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Randomized Controlled Trial [Med Gas Res.](#) 2023 Apr-Jun;13(2):59-66.

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Molecular hydrogen exposure improves functional state of red blood cells in the early postoperative period: a randomized clinical study

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Abstract

Molecular hydrogen (H₂) has been considered a preventive and therapeutic medical gas in numerous diseases. The study aimed to investigate the potential role of molecular hydrogen as a component of

anesthesia in surgical treatment with cardiopulmonary bypass (CPB) of acquired valve defects on the functional state of red blood cells (RBC) and functional indicators of cardiac activity. This clinical trial was conducted with 20 patients referring to the Specialized Cardiosurgical Clinical Hospital, Nizhny Novgorod, Russian Federation, who underwent elective surgery with CPB. Twenty-four patients were randomly assigned to two groups. First group included 12 patients (research group) who received H₂ at a concentration of 1.5-2.0% through a facemask using a breathing circuit of the ventilator together with anesthesia immediately after tracheal intubation and throughout the operation. Second group (control group) included 12 patients who were not given H₂. Blood samples were withdrawn from peripheral veins and radial artery at four stages: immediately after the introduction of anesthesia (stage 1), before the start of CPB (stage 2), immediately after its termination (stage 3) and 24 hours after the operation (the early postoperative period) (stage 4). An increase in electrophoretic mobility, an increase in the metabolism of red blood cells, and a decrease in the aggregation of red blood cells relative to the corresponding indicators of the control group were observed in the research group. Patients in the research group had a decrease in oxidative stress manifestations most pronounced one day after the operation. There was a statistically significant difference between the indicators of myocardial contractile function in the research and control group on the 1st and 3rd days after surgery. H₂ inhalation leads to improvement of functional state of red blood cells, which is accompanied by a more favorable course of the early postoperative period. These data show the presence of protective properties of molecular hydrogen.

Keywords: Schiff bases; aggregation; catalase activity; diene conjugates; electrophoretic mobility; erythrocyte; lipid peroxidation; malondialdehyde; molecular hydrogen; triene conjugates.

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Figures



Figure 1 The flow chart.
Note: CPB:...

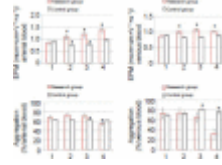


Figure 2 Dynamics of EPM and erythrocyte...

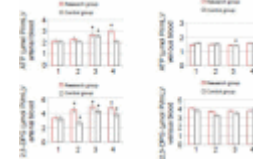


Figure 3 Dynamics of ATP and 2,3-DPG...

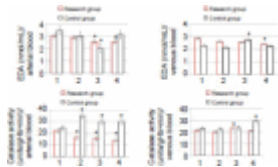


Figure 4 Dynamics of MDA concentration and...

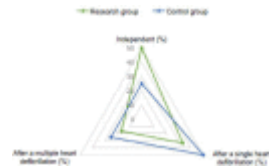


Figure 5 The character of recovery of...

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