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Safety of intravenous administration of hydrogen-enriched fluid in patients with acute cerebral ischemia: initial clinical studies

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Abstract

Background: Most of the results regarding hydrogen (H₂) therapy for acute cerebral ischemia are derived from in vitro studies and animal experiments, with only a few obtained from human trials with a limited number of subjects. Thus, there is a paucity of information regarding both the beneficial therapeutic effects as well as the side effects of H₂ on acute cerebral ischemia in humans. We designed a pilot study to investigate single dose intravenous H₂-administration in combination with edaravone, aiming to provide an initial estimate of the possible risks and benefits in select patients presenting with acute ischemic stroke.

Methods: An open-label, prospective, non-randomized study of intravenous H₂-administration was performed in 38 patients hospitalized for acute ischemic stroke. All patients received an H₂-enriched intravenous solution in addition to edaravone immediately after the diagnosis of acute ischemic stroke. Acute stroke patients within 3 h of onset received intravenous tissue plasminogen activator (t-PA) (0.6 mg/kg) treatment, and patients receiving t-PA had to commence the administration of the H₂-enriched intravenous solution and edaravone before or at the same time as the t-PA was infused.

Results: Complications were observed in 2 patients (5.3%), which consisted of diarrhea in 1 patient (2.6%) and cardiac failure in 1 patient (2.6%). No deterioration in laboratory tests, urinary tests, ECG, or chest X-ray radiograms occurred in any patient in this study. In all patients, the mean National Institutes of Health Stroke Scale (NIHSS) scores at baseline, and 7, 30, and 90 d after admission were 8.2 ± 7.5, 5.6 ± 7.1, 4.9 ± 6.5, and 4.5 ± 6.3, respectively. The early recanalization was identified in 4 of 11 patients (36.4%) who received intravenous t-PA administration. Hemorrhagic transformation was observed in 2 patients (18.2%). None of the patients in this study that were treated with t-PA developed symptomatic intracranial hemorrhage.

Conclusions: Data from the current study indicate that an H₂-enriched intravenous solution is safe for patients with acute cerebral infarction, including patients treated with t-PA.

Keywords: Acute ischemic stroke; Edaravone; Free radical scavenger; Hydrogen; Reactive oxygen species; Safety; Tissue plasminogen activator.

Figures

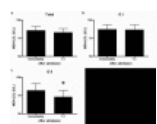


Figure 1 Changes in the levels of...

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