Case 2014-06: The Bleeding Edge

A 55-year-old woman presented for a revision posterior spinal fusion. She had received a red blood cell (RBC) transfusion during her prior surgery. An anesthesia preoperative assessment was performed via telephone, and laboratory studies were done by an outside provider. Prior to the day of surgery, the patient had no blood sample in the blood bank. On the morning of surgery, a type and screen was sent from the preoperative holding area, and anesthesia and surgery were started. Two hours after sending the specimen, the blood bank informed the anesthesiologist that the antibody screen was positive, and a crossmatch would take at least one and a half hours. At this point in the surgery, the patient had a hematocrit of 23 percent. The anesthesiologist discussed with the surgeon whether to cancel the latter portion of the procedure, or pack the incision until blood became available. The decision was made to end the procedure early and bring the patient back to the O.R. once crossmatched blood was available.

Discussion

Any patient undergoing an obstetric or major operative procedure may need an RBC transfusion. Even simple procedures can have a complication that requires RBCs, plasma or platelets. For the revision spinal fusion procedure described here, transfusion is expected.

In emergent situations, uncrossmatched type-O negative blood is acceptable. In women who are past childbearing age, and for men, type-O positive blood is also acceptable. For elective cases, the standard of care is to transfuse only units that have been crossmatched using recent blood samples from the patient. A conservative practice is to crossmatch units of blood for every surgical patient. However, this is time-consuming, expensive and will lead to local shortages because too many units will be held in reserve. In response to a high ratio of crossmatched to actually transfused units, blood banks have implemented “maximum blood ordering schedules” to provide a guideline for which procedures should have a type and screen performed and how many units of blood should be reserved for a given procedure. Current recommendations call for a crossmatch if there is a 10 percent chance that a patient may need blood.1 The maximum blood ordering schedule (MBOS) calls for enough units to be available so that 90 percent of patients who need blood can be transfused crossmatched units from the current inventory.

Modern blood banks start with the type and screen. The screen identifies antibodies in the patient’s blood that are known to be associated with serious transfusion reactions. In the majority of patients no antibodies are identified, so an ABO and Rh-compatible (“type-specific”) unit can be safely and quickly issued without further testing, a process known as “electronic crossmatch.” If the screen identifies an antibody, the blood bank needs to perform additional testing to determine what kinds of antibodies are present. A manual crossmatch is performed by mixing the patient’s plasma with red blood cells from candidate units for transfusion. An electronic crossmatch can be verified with a manual crossmatch, if time permits. For particularly rare antibodies, finding compatible units for transfusion may require reaching out to other blood banks. This process may take several hours or days to complete.

The American Association of Blood Banks (AABB), an international organization that develops transfusion medicine standards, states that a type and screen is only valid for three days.2 Laboratory testing for outpatient surgery is frequently performed weeks before the operation, and often at outside laboratories. For that reason, it is common for patients to have a type and screen drawn on the morning of surgery.

“The type and screen is still pending, do you want to bring the patient into the room?” This is a question nearly every anesthesiologist has faced. The World Health Organization surgical checklist requires that the surgical team discuss the risk of blood loss over 500 mL, and the Joint Commission Universal Protocol requires that requested blood products be present, but neither checklist requires that a type and screen be completed. In a multicenter study by the College of American Pathologists, 25 percent of type and screens drawn on the day of surgery were completed after the start of surgery.3 In this study, 2 percent of type and screens had a positive antibody screen. Of those positive screens, 5.7 percent led to surgical delay.
In an analysis of voluntary medical error reports citing insufficient pre-transfusion testing, three causes were identified. The first is that patients were taken to the O.R. before the type and screen was complete. All the cases that were reported had a positive antibody screen, leading to surgical delay in most cases. The second occurred when pre-transfusion testing was ordered, but samples were lost or never drawn. The final cause was delay because the strict labeling procedures for blood bank specimens were not followed.

An intervention used at some medical centers is to allow the type and screen to remain valid for 14, 21 or even 30 days. In one cancer center studied, the type and screen is valid for 30 days if the patient has not received a transfusion or had surgery in three months, if the patient is not pregnant or had a recent miscarriage, and if no preoperative transfusion is planned. These criteria are generally felt to predict that the patient’s type and screen, if negative, will remain negative. As long as the patient has been at the medical center within 30 days, no same-day type and screen is required. While an extended type and screen reduces the time pressure created by same-day testing, the process requires extra work on the part of the blood bank physicians and staff.

While it is the standard of care to give crossmatched blood, it is worth asking what the risk really is of giving uncrossmatched blood. Type-specific blood has a 99.8 percent chance of a compatible transfusion. With a negative antibody screen, the chance is 99.94 percent, and a crossmatch increases this to 99.99 percent. In a one-year study of 480 trauma patients receiving transfusions, 161 received uncrossmatched type-O RBC. There were no acute hemolytic transfusion reactions noted in this population. Of 10 Rh-negative men receiving Rh-positive blood, only one developed antibodies to the Rh antigen. The authors felt that part of the reason for the low rate of seroconversion may be the immune suppression associated with hemorrhagic shock. However, two larger studies published recently have confirmed the safety of emergency transfusion in large numbers of general medical and surgical patients.

In modern perioperative medicine, the day of surgery may be the first time a patient visits the surgical center. Economic need to keep O.R.’s running puts pressure on anesthesiologists to allow surgery to begin despite an incomplete type and screen, especially because 98 percent of those screens will be negative. Blood conservation techniques, including autologous donation, cell salvage and antifibrinolytic therapy, reduce but never eliminate the potential need for allogeneic transfusion. An extended type and screen policy will help reduce the rate of late type and screens, but only if surgeons and their patients participate in the process.

Recent research demonstrating the safety of uncrossmatched blood may have made anesthesiologists more willing to bring at-risk patients to the O.R. with an incomplete type and screen. This adjustment is known as risk compensation. As more and more of these patients suffer no adverse consequences from the incomplete type and screen, anesthesiologists become more comfortable. This is a phenomenon known as normalization of deviance.

Anesthesiologists can standardize their communication with the blood bank ahead of surgery. Four questions will give the information needed to make informed decisions about how to proceed:

1. Is the antibody screen negative?
2. How many units of blood products are available right now for this patient?
3. If we need additional units for this patient, how long will they take to arrive?
4. Do you need another blood sample to match additional units?

In the case under discussion, the team was able to stop the surgery safely and bring the patient back on another day. It is an option to discuss the situation with the patient’s family and describe the risks of using uncrossmatched blood versus ending the procedure early. Anesthesiologists can transfuse uncrossmatched units with some confidence that a serious reaction is unlikely. However, any transfusion reaction will likely be due to the lack of crossmatch and thus considered preventable.

References: