# *Adjuvant Hyperbaric Oxygen Therapy in the Management of Crush Injury and Traumatic Ischemia: An Evidence-Based Approach*

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**Hyperbaric oxygen therapy (HBO) has been recommended as an adjunct treatment in acute traumatic ischemia and crush injury. Several animal models have shown better outcomes when HBO is used in crush injury and compartment syndrome. Animal and *in vitro* models have suggested that these beneficial effects may be mediated by attenuation of ischemia-reperfusion injury. We did a systematic review of the literature using the Eastern Association for the Surgery of Trauma (EAST) recommendations for evidence-based reviews. An electronic search using Medline, OVID technologies, and the Cochrane database was performed. Only clinical papers published between 1966 and December 2003 with at least five patients that included enough information to evaluate were selected. A group of trauma experts reviewed the selected articles and scored them applying the instrument developed by the EAST practice management guidelines committee. Nine documents fulfilled the inclusion criteria for a total of approximately 150 patients. Most documents were retrospective, uncontrolled, and case series lacking a standardized methodology (class III). There was one prospective controlled randomized trial with some limitations on its design. We determined that eight of nine studies showed a beneficial effect from HBO with only one major complication. We concluded that adjunctive HBO is not likely to be harmful and could be beneficial if administered early. Well designed clinical studies are warranted.**

THE USE OF HYPERBARIC OXYGEN THERAPY (HBO) as an adjunct to the management of surgical disease is controversial.[1] Nevertheless, crush injury and acute traumatic ischemia are considered approved indications for HBO.[2] The Agency for Healthcare Research and Quality reported on a systematic review of the literature that found HBO to be beneficial in severe chronic wounds.[3] Extrapolating this consensus to acute traumatic ischemia and crush injury is inappropriate, as the pathophysiology is different.[4, 5]

The pathophysiology of crush injury and compartment syndrome involves ischemia and hypoxia followed by free oxygen radical formation upon reestablishment of perfusion. Changes in the microcirculation develop progressively during the ischemic period and correlate with the duration of ischemia. These changes result in increasing vascular permeability to plasma proteins and progressive interstitial edema mediated by leukocyte-endothelium interactions.[6]

Several animal models have shown significant reduction in loss of muscle function, edema, and muscle necrosis when HBO is used in crush injury and compartment syndrome, even in the presence of hypovolemic shock.[7, 8] HBO preserves ATP levels and attenuates glutathione depletion when administered immediately after reperfusion.[9] It also attenuates ischemia-reperfusion injury that appears to be mediated by downregulation of key adhesion molecules such as intercellular adhesion molecule-1 and beta-2 integrins.[10, 11]

Considering the pathophysiology of acute traumatic ischemia and crush injury along with the beneficial effects of HBO, it has been hypothesized that adding HBO to the management of these injuries may result in a better outcome.

Evidence-based recommendations for the management of the injured extremity have been developed by

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