Hyperbaric Oxygen 'Dives' Take Brain Injury Healing to New Depths

Brain Injury Association of Georgia's Brain Injury Resource Center Website

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The wisdom of the author of the children's book "The Little Prince"transcends building ships. Teaching patients to "long for the endless immensity of the sea" works both as a metaphor to reach the goal of wellness and as an analogy to prepare patients for the virtual descent to 45-feet below sea level during hyperbaric oxygen (HBO_2) therapy.

Physicians refer patients for HBO_2 treatment when their chronic, non-healing wounds and injuries can benefit from using oxygen as a drug. Since brain function is regulated by oxygen, the potential power of HBO_2in treating traumatic brain injury (TBI) results from its delivery of 100 percent oxygen under pressure to tissues and cells by super-saturating the plasma.

After a complete medical evaluation, the TBI patient's diagnosis, symptoms and overall condition are assessed to help determine treatment protocol. O_2 dosage and treatment time for TBI patients is still debated in hyperbaric medicine circles. Although the use of HBO_2 as an adjunctive therapy to traditional methods of TBI treatment and rehabilitation remains "off-label," it's gaining more recognition and ground among healthcare professionals.

During each one to two hour HBO_2 treatment or "dive," the hyperoxygenation received in the pressurized hyperbaric chamber enriches the patient's blood to help regenerate tissues and in the case of an injured brain, can have a marked effect on blood flow. This benefit has been shown to reduce and improve a TBI patient's neurological disability and accelerate the rehabilitation and healing process.

Cerebral edema or swelling is a major symptom of acute TBI. HBO_2"attacks" the edema with high-pressure oxygen, which constricts blood vessels while simultaneously increasing oxygen to the injured area. A TBI patient case study chronicled by Dr. Richard A. Neubauer in the Southern Medical Journal revealed a "dramatic improvement in many of (the patient's) cognitive functions" after an intensive course of HBO_2 therapy. Dr. Neubauer's study hailed the importance of "SPECT imaging before and after HBO_2 therapy to identify potentially recoverable brain tissue, in monitoring the effectiveness of therapy and in helping to identify the end point of therapy."[1]

Proponents for HBO_2 believe consistent and frequent HBO_2 treatment is effective for assisting TBI rehabilitation by:

- Enhancing oxygen concentration in hypoxic areas of the brain
- Promoting revascularization of ischemic areas
- Reducing cerebral edema and intracranial pressure by causing constriction of the brain's blood vessels
- Reactivating idling neurons
- Stimulating the growth of new blood vessels (angiogenesis) over time
- Savaging free radicals
- Restoring the integrity of the blood-brain barrier and cell membranes
- Building the oxygen content in cerebrospinal fluid
- Inhibiting reperfusion injury, or injury to tissues deprived of blood supply when blood flow is resumed

The benefits of HBO_2 may vary according to various factors including the severity of TBI, the number of recoverable neurons and how soon the treatment commences after injury.

Although HBO_2 remains an "off-label" adjunctive treatment method for chronic TBI, its use is essential to the practice and progression of medicine. To better assess HBO_2's effectiveness for TBI, more research is needed.

Foundation funding is necessary as are patients willing to undergo HBO_2 treatment, which may have side effects including barotrauma, bruised eardrums and a higher risk for brain seizures from higher O_2 pressure. The side effects are reduced or diminished by seizure medication and by clearing the ears while in the hyperbaric chamber.

[1] *Neubauer, R.A., Southern Medical Journal, Journal of the Southern Medical Association, Volume 87, Number 9, Sept. 1994, Pages 933-936.*

About Dr. Richard (Rick) King

The Emory University School of Medicine graduate is board-certified in physical medicine and rehabilitation and in underseas and hyperbaric medicine. Combining a career in medicine and an avid interest in scuba diving led Dr. King to open HyOx Medical Treatment Center, a hyperbaric medicine and rehabilitation facility located in Atlanta.