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Pressure Points

Caring for people. Helping to heal.

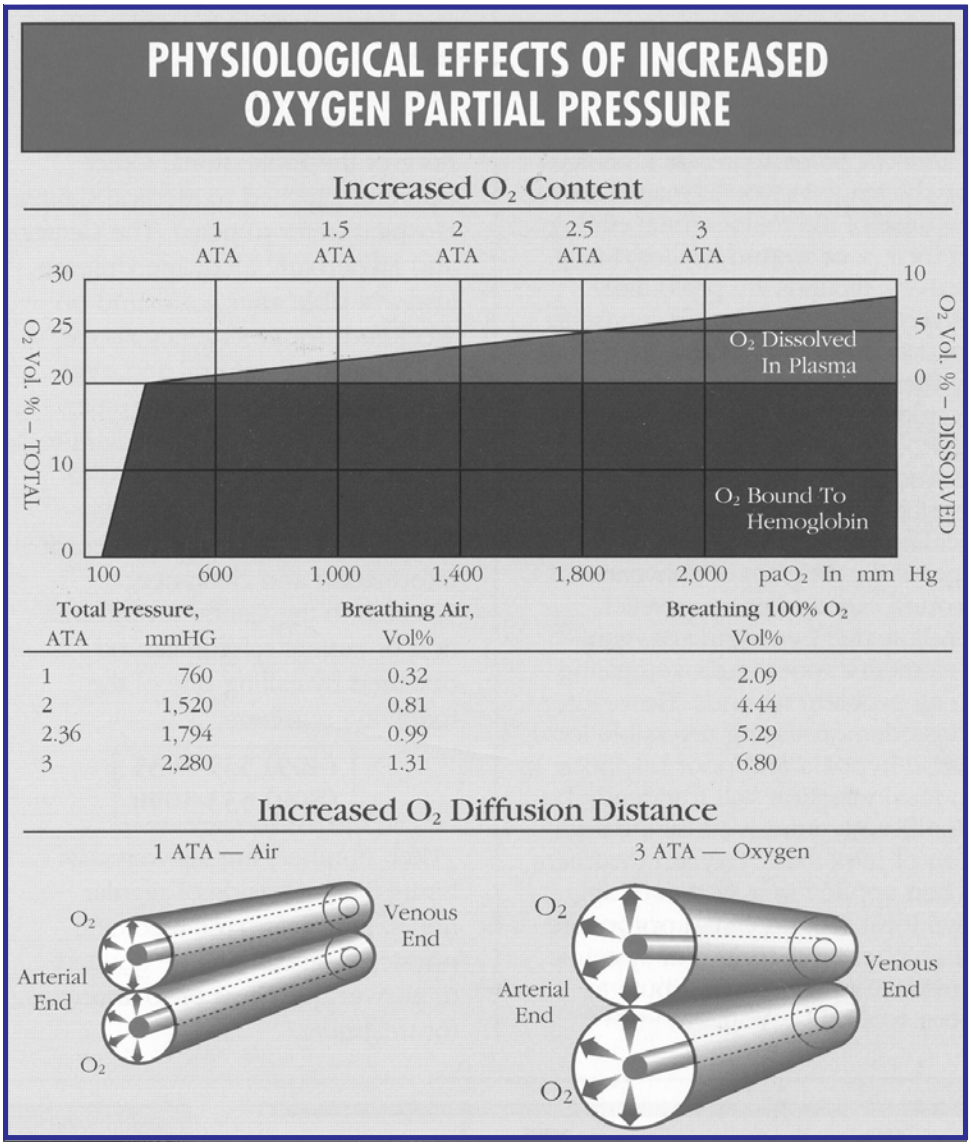
Hyperbaric Oxygen in Wound Healing

Acute wounds normally proceed through an orderly and timely sequence of events involving *hemostasis, inflammation, proliferation,* and *remodeling* that ultimately results in the restoration of nearly normal anatomic and functional integrity. Chronic wounds are wounds which have failed at some point to proceed through this orderly sequence and demonstrate arrested healing in one of these stages.

There are many factors which may cause the conversion of an acute wound to a chronic, non-healing wound. Principle among them are: (1) infection, (2) ischemia and tissue hypoxia, (3) inadequate local wound stimulus or responsiveness, and (4) unrelieved pressure or repetitive mechanical injury. Important risk factors for poor wound healing include tobacco use, diabetes mellitus, foreign bodies, and underlying vascular disease. *Tissue hypoxia* plays an important role in many non-healing wounds by reducing the effectiveness of the host response to infection and by impeding the processes of angiogenesis and fibroblast replication and collagen deposition. Thus, correction of tissue hypoxia becomes an important aspect of the management of many non- healing wounds.

As shown in the figure, hyperbaric oxygen treatment increases the dissolved oxygen content in blood plasma and the diffusion distance for oxygen into tissues. This produces a number of physiological benefits to the wounded host including:

- Correction of tissue hypoxia in partially ischemic, infected, or irradiated tissue
- Stimulation and support of fibroblast replication and collagen synthesis and angiogenesis
- Reduction of local tissue edema by local alteration in blood flow while oxygen delivery is increased by the greater diffusion of oxygen into the tissues



- Enhancement of leukocyte killing of microorganisms, improved antibiotic function, and direct toxic effects on anaerobic organisms

When combined with appropriate conventional wound care such as surgical debridement, antibiotics, edema control, and pressure relief, many previously non-healing wounds can be successfully managed.

Tissue salvage in crushing injury, compartment syndrome or other acute traumatic ischemias is enhanced because of the edema relief and greatly increased oxygen delivery to compromised tissue.

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Hyperbaric Oxygen (from page 1)

Wounds associated with *clostridial myonecrosis, necrotizing soft tissue infections*, and *refractory osteomyelitis* are improved and survival increased because of the reduction of toxin production, improved ability of leukocytes to respond to local infection, and enhanced antibiotic function.

Wounds occurring in the setting of *previous radiation exposure* develop increased angiogenesis and microvascularity following hyperbaric oxygen treatment restoring nearly normal resting tissue pO_2's and allowing surgical reconstruction or healing to proceed more normally.

Diabetic patients present a particular challenge in wound management because of the multifactorial etiology of their poor wound healing. Many diabetic wounds are profoundly hypoxic with poor host response to local infection. Adjunctive hyperbaric oxygen treatment can in many cases correct the tissue hypoxia, improve leukocyte and antibiotic function, and stimulate the development of granulation tissue and subsequent healing when combined with an aggressive program of conventional wound care and pressure relief.

Adjunctive hyperbaric oxygen treatment cannot improve healing in all problem wounds. However, those demonstrating reversible local tissue hypoxia and poor response to local infection will frequently be significantly improved by the addition of hyperbaric oxygen treatment when applied in a system of aggressive local wound care, appropriate antibiotics, and control of systemic host factors which contribute to poor wound healing.

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