

# Hyperbaric oxygen therapy as adjunct therapy for wound care

By Debra Clair, PhD, APRN, WOCN, WCC, DWC

**W**hy would a patient with a wound spend almost 2 hours a day, 5 days a week, in a locked chamber receiving 100% oxygen? The answer is that medical grade hyperbaric oxygen therapy (HBOT) can be a valuable adjunct therapy for selected types of wounds.

In this article, I'll focus on hospitals and clinics that follow guidelines from the Undersea & Hyperbaric Medical Society as I give you a brief overview of how HBOT works and its use in wound care.

## How HBOT helps in wound healing

The air that we breathe is 21% oxygen. With HBOT, patients are placed in a sealed chamber, where they breathe



100% oxygen under pressure. The pure oxygen saturates blood cells and blood plasma, which in turn increases oxygen supply to the tissues—including the wound being treated. HBOT can reduce the time it takes for a wound to heal by:

- promoting collagen deposition, enhancing epithelial cell migration, and decreasing local tissue edema

## Patient education resources for hyperbaric oxygen therapy

Patient education before hyperbaric oxygen therapy (HBOT) is key. Patients need to know not only how HBOT works, but what to expect when they are in the chamber. For example, the 100% oxygen environment means it's important to avoid any source of combustibility, which is why patients need to wear a 100% cotton gown for the treatment. Here are

a few helpful resources.

- **22 reasons why hyperbaric oxygen therapy (HBOT) will help you<sup>8</sup>**, from Advanced Hyperbaric Recovery™
- **Hyperbaric oxygen therapy for wound healing<sup>c</sup>**, from Johns Hopkins Medicine
- **Hyperbaric oxygen therapy fact sheet<sup>9</sup>**, from Kent Hospital
- **What are the side effects of hyperbaric oxygen therapy?<sup>e</sup>** from Hyperbaric Centers of Texas
- **Hyperbaric oxygen enhances wound therapy<sup>f</sup>**, a video from OSU Wexner Medical Center
- **What is hyperbaric oxygen therapy (HBOT)?<sup>6</sup>**, a video from Martin Health System

- killing anaerobic bacteria in tissue and bones
- preventing additional bioburden by increasing leukocyte production and activity
- enhancing angiogenesis (development of new blood vessels), which brings more blood and healing factors to the wound. Keep in mind that although angiogenesis can be beneficial for wounds with insufficient perfusion, HBOT is not an alternative to revascularization.

Not all wounds benefit from HBOT. (See *Types of wounds treated with hyperbaric oxygen therapy*.)

### Length of treatment

The average treatment time is 110 minutes in the HBOT chamber: about 10 minutes for a patient to reach the appropriate pressure, 90 minutes at the pressure, and 10 minutes to return the patient to normal pressure. Times can be expedited in the case of an emergency; for example, a patient can be out of the chamber in 7 minutes if he or she experiences a serious reaction. The average length of treatment is 30 visits, normally 5 days a week for 6 weeks.

A safety director monitors the HBOT chambers and treatment area, and a supervising provider is present at all times to monitor each treatment and prevent or manage emergencies.

### Possible negative effects

Overall, HBOT is a safe treatment for serious wounds, but there can be negative effects. The most common of these is barotrauma—discomfort in the ear when the pressure on the outside of the ear is

## Types of wounds treated with hyperbaric oxygen therapy

The Undersea & Hyperbaric Medical Society provides an evidence-based list of indications and contraindications for hyperbaric oxygen therapy (HBOT). Medicare and most insurance companies use this list when approving or denying HBOT reimbursement. Some private insurers may approve indications not accepted by Medicare, but it's important to verify which ones.

