

Right Hemicolectomy in a Severely Anemic Jehovah's Witness Patient With an Extremely Low Preoperative Hemoglobin Level and the Decision to Operate

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Severe anemia is associated with high mortality, and patients with this condition are typically treated with packed blood red cells. Patients of Jehovah's Witness faith, however, do not accept blood transfusion therapy. The authors report the case of a Jehovah's Witness patient who presented with lower gastrointestinal bleeding secondary to *Clostridium difficile* colitis. Because the patient refused blood transfusion therapy, he underwent a right hemicolectomy with a preoperative hemoglobin level of 2.7 g/dL and a postoperative hemoglobin level of 1.8 g/dL. He was neurologically intact and discharged to a skilled care facility on postoperative day 10. The surgical team worked with the patient, his family, the anesthesiologists, and the Jehovah's Witness Hospital Liaison Committee physician members to devise a care plan that fully supported and respected the patient's religious beliefs and allowed him to maintain complete autonomy in his treatment decisions. Health care providers should be aware of how a patient's ethical, cultural, and religious background may impact treatment options.

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Severe anemia is associated with high mortality.¹ In accordance with the oxygen delivery equation, a low hemoglobin level decreases delivery of oxygen to the tissue level and disables aerobic metabolism.² Anemic patients receive blood transfusions to raise oxygen content. Carson et al¹ conducted a retrospective analysis of 300 patients with a hemoglobin level of less than 8 g/dL who did not receive blood transfusions between 1981 and 1994. After stratifying for age; Acute Physiology and Chronic Health Evaluation II, or APACHE II, scores; and cardiovascular disease, the observed 30-day mortality rate based on patient hemoglobin level was 0% for 7 to 8 g/dL, 8.9% for 6 to 7 g/dL, 9% for 5 to 6 g/dL, 34% for 4 to 5 g/dL, 25% for 3 to 4 g/dL, 54% for 2 to 3 g/dL, and 100% for 1 to 2 g/dL.¹

However, the standards for blood transfusion are changing. Results of the Transfusion Requirements In Critical Care, or TRICC, trial³ indicated that a conservative rather than liberal transfusion practice improved survival rates in patients in the intensive care unit (ICU) who had APACHE II scores of less than 20, who were aged 55 years or younger, and who did not have cardiac ischemia. Villanueva et al⁴ also found a conservative strategy to be associated with improved survival rates in patients with acute upper gastrointestinal bleeding. These studies^{3,4} demonstrate that our understanding of anemia and transfusions is incomplete.

We report the case of a patient of Jehovah's Witness faith with severe anemia from a perforated, necrosed cecum. His lowest hemoglobin level was 1.8 g/dL 4 hours after a right

hemicolectomy. Our case exemplifies the ability of the body to compensate for anemia and to survive with low hemoglobin levels, as well as illustrates the complex management of Jehovah's Witness patients whose religious beliefs conflict with the standard of care for patients with severe anemia.

Report of Case

A 43-year-old man with *Clostridium difficile*-associated pseudomembranous colitis presented to the emergency department with syncope and rectal bleeding. A computed tomographic (CT) scan of the patient's abdomen and pelvis completed 2 weeks before admission demonstrated inflammation of the ascending colon, which extended caudally to the level of the cecum consistent with possible diverticulitis or colitis. There was no evidence of abscess or phlegmon. He had been receiving metronidazole and ciprofloxacin for 13 days for management of colitis. Results of a colonoscopy performed 10 days before the onset of rectal bleeding was positive for pseudomembranes of the right side of the colon. The patient's initial laboratory results were as follows: hemoglobin level, 5.9 g/dL (baseline, 12 g/dL); white blood cell count, 23,100 μ L; and international normalized ratio (INR), 2.8. His medical history included hemodialysis-dependent hypertensive nephrosclerosis and thrombosed arteriovenous grafts requiring daily warfarin therapy. His average dialysis baseline hemoglobin level was 9 to 12 g/dL. The patient stated he was a Jehovah's Witness and would not accept blood transfusion therapy.

