

Can HBOT replace blood transfusion?

In exceptional cases of patients refusing a blood transfusion from religious reasons or if transfusion is not possible for medical reasons, hyperbaric oxygen therapy can be used to help such patients acquire enough oxygen to support basic metabolic needs.

On BaroMedical website acute blood loss, hemorrhage or anemia are defined as characterized by significant decrease in blood volume and red blood cells – the main oxygen carriers in our body. Resulting lack of oxygen (hypoxia), if left untreated, can seriously harm the organ function. In acute or chronic anemia the body tries to compensate for decreased oxygen supply by producing more red blood cells in bone marrow and extract the liquid from interstitial places. Secondary carrier of oxygen in our body is blood plasma, with only 2% of carrying capacity when compared to hemoglobin – protein in the red blood cell which carries oxygen.

20 times more oxygen

Further on the site it is stated that the principle of hyperbaric oxygen therapy (HBOT) is based on breathing pure oxygen under higher ambient pressure (1 ATA) which allows up to 20 times more dissolved oxygen in blood plasma. This increased amount of oxygen dissolved in plasma covers all immediate metabolic needs of the whole body including brain and heart until sufficient red blood cells are restored.

The brain and heart are the most critical body tissues that require constant oxygen supply. In acute blood loss anemia the oxygen deprived tissues cause all blood vessels to open (dilate) to increase the blood flow. This will cause heart to work much harder and faster also to prevent cardiopulmonary congestion. Overworked heart in these conditions can lead to congestive heart failure.

UHMS Indication

The treatment of severe anemia with hyperbaric oxygen is one of thirteen indications approved by the Hyperbaric Oxygen Therapy Committee of the Undersea and Hyperbaric Medical Society for appropriate use of the therapy. All publications report a positive result when HBOT is delivered as treatment for severe anemia. Oxygen therapy can be administered rapidly at pressure up to 2-3 ATA for periods of 3-4 hours three to four times a day if intra-treatment patient air breaks are used. In exceptional cases (Jehovah's Witnesses and certain hemolytic anemias) when cross-matched transfusion is not possible, the intermittent use of HBO dissolves enough oxygen in the severely anemic patient to support basic metabolic needs. HBO therapy at 3 ATA will place 6 volumes percent of oxygen dissolved in plasma for the direct use by tissue cells. At the same time the amount of stem cells released from bone marrow by 90 minute oxygen therapy doubles.

In chronic anemia such as in cancer patients oxygen treatments can be lengthened gradually until the hemoglobin baseline builds to allow for proper oxygen delivery. It has been shown clinically that a set of 20 HBOT over 4 weeks will increase amount of stem cells in the blood circulation 8 fold. This is extremely important for those cancer patients who are awaiting bone marrow transplant. Harvesting of stem cells combined with hyperbaric oxygen therapy is becoming a routine in some medical centers.

Comparable cost

Hyperbaric oxygen will supply enough oxygen to support the metabolic needs of the body tissues until red blood cells (RBCs) are restored. The function of the RBC is to deliver oxygen from the lungs to the tissues and carbon dioxide from the tissues to the lungs. Anemia compromises oxygen delivery to the tissue and ischemia develops.

As stated on the website, a single HBOT table cost is comparable to the cost of a unit of packed RBCs, which is confirmed on the Europe PubMed Central website: “A hyperbaric oxygen treatment is equivalent in wholesale cost to a unit of packed red blood cells in the western world. By controversy, but true, hyperbaric oxygen provides a low-technology, cost-competitive means of pharmacologically reducing accumulated oxygen debt in the anemic, injured or critically ill patient with little side effect. To address severe anemia in trauma or illness, the future may well afford the use of hyperbaric oxygen therapy in the military far-forward, in pre-hospital EMS settings, in trauma center emergency departments, in operative and recovery units, and in intensive care units of hospitals.” Side effects of HBOT are few and infrequent and safety of hospital based HBOT in the United States has been very good to date.

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References:

[Blood Loss and Anemia](#). Published online on BaroMedical.

Van Meter, K. W. [\[abstract\] The effect of hyperbaric oxygen on severe anemia](#). Journal of the Undersea and Hyperbaric Medical Society, Inc. 2012; 39(5): 937-942. Published online. PMID: 23045922.