### Indications

- Gas gangrene
- Crush injury, compartment syndrome, and other acute traumatic ischemic wounds
- Acute arterial insufficiency
- Refractory osteomyelitis
- Osteoradionecrosis and soft tissue radionecrosis
- Compromised grafts and preparation and preservation of skin flaps
- Acute thermal burn injury
- Progressive necrotizing infections
- Nonhealing, infected deep ulcerations (reaching tendons or bone) of the lower extremity in adults with diabetes; ulcerations must be unresponsive to at least 1 month of meticulous wound care

### Absolute contraindications

- Untreated tension pneumothorax
- Certain medications, including bleomycin, disulfiram, cisplatin, sulfamylon, doxorubicin, and amiodarone

### Relative contraindications

- Upper respiratory tract infections
- Emphysema with carbon dioxide retention
- Asymptomatic pulmonary lesions seen on chest radiograph
- History of thoracic or ear surgery
- Uncontrolled hyperthermia
- Pregnancy
- Claustrophobia
- Seizure disorder

different than the pressure on the inside of the ear. This is similar to when you are flying in a plane or diving under water and your ears feel like they are plugged up.

Although quite rare, patients can develop a tension pneumothorax. Other important potential side effects include hypoglycemia and hypoglycemic seizures,

## HBOT may help the patient avoid an amputation, which has been shown to reduce life expectancy for patients with diabetes.

oxygen toxicity with seizures, and vision changes that can persist for up to 6 weeks after treatment.

Some patients are claustrophobic and require sedation medicine before entering the chamber.

### Timely intervention

HBOT should not be considered a last-resort wound treatment, although typically insurers require an adequate trial of other high-quality wound care interventions before granting authorization. It's important to refer potential patients early so they can get treatment as soon as possible. Early referral can make a significant difference. For example, HBOT may help the patient avoid an amputation, which

has been shown to reduce life expectancy for patients with diabetes.

### A healing effect

HBOT can make a difference in wound healing and, in turn, a patient's quality of life. Keep this option in mind and refer patients with wounds who may benefit from it for further evaluation. For more information about HBOT, visit the website for the **Undersea and Hyperbaric Medical Society<sup>A</sup>**. ■

Debra Clair is a wound care and hyperbaric therapy provider at University Hospitals Wound Care and Hyperbaric Center in Streetsboro, Ohio.

### Selected references

Cakmak T, Battal B, Kara K, et al. A case of tension pneumothorax during hyperbaric oxygen therapy in an earthquake survivor with crush injury complicated by ARDS (adult respiratory distress syndrome). *Undersea Hyperb Med*. 2015;42(1):9-13.

Kaur S, Pawar M, Banerjee N, Garg R. Evaluation of the efficacy of hyperbaric oxygen therapy in the management of chronic nonhealing ulcer and role of periwound transcutaneous oximetry as a predictor of wound healing response: randomized prospective controlled trial. *J Anaesthesiol Clin Pharmacol*. 2012;28(1):70-5.

Medicare.gov. Hyperbaric oxygen (HBO) therapy. n.d. [www.medicare.gov/coverage/hyperbaric-oxygen-therapy.html](http://www.medicare.gov/coverage/hyperbaric-oxygen-therapy.html)

Weaver LK, ed. *Hyperbaric Oxygen Therapy Indications*, 13th ed. Undersea and Hyperbaric Medical Society. 2014.

### Online Resources

A. <https://www.uhms.org/>

B. <http://hyperbaricoxygentherapy.com/patient-info>

C. [http://www.hopkinsmedicine.org/healthlibrary/test\\_procedures/neurological/hyperbaric\\_oxygen\\_therapy\\_for\\_wound\\_healing\\_135,44/](http://www.hopkinsmedicine.org/healthlibrary/test_procedures/neurological/hyperbaric_oxygen_therapy_for_wound_healing_135,44/)

D. <http://www.kentri.org/woundcare/hyperbaric-oxygen-therapy-facts.cfm>

E. <http://www.hyperbariccentersoftexas.com/what-are-the-side-effects-of-hyperbaric-oxygen-therapy#KiA1CbKWYd050Jjk.99>

F. <https://www.youtube.com/watch?v=HeW1m3TiNHI>

G. <https://www.youtube.com/watch?v=mh5UveY4r-U>