How hyperbaric oxygen therapy helps heal chronic wounds

BY JOSEPH V. BOYKIN, MD

HYPERBARIC OXYGEN (HBO) therapy is the systemic delivery of oxygen at increased atmospheric pressure. In studies of chronic wound management, HBO therapy has been found to accelerate granulation tissue formation and wound closure.

Here's how it works: The patient is placed in an enclosed chamber where 100% oxygen is administered at 1.5 to 3 absolute atmospheres of pressure (ATA). This causes systemic hyperoxia by increasing the dissolved fraction of oxygen in plasma.

Encouraging wound repair

Two mechanisms are believed to be responsible for the enhanced wound healing shown by HBO therapy: wound hyperoxia and increased nitric oxide production by the wound.

Hyperoxia during wound repair satisfies the need for increased aerobic metabolism and supports increased inflammatory and cellular requirements for oxidative microbial killing and phagocytosis. Oxygen also is needed for collagen production, bone formation, epithelialization, and formation of the wound matrix. Creation or enhancement of a significant oxygen gradient between the wound (which usually is hypoxic) and peripheral tissues stimulates the neovascularization necessary to wound healing.

Nitric oxide is a gaseous free radical that plays a critical role in the regulation of microcirculation and endothelial cells. Nitric oxide causes vasodilation and is an important regulator of wound matrix repair and a critical mediator for wound angiogenesis.

Typically, HBO therapy is used as an adjunct to standard wound care. If, during assessment, the wound care specialist suspects that the patient has a hypoxic wound, the specialist will take transcutaneous oxygen measurements to document the oxygenation level of the intact periwound skin. An oxygen level less than 30 mm Hg is considered hypoxic.

Initially, the patient would receive 90 minutes of HBO therapy at 2 ATAs. Transcutaneous oxygen measurements will continue to be taken during HBO therapy and used to guide treatment.

Who's a candidate?

Hyperbaric oxygen therapy is indicated for wounds that are acutely or chronically compromised by hypoxia or infection. Some examples are wounds caused by peripheral vascular disease, diabetes, radiation necrosis, mixed soft-tissue infections, refractory osteomyelitis, and some traumatic wounds. This therapy is contraindicated in patients with acute pneumothorax or a history of recent or recurrent pneumothorax. In the hyperbaric chamber, a recurrent pulmonary leak in the patient's parietal or visceral pleura could rapidly develop into a tension pneumothorax.

Relative contraindications to HBO therapy include recent or significant ear or sinus surgery, chemotherapy, an acute or significant history of seizure disorders, claustrophobia, and febrile disorders, because the therapy may increase the risk of seizures.

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