Contents lists available at SciVerse ScienceDirect



American Journal of Emergency Medicine

journal homepage: www.elsevier.com/locate/ajem

Case Report

Severe blood loss anemia in a Jehovah's Witness treated with adjunctive hyperbaric oxygen therapy $\overset{,}{\Join}, \overset{,}{\leadsto} \overset{,}{\Join}$

Abstract

We describe the case of a 39-year-old African-American woman who developed sudden onset, near-term placental abruption with severe blood loss anemia whose religious beliefs precluded her from receiving any blood products. The patient had lost most of her blood volume, with a reported hemoglobin level of 1.9 g/dL, developed multisystem failure, and disseminated intravascular coagulation with bilateral deep venous thrombosis. Adjunctive hyperbaric oxygenation (HBO) therapy was considered, and the patient was referred for treatment. The patient required ventilatory support as well as vasopressors and hemodialysis. HBO therapy occured in a monoplace chamber setting at 2.0 atmospheres absolute for 90 minutes per treatment up to twice daily depending on patients clinical status. The patient underwent a total of 30 HBO treatments and had sustained improvement in all hemodynamic parameters, red blood cell volume, renal and respiratory function. She was discharged to a rehabilitation facility on hospital day 29 and then to home, soon thereafter. The patient had no evidence of sustained physical or cognitive impairment at time of discharge, and there were no reported complications associated with HBO therapy. Adjunctive HBO therapy should be considered in the management of patients with exceptional severe blood loss anemia who refuse the use of blood products.

A 39-year-old gravida 2 para 1 female patient developed an abrupt onset of severe abdominal pain at 36 weeks and 1 day of gestation. She denied any vaginal bleeding and was transported directly to the labor and delivery unit by emergency medicine services. Her transport was uneventful other than the complaint of severe pain, and immediately upon arrival at labor and delivery, the patient underwent examination and bedside ultrasound. She was noted to have a blood pressure of 156/92 mm Hg, heart rate of 96 beats/min, and respirations of 18 breaths/min. Examination revealed tetanic uterine contractions, a cervical dilation of 2 cm, an effacement of 40%, and a station of -2 with intact placental membranes. Tocometry showed tetanic contractions with no evidence of fetal cardiac activity. Bedside ultrasonography con-

firmed fetal demise, and the patient was subsequently consented for emergent cesarean delivery. At the time of consent, the patient identified herself as a Jehovah's Witness and refused any blood products. Noteworthy, initial laboratory findings included a hemoglobin (Hb) level of 10.5 g/dL, platelets of 122 k/ μ L, prothrombin of 10.9 seconds, partial thromboplastin time of 30 seconds, blood urea nitrogen of 15 mg/dL, and creatinine of 1.1 mg/dL.

The cesarean delivery confirmed fetal demise, abruptio placenta, at least 1 L of clotted blood, and evidence of a uterus with heavy fibroid burden. After hemostasis of the uterine incision, the abdominal muscles were noted to the have sustained bleeding from multiple sites requiring ligation, gel foam, thrombin spray, and a Jackson-Pratt drain into the subfascia.

The reported estimated blood loss status was 2 L, and the patient received 1 L of intraoperative hetastarch and 2.5 L of crystalloid. Postoperative pertinent laboratory values were as follows: an Hb level of 3.1 g/dL, prothrombin/partial thromboplastin time of 20.6/35 seconds, fibrinogen of 24 mg/dL, and lactic acid of 3.4 mmol/L. These findings were consistent with disseminated intravascular coagulation. The patient was subsequently transferred to the intensive care unit for further management. The treatment team minimized blood draws in response to a post operative hemoglibin reported at 1.9 g/dL. The patient developed acute renal failure, acute respiratory distress syndrome, circulatory shock requiring vasopressor support, and bilateral lower extremity deep venous thrombosis.

The treatment team revisited the use of blood products with the patient's family who declined the use of any blood product except for erythropoietin, which was subsequently added to her treatment plan. In view of the severe anemia and an increasing accumulated oxygen debt urgent hyperbaric oxygenation (HBO) consultation was obtained. The patient met Undersea and Hyperbaric Medicine Society criteria as an appropriate candidate for adjunctive HBO therapy [1]. Current indications include an Hb level below 6.0 g/dL with evidence of end-organ dysfunction, accumulative oxygen debt, and an inability to transfuse red blood cells. Hyperbaric oxygenation treatment was instituted at 2.0 atmospheres absolute for 90 minutes with one 10-minute air break to decrease likelihood of oxygen toxicity. Over the course of her 29-day hospital stay, the patient underwent a total of 30 HBO treatments at 2.0 atmospheres absolute. Treatment frequency ranged from twice daily to every other day or third day based on periods of hemodynamic or respiratory instability that would

