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Hydrogen gas ameliorates oxidative stress in early brain injury after subarachnoid hemorrhage in rats

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Abstract

Objective: Hydrogen gas has been demonstrated to neutralize free radicals and reduce oxidative stress recently. Our objective was to determine the therapeutic effect of H₂ inhalation and its antioxidative activity on early brain injury after subarachnoid hemorrhage.

Design: Controlled in vivo laboratory study.

Setting: Animal research laboratory.

Subjects: One hundred thirty-seven adult male Sprague-Dawley rats weighing 280-350 g.

Interventions: Subarachnoid hemorrhage was induced by endovascular perforation method in rats. Subarachnoid hemorrhage rats were treated with 2.9% hydrogen gas inhaled for 2 hrs after perforation. At 24 and 72 hrs, mortality, body weight, neurologic deficits, and brain water content were assessed. Blood-brain barrier permeability and apoptosis were also measured at 24 hrs. To investigate the antioxidative activity of hydrogen gas, the expression of malondialdehyde, nitrotyrosine, and 8-hydroxyguanosine, which are oxidative markers of lipid, protein, and DNA damage, respectively, were measured at 24 hrs.

Measurements and main results: Hydrogen gas significantly alleviated brain edema and blood-brain barrier disruption, reduced apoptosis, and improved neurologic function at 24 hrs but not 72 hrs after subarachnoid hemorrhage. These effects were associated with the amelioration of oxidative injury of lipid, protein, and DNA.

Conclusions: Hydrogen gas could exert its neuroprotective effect against early brain injury after subarachnoid hemorrhage by its antioxidative activity.

Figures

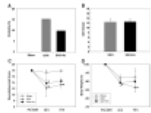


Figure 1 A, Mortality was 15.3% and...

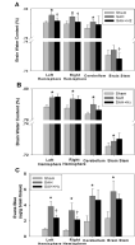


Figure 2 Hydrogen treatment decreased brain water...

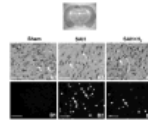


Figure 3 Nissl staining was performed on...

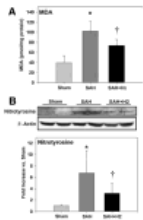


Figure 4 A, subarachnoid hemorrhage (SAH...

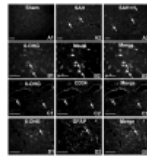


Figure 5 A1–A3 , 8 hydroxyguanosine (...)

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Hardeland R.

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