On day 1, the patient was admitted to the ICU. His INR of 2.8 decreased to 2.0 after he received vitamin K (10 mg orally). The patient received epoetin alfa (40,000 U/mL every other day), as well as intravenous iron sucrose (200 mg intravenously once per week) and oral folate (1 mg orally per day) to optimize hematopoiesis. He agreed to receive coagulation factor VIIa (9 mg intravenously) and aminocaproic acid (4 g intravenously followed by 1 g intravenously every hour). Blood con-

servation techniques were implemented. Vancomycin (500 mg orally every 6 hours) was started in addition to intravenous metronidazole (500 mg intravenously every 8 hours) for management of colitis.

A contrasted CT scan of the patient's abdomen and pelvis showed right-sided colitis and a substantial amount of inflammation associated with the cecum. He continued passing loose clots rectally. Because of the frequent bleeding and the considerable amount of inflammatory change on the CT scan, angiography was performed in lieu of endoscopic intervention. An angiograph revealed extravasation at the cecum; however, no direct route to the site of bleeding for angioembolization was accessible.

On day 2, the patient's INR normalized at 1.0, but the bleeding persisted. His hemoglobin level decreased to 3.3 g/dL. Episodes of tachycardia and hypotension were managed with normal saline boluses. The patient and 2 regional Jehovah's Witness Hospital Liaison Committee physician members devised an acceptable collaborative care plan. Although the patient refused a whole blood transfusion, he agreed to the use of plasma fraction products. At this time, 40 g intravenous immune globulin was given. Colonoscopy was not offered because of the high risk of perforation, and surgery was not immediately offered because of his low hemoglobin level and comorbidities.

On day 3, the patient's hemoglobin level reached 2.7 g/dL, and he had 2 bloody bowel movements. The patient and his family had multiple discussions with the hospital's surgeons, anesthesiologists, and Jehovah's Witness Hospital Liaison Committee physician members regarding therapeutic options, including the use of fresh frozen plasma (FFP), which is typically an unacceptable blood product to Jehovah's Witness patients, and surgery. The patient chose to undergo surgery but agreed to use FFP if needed. The Jehovah's Witness Hospital Liaison Committee physician members supported the use of FFP in this case because the patient was already receiving plasma fraction products. A preoperative planning ses-

sion was held with the surgical team and anesthesiologist to discuss which techniques and procedures could decrease operative time and maximize blood conservation.

During exploratory laparotomy, an inflamed cecum with cecal perforation was found with bleeding into the lumen and minimal peritoneal soiling. An extended right hemicolectomy with end ileostomy and a mucous fistula was performed. The abdomen was closed primarily, and anesthesia time was documented at 72 minutes. Estimated procedure time (skin to skin) was 45 minutes, and estimated blood loss was 50 mL. Intravenous fluids included 2 U of FFP, 2300 mL of crystalloid, and 500 mL of albumin solution. Anesthesia was maintained with isoflurane at 1.3%, and blood pressure was maintained with phenylephrine. The patient was sent to the surgical ICU and received mechanical ventilation. His hemoglobin level reached a low of 1.8 g/dL 4 hours after the laparotomy, and he self-extubated on postoperative day 1. He was neurologically intact and discharged to a skilled care facility on postoperative day 10. The ileostomy was successfully reversed 6 months later once his hemoglobin level returned to baseline.

Discussion

A Jehovah's Witness patient's refusal of blood transfusions presents a unique set of constraints on the medical management of a bleeding patient. These constraints prompt the health care provider to consider alternative bloodless treatment modalities. The present case and others⁵⁻¹⁰ demonstrate that patients do survive with very low hemoglobin levels because of the body's ability to compensate for anemia. In our case, a major surgical procedure was the definitive treatment, which required in-depth risk-benefit discussions between the patient and multiple specialists.

