A Monograph for Health Care Providers

Innovative Wound Care Specialists

Hyperbaric Oxygen Therapy (HBO) for Wounds

Hyperbaric oxygen therapy is defined as an intervention in which an individual breathes 100% oxygen while inside a hyperbaric oxygen chamber that is pressurized to greater than sea level pressure or 1 atmosphere absolute.

Hyperbaric oxygen therapy is beneficial in the treatment of a variety of clinical diseases. Many of the favorable effects of HBO are based upon one or more of the following mechanisms of action.

The basic therapeutic value of HBO lies in increasing the partial pressure of oxygen; arterial oxygen pressures of 2000 mmHg are possible when the patient breathes 100% oxygen under pressure. Approximately 6.4 volumes percent of oxygen can be physically dissolved in plasma, enough to support life, even in the absence of hemoglobin.

Additional benefits include:

- Improved local tissue oxygenation leading to improved cellular energy metabolism
- Increased collagen and other extracellular matrix protein deposition, epithelialization
- Increase oxygen diffusion distance on the arterial end of the capillary (4 fold)
- More rapid elimination of hemoglobin bound toxins such as carbon monoxide
- Decreased local tissue edema due to vaso constriction of vessels in non-ischemic tissues
- Improved leukocyte-bacterial-killing (adequate leukocyte count critical for benefit)
- Suppression of exotoxin production
- Increased effectiveness of antibiotics which require oxygen for active transport across microbial cell membranes

Pharmacological effects of oxygen that only occur under pressure:

- Enhanced production of growth factors and receptor sites which accelerates development of new blood vessels and tissue
- Alteration in WBC ß-integrin receptor sensitivity which inhibits polymorphonuclear leukocytes adhesion
- Reduced inflammation by down regulation of pro-inflammatory mediators
- Reduced apoptosis which frequently occurs in chronic wounds due to ischemia and inflammation
- Activated stem cell mobilization, HBO therapy increases circulating stem cells by 50%
- Increased angiogenesis through stimulation of VEGF production which stimulates vascular endothelial cell migration and PDGF to stimulate smooth muscle cell migration alongside budding capillary loops required for effective angiogenesis in wound healing

References

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