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A basic study on molecular hydrogen (H₂) inhalation in acute cerebral ischemia patients for safety check with physiological parameters and measurement of blood H₂ level

Hirohisa Ono # ¹, Yoji Nishijima # ¹, Naoto Adachi # ¹, Masaki Sakamoto # ¹, Yohei Kudo # ¹, Kumi Kaneko # ¹, Atsunori Nakao ², Takashi Imaoka ¹

Affiliations

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Abstract

Background: In animal experiments, use of molecular hydrogen (H₂) has been regarded as quite safe and effective, showing benefits in multiple pathological conditions such as ischemia-reperfusion injury of the brain, heart, kidney and transplanted tissues, traumatic and surgical injury of the brain and spinal cord, inflammation of intestine and lung, degenerative striatonigral tissue and also in many other situations. However, since cerebral ischemia patients are in old age group, the safety information needs to be confirmed. For the feasibility of H₂ treatment in these patients, delivery of H₂ by inhalation method needs to be checked for consistency.

Methods: Hydrogen concentration (HC) in the arterial and venous blood was measured by gas chromatography on 3 patients, before, during and after 4% (case 1) and 3% (case2,3) H₂ gas inhalation with simultaneous monitoring of physiological parameters. For a consistency study, HC in the venous blood of 10 patients were obtained on multiple occasions at the end of 30-min H₂ inhalation treatment.

Results: The HC gradually reached a plateau level in 20 min after H₂ inhalation in the blood, which was equivalent to the level reported by animal experiments. The HC rapidly decreased to 10% of the plateau level in about 6 min and 18 min in arterial and venous blood, respectively after H₂ inhalation was discontinued. Physiological parameters on these 3 patients were essentially unchanged by use of hydrogen. The consistency study of 10 patients showed the HC at the end of 30-min inhalation treatment was quite variable but the inconsistency improved with more attention and encouragement.

Conclusion: H₂ inhalation of at least 3% concentration for 30 min delivered enough HC, equivalent to the animal experiment levels, in the blood without compromising the safety. However, the consistency of H₂ delivery by inhalation needs to be improved.

Figures



Figure 1 Hydrogen concentration (HC) in the...

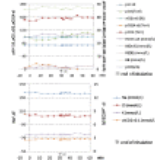


Figure 2 Physiological parameters before, during and...

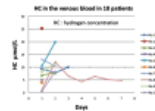


Figure 3 Inconsistency of blood HC after...

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