Our institutional policy and procedure manual had no resources or directives specific to Jehovah's Witness patients. The patient was an alert, competent adult who

chose not to receive a blood transfusion for religious reasons. The Accreditation Council for Graduate Medical Education general surgery program requirements state, "Residents must demonstrate a commitment to carrying out professional responsibilities and an adherence to ethical principles."¹¹ Furthermore, residents are expected to demonstrate "respect for patient privacy and autonomy" and "sensitivity and responsiveness to a diverse patient population, including ... religion."¹¹

The surgical team in our case conducted an online search to locate and review evidence from scientific studies and culturally relevant resources related to Jehovah's Witness patients with severe anemia. A patient representative contacted the Jehovah's Witness Hospital Liaison Committee, which sent 2 regional physician members to participate in medical treatment discussions at the patient's bedside. This supportive environment allowed the patient and his family to decide which options were acceptable to them and clarified for the medical team which options were prohibited by the Jehovah's Witness faith. The health care team ensured that the patient's religious beliefs would be honored during all aspects of his care.

The United States legal system has consistently ruled that competent adults have the right to informed consent and may accept or refuse treatment. This precedent began with the case of *Mary E. Schloendorff vs The Society of New York Hospital* in 1914, in which the judge stated, "Every human being of adult years and sound mind has a right to determine what shall be done with his own body."¹² The Patient Self-Determination Act of 1990 requires institutional health care providers to ask patients if they have an advanced directive, to record patient preferences for end-of-life care in the medical record, and to develop institutional policies regarding the right to have patient decisions respected by health care personnel when a patient is not able to advocate for themselves.¹³ To the authors' knowledge, there are no officially recognized Jehovah's Witness no-blood advance directive forms, and this patient did not have any type of written advance

directive. If no advance directives exist, a discussion should be held and documented with the patient and his or her surrogate medical decision maker, if applicable, to discuss worst case scenario care options before a medical emergency occurs. If a signed advance directive does exist, health care providers should attempt to ascertain if the information in the advance directive accurately reflects the patient's current beliefs and wishes for care and to document that discussion.

Health care providers should be aware of how patients' religious beliefs may impact treatment options. Surgery, the definitive therapy needed for the patient in the present case, was not initially offered as an option by the health care providers because of the high risk for adverse effects. Surgeons typically treat anemic patients with blood transfusions, and when this standard of care is not an option, they are often unsure of how to proceed. This mindset can hinder the selection of an alternative treatment option and result in an inadequate informed consent process. The surgical team waited until day 3 before acknowledging that nonsurgical treatment was not stabilizing the patient's condition. If surgery had been offered immediately as an option, the patient could have undergone the operation on day 2 with a higher hemoglobin level and with less risk.

Numerous reports in the literature discuss blood conservation and bloodless treatment alternatives.¹⁴⁻¹⁸ The approaches commonly involve addressing the source of anemia, minimizing blood draws, maximizing oxygen delivery, and reducing oxygen demand.¹⁴⁻¹⁸ Medications that aid hematopoiesis, such as erythropoietin, folate, and vitamin B₁₂, may be initiated. If the patient is coagulopathic, then FFP, coagulation factor VIIa, and aminocaproic acid can be used in addition to oral or intravenous vitamin K.¹⁴⁻¹⁸ Although not available at the time of the present case, the US Food and Drug Administration has recently approved the use of prothrombin complex concentrates such as Kcentra and Beriplex for reversal of oral anticoagulants with vitamin K–dependent coagulation factors.¹⁸ However, these products, as well as anti-

inhibitor coagulant complexes, contain human plasma and would need to be discussed with any Jehovah's Witness patient before initiation of treatment. With the advent of newer pharmacologic agents and medical devices, the lines have blurred for what constitutes as acceptable blood treatment options for Jehovah's Witness patients. Autotransfusion and blood subproducts such as FFP, cryoprecipitate, clotting factors, and albumin are considered by the Watch Tower Bible and Tract Society of Pennsylvania, the governing body of the Jehovah's Witnesses, to be the personal choice of each individual to receive or refuse.¹⁹ Individuals decide for themselves whether or not these products are in accordance with their religious beliefs.¹⁴⁻¹⁸ A dual approach with health care providers and a Jehovah's Witness Hospital Liaison Committee member can provide the patient with both the scientific and religious information needed to make an informed treatment decision.

