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Editorial

Beneficial Effect of Hydrogen-Rich Saline on Burn Trauma

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EDITORIAL

Oxidative stress evoking inflammatory reaction is playing an important role in burn trauma progression. Fluid resuscitation is the main treatment to correct hypovolemia and to restore peripheral perfusion [1]. However, this reperfusion may produce abundant deleterious free radicals, such as superoxide anion radical (O_2-.) and hydrogen peroxide (H_2O_2) which exacerbate ischemia-related tissue injury. Therefore, antioxidant strategies aiming to inhibit free radical formation or clear free radicals have particular clinical significance in organ protection after burn trauma.

Hydrogen is considered as a novel, selective antioxidant which exhibits significant anti-oxidant effects since Ohsawa et al., first reported that it could neutralize the hydroxyl radical (OH) and peroxynitrate anion (ONOO−) [1]. It has protective effect against oxidative stress-induced organ damage in varied disease model of oxidative stress [2], so as the burn trauma.

One study measured the oxidative stress and inflammatory reaction of lungs in severely burned rats (30% TBSA) after treated by hydrogen-rich saline. Results showed obvious decreases of oxidative products (malondialdehyde, carbonyl, and 8-hydroxy-2'-deoxyguanosine), as well as inflammatory mediators (IL-1, IL-6 and TNF-α) and myeloperoxidase in lungs with administration of hydrogen-rich saline, which indicated that hydrogen-rich saline resuscitation could reduce oxidative stress and inflammatory response in severe burn-induced acute lung injury [3].

Some researchers studied renal alterations in severely burned rats (40% TBSA) which received hydrogen-rich saline resuscitation, and investigated the potential protective effects of hydrogen. The study observed remarkable reduced oxidation-reduction potential and malondialdehyde level in kidney, where as endogenous antioxidant enzyme activities was significantly increased, and consequent improvements in renal function and tubular apoptosis were noticed. Adropin myeloperoxidase level and release of inflammatory mediators were also detected. The potential regulation was considered to be related to inhibition of p38, JNK, and ERK, activation of NF-κB, and the increase in Akt phosphorylation. The study concluded hydrogen could attenuate severe burn-induced early acute kidney injury (AKI) [4].

Another study established deep-burn rat models with 4% of third-degree burns, and then treated burned rats with hydrogen-rich saline. The results showed decreased level of MDA which ameliorated oxidative stress in the stasis zone of rat burn wounds. An up regulated level of Bcl-2, inhibited expressions of bax and Caspase-3 were also detected in the wounds, which led to inhibition of apoptosis in the wounds. Furthermore, inflammatory mediators releasing in the wounds was also reduced. The study suggested that the protection effects of hydrogen were induced by alleviating oxidative stress, thus inhibiting apoptosis and inflammation, and Akt/NF-κB signal path might be involved in regulating inflammatory mediators releasing [5].

Our study on the inflammatory reaction in severely burned rats with delayed resuscitation also proved the protective role of hydrogen-rich saline. Applying the hydrogen-rich saline in resuscitation reduces the production of MDA and 8-OHdG and decreased the level of IL-1β, IL-6, TNF-α in serum and which is possibly by inhibiting activation of NF-κB [6].

Overall, all of the present studies reveal an important regulatory effect of hydrogen on burn trauma by reducing the oxidative stress reaction and inflammation reaction. Further studies should be carried out and hydrogen-rich saline may be a potential effective therapy in burn trauma.

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