(2) from 5 min to 5h after sham or TBI operation, respectively. Here, we found that TBI-challenged rats showed significant brain injuries characterized by the increase of BBB permeability, brain edema and lesion volume as well as neurological dysfunction, which was significantly attenuated by 2% H(2) treatment. In addition, we found that the decrease of oxidative products and the increase of endogenous antioxidant enzymatic activities in the brain tissue may be associated with the protective effects of H(2) treatment in TBI-challenged rats. The present study supports that H(2) inhalation may be a more effective therapeutic strategy for patients with TBI.

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