Reduced hemodialysis-induced oxidative stress in end-stage renal disease patients by electrolyzed reduced water

Huang KC, Yang CC, Lee KT, Chien CT Department of Family Medicine, National Taiwan University College of Medicine and National Taiwan University Hospital, Taipei, Taiwan.

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BACKGROUND:
Increased oxidative stress in end-stage renal disease (ESRD) patients may oxidize macromolecules and consequently lead to cardiovascular events during chronic hemodialysis. Electrolyzed reduced water (ERW) with reactive oxygen species (ROS) scavenging ability may have a potential effect on reduction of hemodialysisinduced oxidative stress in ESRD patients. METHODS: We developed a chemiluminescence emission spectrum and high-performance liquid chromatography analysis to assess the effect of ERW replacement on plasma ROS (H2O2 and HOCl) scavenging activity and oxidized lipid or protein production in ESRD patients undergoing hemodialysis. Oxidized markers, dityrosine, methylguanidine, and phosphatidylcholine hydroperoxide, and inflammatory markers, interleukin 6 (IL-6), and C-reactive protein (CRP) were determined.

RESULTS:
Although hemodialysis efficiently removes dityrosine and creatinine, hemodialysis increased oxidative stress, including phosphatidylcholine hydroperoxide, and methylguanidine. Hemodialysis reduced the plasma ROS scavenging activity, as shown by the augmented reference H2O2 and HOCl counts (Rh2o2 and Rhocl, respectively) and decreased antioxidative activity (expressed as total antioxidant status in this study). ERW administration diminished hemodialysis-enhanced Rh2o2 and Rhocl, minimized oxidized and inflammatory markers (CRP and IL- 6), and partly restored total antioxidant status during 1-month treatment.

CONCLUSION:
This study demonstrates that hemodialysis with ERW administration may efficiently increase the H2O2- and HOCl-dependent antioxidant defense and reduce H2O2- and HOCl-induced oxidative stress.