Our patient's neurologically intact survival is extremely rare. Carson et al¹ found a 100% mortality rate in patients with a postoperative hemoglobin level of 1 to 2 g/dL and a 54% mortality rate in patients with postoperative hemoglobin level of 2 to 3 g/dL.¹ Our patient's hemoglobin level was 2.7 g/dL preoperatively and 1.8 g/dL postoperatively, which, to our knowledge, is the lowest documented hemoglobin level in a patient who survived without a blood transfusion.⁸ The lowest hemoglobin level documented in a patient who survived with a blood transfusion was 0.7 g/dL, which was observed in a patient with a rare blood type who experienced bleeding from an injured axillary artery and who was treated with intravenous fluids until blood arrived.⁵

The patient's ability to survive a major surgical procedure with such a low hemoglobin level poses the question: how was he able to do it? The delivery of oxygen is determined by the oxygen content of the blood and cardiac output, as well as the ability of the tissue to extract oxygen. The body compensates for anemia by increasing cardiac output (increased heart rate, contractility, decreased blood viscosity, and decreased periph-

eral vascular resistance, as well as a rightward shift in the oxygen-hemoglobin dissociation curve and increased oxygen extraction). Oxygen delivery is redundant in a resting patient in that it exceeds extraction by a factor of 4. Inadequate oxygen delivery may not be apparent until a hemoglobin level of 5 g/dL is achieved in resting, otherwise healthy patients.²⁰

Our patient had compensatory tachycardia, and although we did not measure his cardiac output and systemic vascular resistance, we presume contractility was probably markedly increased. His systemic vascular resistance was most likely decreased because of sepsis in addition to his compensation for his anemia. Whether or not there were other compensation mechanisms involved in our patient's survival (ie, chronic renal failure, infusion of intravenous immune globulin, anesthesia techniques, or more efficient oxygen offloading) would require further investigation.

A review of the literature includes much discussion regarding restrictive vs liberal transfusion practices.^{1,3,4,21} Our case clearly would have warranted blood transfusion (barring his refusal) because of the documented risks associated with a hemoglobin level less than 6 g/dL coupled with physiologic changes, rapid bleeding, and an emergent surgery. Of note, the length of the procedure and amount of blood loss were quite low for this type of major operation, emphasizing the importance of damage control philosophy in surgery and good technique. Whatever the mechanism, the outcome in our patient and in patients of the other case reports⁵⁻¹⁰ of severe anemia speaks to the amazing homeostatic mechanism of the body.

The tenets of osteopathic medicine include a commitment to the dynamic interaction of mind, body, and spirit and the body's ability to heal itself.²² As osteopathic physicians, we pledge to provide compassionate quality care, to partner with our patients to promote health, and to display integrity and professionalism.²³ Our patient and his family truly trusted our team to provide the best care possible, and they had no doubts that we would

honor their religious beliefs and stay within the mutually agreed upon plan of care no matter the outcome. The authors believe this strong physician-patient relationship and our patient's unwavering religious faith were key to his survival, even though they cannot be scientifically proven or replicated.

Conclusion

The present case underscores the need for physicians to honor patient autonomy and to individualize patient treatment plans by engaging in detailed conversations with the patient, the patient's family, and various specialists to lay out all available options, risks, and benefits and to allow for a truly informed consent. Our case highlights the complex management of a patient whose religious background opposed the usual standard of care and forced health care providers to be flexible. All too frequently, medical decision making consists of scientific facts with ethical, cultural, and religious considerations filtered out of the conversation. It is imperative for physicians to respect their patients' wishes and belief systems and to commit to treating the whole person no matter the outcome.

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