Hyperbaric Chamber Oxygen Therapy

By: Christopher Mackenzie

As early as the 1600s, practitioners varied atmospheric pressure in attempts to heal. Using a system of organ bellows, a British clergyman named Henshaw could adjust pressure within a sealed chamber called a domicilium. The simplistic principle behind its use was that acute conditions would respond to elevated atmospheric pressures, whereas chronic conditions would benefit from reduced pressure. a French surgeon named Fontaine created a mobile chamber that took advantage of a basic law of physics (Henry's law), which states that the solubility of a gas in a liquid is proportional to the pressure of the gas over the solution, provided that no chemical reaction occurs. By raising the atmospheric pressure within the chamber, Fontaine was able to increase the amount of oxygen carried by the patient's bloodstream during the administration of nitrous oxide anesthesia. This prevented blood oxygen levels from falling too low as typically happened with surgically acceptable depths of anesthesia. In the early 1900s, Cunningham observed that patients with cardiovascular disease who dwelled at high altitudes fared less well than comparable patients living closer to sea level. Suspecting that altitude-dependent changes of atmospheric pressure were responsible, Cunningham hypothesized that raising pressure beyond a normobaric level would confer even greater benefit. He successfully treated a young colleague with influenza who was near death from lack of oxygen secondary to restricted lung function. With that success bolstering his confidence, he developed a cylindrical hyperbaric chamber approximately 3 meters in diameter by 27 meters in length, which could be used to treat many conditions. In 1670, Robert Boyle observed how the eye of a snake could express a gas bubble visible through the cornea (the transparent outer membrane at the front of the eye). He concluded that tissues undergoing rapid decompression could express bubbles of previously dissolved gas. His conclusion is embodied in Boyle's law. Through subsequent decades, scores of therapeutic recompression/decompression protocols were devised. These developments were spearheaded by the military, who eagerly exploited the advantages of the hyperbaric submarine environment

Studies in the 1930s suggested that supplementary oxygen could play an important role in treating decompression sickness

A pressurized environment allows a greater amount of gas (in this case oxygen) to be dissolved into a liquid (in this case plasma). This is known as Henry's Law of Physics. Greater amounts of oxygen are absorbed into the plasma, synovial fluid and cerebral fluid when the body is pressurized using a hyperbaric chamber. In addition to the greater absorption, the oxygen is also allowed to reach areas in the body that are difficult to reach without the increased pressure.

Hyperbaric Oxygen Therapy (HBOT) is used to treat a wide range of conditions, with new applications being researched on a continual basis. There are currently 13 conditions treatable with hyperbaric that are approved by the FDA in the US. FDA allows "off-label" use of approved medical devices that have scientific data supporting their use under the supervision of a licensed physician.

Hyperbaric therapy is not typically covered by insurance for "off-label" uses, therefore most doctors are unable to recommend the therapy because of contractual obligations with insurance companies. Hyperbaric oxygen therapy can be used to treat numerous conditions as an "off-label" use, many of which are documented with scientific evidence that is stronger than that of the FDA approved conditions. Direct costs of HBO are typically around $500 per treatment with chronic indications requiring 20-40 treatments. Insurance will cover FDA approved uses but not off label treatments.

Sources

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