Resuscitation. 2013 May;84(5):690-5. doi: 10.1016/j.resuscitation.2012.10.018. Epub 2012 Oct 27.

The neuroprotective effects of intraperitoneal injection of hydrogen in rabbits with cardiac arrest

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PMID: 23108240 DOI: 10.1016/j.resuscitation.2012.10.018

Abstract

Objective: The purpose of this study was to investigate the neuroprotective effects of intraperitoneal injection of hydrogen (H2) in rabbits with cardiac arrest (CA).

Methods: A rabbit model of CA was established by the delivery of alternating current between the esophagus and chest wall to induce ventricular fibrillation. Before CA, the animals were randomly divided into four groups: a sham group (no CA), a CA group, a CA + low dose (10 ml/kg) H2 group (CA + H2 group 1), and a CA + high dose (20 ml/kg) H2 group (CA + H2 group 2). In the first experiment, animals were observed for 72 h after the restoration of spontaneous circulation (ROSC). The neurological scores were assessed at 24, 48 and 72 h after ROSC. The rabbits that survived until 72 h were sacrificed using an overdose of anesthetic, and the brain tissues were collected and Nissl-stained to observe nerve cell damage in the hippocampal CA1 area. In addition, TUNEL assay was performed to detect apoptosis. In the second experiment, animals were observed for 6h after ROSC. Blood samples and brain hippocampal tissues were collected, and differences in oxidative stress indicators were compared among the four groups.

Results: Intraperitoneal injection of H2 improved the 72-h survival rate and neurological scores, reduced neuronal injury and inhibited neuronal apoptosis. Intraperitoneal injection of H2 reduced oxidative stress indicators in the plasma and hippocampal tissues and enhanced antioxidant enzyme activity. No significant difference was observed between the two CA groups treated with different doses of H2.

Conclusions: Intraperitoneal injection of H2 is a novel hydrogen administration method and can reduce cerebral ischemia-reperfusion injury and improve the prognosis of cardiopulmonary cerebral resuscitation in a rabbit model of CA.

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