 $[\]stackrel{\scriptscriptstyle{\scriptsize \mbox{\tiny \mbox{\atop \mbox{\tiny \mbox{\tiny\mbox{\tiny \mbox{\tiny \mbox{\tiny \mbox{\tiny\mbox{\mbox{\tiny \mbox{\tiny \mbox{\tiny\mbox{\tiny \mbox{\tiny \mbox{\tiny \mbox{\mbox{\tiny \mbox{\tiny \mbox{\tiny\mbox{\tiny \mbox{\tiny\mbox{\tiny \mbox{\tiny \mbx{\tiny \mbx{\tiny \mbox{\tiny\mbox{\tiny\mbox{\tiny\mb}\mbx{\tiny \mbox{\mbox{\mbox{\mbox{\mb}\mbox{\mbox{\mb}\mbox{\mbox{\mb}\mbox{\mbox{\mb}\mb}\mbox{\!\mb}\mbox{\mbox{\mb}\mb}\mbox{\mbox{\mb}\mb}\mbox{\!\mb}\mbox{\mbox{\mb}\mb}\mbox{\mbox{\mb}\mb}\mbox{\mbox{\mb}\mb}\mbox{\mb}\mb}\mbox{\mbox{\mb}\mb}\mbox{\mb}\mb}\mbox{\mbox{\mb}\mb}\mbox{\mb}\mb}\mbox{\mb}\mb}\mbox{\mb}\mb}\mbox{\mbox{\mb}\mb}\mbox{\mbox{\mbo\mbx{\mb}\mb}\mb}\mb}\mb}\mbox{\mb}\mb}\mbox{\mb}\mb}\mb}\mb}$

^{☆☆} Presentations: None.

preclude meeting patient safety requirements for monoplace chamber treatment. Over the course of her treatment time, the patient had sustained improvement in her renal and respiratory function, lactic acidosis, need for vasopressors, and Hb levels. With improvement in aforementioned parameters and an Hb level of 6.3 g/dL on hospital day 35 as well as normalization of serum lactic acid levels, HBO therapy was withheld. The patient was discharge on hospital day 35 in stable condition with continued outpatient rehabilitation therapy and was discharged home without evidence of any neurologic, cognitive, or sustained physical impairment. There were no reported complications associated with HBO therapy.

Hyperbaric oxygen therapy in severe blood loss anemia has been described as early as 1959. In a swine model subjects survived complete blood volume exchange using 6% dextran/dextrose/ Ringers' lactate solution supplemented with HBO therapy [2].

Review of the literature on the use of HBO in severe blood loss anemia is based on a limited number of case reports [3-6]. Treatment efficacy is based upon evidence of improvements in tissue perfusion and inhibition of inflammatory cytokines when oxygen is delivered under hyperbaric conditions [7-10].

We describe a patient who appears to have had a favorable clinical response to adjunctive HBO therapy in the setting of severe blood loss and refusal of blood products as a therapeutic intervention. Clinicians treating patients with severe blood loss anemia under similar circumstances should consider hyperbaric medical therapy as an adjunct to patient management.

Charles Graffeo MD William Dishong MD Department of Emergency Medicine Eastern Virginia Medical School Norfolk, VA 23507 E-mail address: wpdishong@gmail.com

http://dx.doi.org/10.1016/j.ajem.2012.11.013

References

- [1] Gesell L. Undersea and hyperbaric medical society: hyperbaric oxygen therapy indications12th ed. ; 2008. p. 85-91. Boerema PI, Meyne NG, Brummelkamp WH, et al. Life without blood. Arch Chir
- Neerl 1959:11:70-84.
- [3] McLoughlin PL, Cope TM, Harrison JC. Hyperbaric oxygen therapy in the management of severe acute anaemia in a Jehovah's Witness. Anaesthesia 1999;54(9):891-5.
- [4] Hart GB. Exceptional blood loss anemia. Treatment with hyperbaric oxygen. JAMA 1974:228(8):1028-9.
- [5] Greensmith JE. Hyperbaric oxygen reverses organ dysfunction in severe anemia. Anesthesiology 2000;93(4):1149-52.
- [6] Bell MD. The use of hyperbaric oxygen in the management of severe anaemia in a Jehovah's Witness. Anaesthesia 2000;55(3):293-4.
- [7] Wells CH, Goodpasture JE, Horrigan DJ, Hart GB. Tissue gas measurements during hyperbaric oxygen exposure. In: Smith G, editor. Proceedings of the Sixth International Congress on Hyperbaric Medicine. Aberdeen University Press; 1979. p. 118-24.
- Stirban A, Lentrodt S, Nandrean S, Pop A, Tschoepe D, Scherbaum WA. Functional [8] changes in microcirculation during hyperbaric and normobaric oxygen therapy. Undersea Hyperb Med 2009;36(5):381-90.
- Sukoff MH. Effects of hyperbaric oxygenation. J Neurosurg 2001;95(3):544-6.
- [10] Yamashita M. Hyperbaric oxygen treatment attenuates cytokine induction after massive hemorrhage. Am J Physiol Endocrinol Metab 2000;278(5):E811-6.