

Hyperbaric Medicine Offers Major Advantages to Physicians, Surgeons and Patients

Hyperbaric oxygen therapy has assumed an ever-expanding role in modern medical practice, offering numerous advantages to physicians, surgeons and patients. Its clinical use in a growing number of indications demonstrates its effectiveness in primary and adjunctive care. Combined with a team approach that involves hyperbaric specialists and the referring physician, hyperbaric oxygen therapy is very effective medicine.

Definition of Therapy

Hyperbaric oxygen therapy involves the systemic delivery of oxygen at values two to three times greater than atmospheric pressure. Patients are placed in a treatment facility and breathe 100 percent oxygen while exposed to elevated ambient pressures. As an application of an established technology, hyperbaric oxygen therapy is helping to resolve a growing number of difficult, expensive or otherwise hopeless medical problems.

Physiological Basis of Therapy and Mechanisms of Action

Hyperbaric oxygen therapy employs a variety of action mechanisms. Some are related directly to elevated pressures; others are related to increased oxygen effects in the blood stream, tissues and cells.

Treatment facility pressure greater than sea level results in:

- Elimination of intravascular and tissue gas bubbles, which trigger coagulopathy and other mechanisms in the complex diving disorder, decompression sickness.
- Restoration of CNS perfusion by compression of intravascular gas emboli in pulmonary over-pressure diving accidents or iatrogenic intravascular gas embolism.
- Increased partial pressure of oxygen (tension) which increases the amount of oxygen dissolved in plasma. This can increase oxygen levels to approximately 450 mmHg at the tissue level.
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The effects of increased oxygen tensions are seen in a variety of different situations:

- Vasoconstriction and for the reduction of edema in the area of trauma for crush injuries. Oxygen tension levels may be 10 to 20 times that achieved by normobaric oxygen breathing.

- Rapid dissociation of carbon monoxide molecules from hemoglobin and cytochrome A3 oxidase (23 minutes at 3 ATA) and delivery of physically dissolved oxygen via the plasma.
- Increase in oxygen diffusion distance from functioning capillaries in the hypoperfused wound. Stimulation of growth and occurrence of fibroblasts, osteoclasts and granulocytes, resulting in wound healing. The resulting angiogenesis enhances healing skin grafts, select problem wounds and compromised flaps.
- Cessation of alpha toxin production by the clostridial organisms in gas gangrene.

How it Works

Hyperbaric oxygen therapy greatly increases the amount of oxygen delivered to body tissues by your blood. It is important to note that the benefits of hyperbaric oxygen therapy result from an oxygen-enriched bloodstream and not from the oxygen's direct contact with wounds. This is why wound dressings are usually left in place during treatment. This treatment provides one or more of the following effects:

- Enhanced wound healing
- Increased oxygen delivery to injured tissue
- Improved infection control
- Greater blood vessel formation
- Preservation of damaged tissues
- Elimination and reduced effects of toxic substances
- Reduction or elimination of gas-bubble obstructions

HBO₂ Indications

- Diabetic Wounds of the Lower Extremity
- Compromised Skin Grafts and Flaps
- Delayed Radiation Injury
- Necrotizing Soft Tissue Infections
- Osteomyelitis (Refractory)
- Clostridial Myonecrosis (Gas Gangrene)
- Crush Injury, Compartment Syndrome and other Acute Traumatic Ischemias
- Select Problem Wounds

Treatment Protocols

Because oxygen inspired under increased atmospheric pressure is a potent drug, hyperbaric oxygen must be administered carefully to avoid toxic effects. A patient's clinical response and other factors often dictate the number of treatments required. Emergency cases, such as carbon monoxide poisoning or cerebral arterial gas embolism, may only require one or two treatments. Non-healing problem wounds may call for as many as 20 to 30 treatments. Radiation tissue injury may require 60 or more hyperbaric oxygen treatments for optimal benefit. Except for decompression sickness

and cerebral arterial gas embolism, treatments last about two hours. Treatments are administered once or twice a day. In some cases, treatments are administered every eight hours. Most acute conditions are treated in less than 10 days. Chronic conditions may require 30 or more treatments. In some cases, patients can watch TV/movies or listen to the radio during therapy.