Successful use of a polymerized hemoglobin blood substitute in a critically anemic Jehovah's Witness.(Case Report)

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Abstract: A stable, polymerized hemoglobin product has been formulated that overcomes the three traditional hurdles of hemoglobin-based blood substitutes: nephrotoxicity, osmotic diuresis, and blood-borne pathogens. We present a case of a patient with persistent colonic bleeding and a hemoglobin of 2.9 g/100 mL. Since her religious faith prevented her from accepting blood products, we offered a hemoglobin-based substitute and describe the use of this product.

Key Words: blood products, Jehovah's Witness faith, polymerized hemoglobin blood substitute

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Caring for Jehovah's Witness (JW) patients with critical hemorrhage has always been a challenging experience for physicians. The JW faith began in Philadelphia, PA, as a bible study group led by Charles Russell in the late 1870's. A literal interpretation of the Bible is the cornerstone of the JW faith. Thus, Genesis 9:3,4 "Every moving animal that is alive may serve as food for you ... Only flesh with its soul--its blood--you must not eat," is taken literally as a prohibition of receiving blood through any route. Disobeying this ban, according to JW beliefs, imperils the blood recipient's immortal soul, and the recipient is punished on earth by being shunned by friends, family, and the entire JW community. The position of the JW faith, however, has evolved over the last 20 years. The Watch Tower, the official JW journal, has approved the use of plasma, platelets, clotting factors, and organ transplants. Cell-free hemoglobin substitutes have, since the year 2000, been acceptable to members of the JW community. (1,2) We describe a case of life-threatening hemorrhage successfully treated with polymerized hemoglobin and discuss the indications and technique for using this product.

Case Report

A 51-year-old JW female with a history of pandiverticulosis came to our emergency department after 10 episodes of bright red blood per rectum over a period of 4 days. In accordance with her faith, she had never accepted blood transfusion in the past. At admission, the patient's complete blood count revealed white blood cell count of 12,000/[mm.sup.3]; hemoglobin, 6.2 g/dL; hematocrit, 17.8%; platelets, 198,000/[mm.sup.3]; and mean corpuscular volume, 95.6 [micro]m. (3) The patient was admitted, but her bleeding stopped and the hemoglobin remained stable.

She was treated with high-dose erythropoietin and iron. Three days later, she passed more bright red blood per rectum and the hemoglobin fell to 2.9 g/dL. A tagged red blood cell scan revealed that the source of bleeding was the descending colon. Immediate angiography of the superior mesenteric artery and inferior mesenteric artery showed no active source of bleeding. A catheter was left in the superior mesenteric artery for potential vasopressin administration, and the patient was admitted to the intensive care unit.

At arrival, the patient was anxious and tremulous, complaining of chest pain and dizziness. Vital signs were blood pressure, 95/65 mm Hg supine; heart rate, 125 beats per minute; respirations, 18 per minute; oxygen saturation, 100% on 2 L oxygen per nasal cannula. Mucous membranes were pale. Lungs were clear to auscultation bilaterally. Cardiac auscultation revealed a 2/6 systolic ejection murmur heard best at the left sternal border. Her abdominal examination was benign, without rebound or guarding. Examination of the extremities was normal. Electrocardiography showed sinus

rhythm without ST elevations or depressions.

Because her anemia was critical, (1) we offered the patient a polymerized hemoglobin blood substitute that she agreed to accept. After the patient consented, two units of polymerized hemoglobin were transfused, each containing 50 g of hemoglobin in 500 mL of fluid. Her vital signs after the second unit of polymerized hemoglobin were blood pressure, 134/94 mm Hg supine; heart rate, 98 beats per minute; respirations, 14 per minute; oxygen saturation, 92% on 2 L oxygen per nasal cannula. Her pulse oximetry demonstrated a brief desaturation after the transfusion secondary to mild transient pulmonary edema and possibly the interference of the product with pulse oximetry, but she responded immediately to low-dose furosemide and 2 L oxygen by nasal cannula. We detected no hemoglobinuria or renal impairment, and the patient tolerated the hemoglobin transfusion well. High-dose erythropoietin and iron were continued. The patient did not have any more bleeding episodes and was discharged 11 days later with a hemoglobin of 7.1 g/dL. The patient subsequently missed six outpatient appointments with the surgery department, so her need for elective hemicolectomy has not yet been addressed. One year after discharge, she was seen in the general medicine clinic with a hemoglobin level of 11.2 g/dL.

Discussion

There have been no randomized trails of polymerized hemoglobin in critically anemic patients, and some authors have questioned the efficacy of these products, (4) calling for data on tissue oxygenation before and after administration. These patients are critically ill, however, and to add the risk of right heart catheterization seems unwarranted. Our patient had dramatic clinical improvement with minimal untoward effects, and there have been several case reports with similar outcomes. Physicians need to be aware that this product, PolyHeme, is not available on weekends, can only be used on a compassionate-use basis, and must be shipped from North-field Laboratories, in Evanston, Illinois. For JW patients who are bleeding and at risk for critical anemia, polymerized hemoglobin should be obtained during weekdays and stored for that patient's use. The product has a shelf life of 2 years. The process will be easier if Food and Drug Administration approval of this product is obtained.

Conclusion

When critically ill, people often find strength in adhering strongly to their religious faith. From this perspective, when patients refuse transfusion because they fear a loss of their soul, they are behaving rationally.

Instead of asking, "Why die instead of receiving a transfusion?" the physician should work with the patient within the context of the patient's religious beliefs. Erythropoietin, iron, DDAVP, aminocaproic acid, and angiographic embolization are all reasonable alternatives for the patient who refuses transfusion. We now have polymerized hemoglobin to add to this armamentarium.

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RELATED ARTICLE: Key Points

* Patients of the Jehovah's Witness faith believe that they risk their immortal soul if they accept blood products.

* The official church position has changed so that they can accept a polymerized hemoglobin blood substitute.

* We describe the appropriate use of this product as a bridge for life-threatening hemorrhage.

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