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Type and Screen for Cesarean Section: A Prudent Alternative

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The use of the type and screen procedure as an alternative to crossmatching blood for patients undergoing elective surgery has gained growing acceptance during the last few years.[1,2] The overall, long-term advantage is a better use of our available blood supply. This is accomplished by reducing the number of crossmatched units in a blood bank inventory. Crossmatched units may not be used for anyone else until released and can lead to blood exceeding its expiration date without being utilized. The type and screen procedure allows for units of blood to be assigned on an "as needed" basis; older units of the proper type can then be released first which will reduce outdating. This also reduces a blood bank's need for a large inventory of whole blood and permits a greater number of freshly acquired units to be fractionated into blood products such as platelet concentrates, fresh frozen plasma, and cryoprecipitate. The cost of medical care also could be reduced by eliminating the charges involved in unnecessary crossmatching. The high crossmatch-to-transfusion ratio (C/T) has been used to demonstrate the rationale for use of the type and screen. For obstetric patients, including those undergoing cesarean section, a C/T ratio ranging from 17.6/1 to 64.1/1 was found.[3] This certainly indicates that far more blood is being crossmatched than is ever needed. Approximately 3,000 infants are delivered annually in our obstetric suite with a cesarean section rate of about 15%. Because all cesarean section patients in our hospital receive a type and crossmatch for two units of blood, we crossmatch about 900 units of blood per year in preparation for their surgery. A review of the intraoperative use of blood in these patients was conducted to determine if the type and screen procedure would be an appropriate alternative for our population and if so, which types of patients still should have the crossmatch carried out prior to surgery.

METHODS

Upon receiving approval from the Human Subjects Committee, the anesthesia records for all cesarean sections performed between October 1, 1980 and September 30, 1981 were reviewed. The use of whole blood or packed red blood cells during the operative period was noted. The medical record of each patient receiving blood then was obtained and abstracted for the following data: primary or repeat cesarean section; number of units crossmatched; number of units transfused; type of product utilized; indication for cesarean section; postoperative transfusions; estimated blood loss; and preoperative and postoperative hematocrits.

RESULTS

Four hundred and fifty-seven cesarean sections were performed. The distribution between primary and repeat cesarean sections appears in table 1. The total number of units crossmatched was 914, although not all patients had a two-unit crossmatch. Fourteen patients in our series received an intraoperative blood transfusion (3.06%). All but one of these patients underwent primary cesarean section. They received a total of 14 units of whole blood and seven units of packed red blood cells. The average number of units given intraoperatively was 1.5 with a range of one to three. The estimated blood loss ranged from 800–3,000 ml, with an average loss of 1,370 ml. Transfusion was instituted at the clinician's discretion, but none of these patients was transfused for hemodynamic instability. Six of these patients received additional blood transfusions during the first 24 hours after surgery, bringing the total number of units administered to 33.

The 14 patients who were transfused were distributed into four categories based on the preoperative diagnosis: placenta previa (7); preoperative hematocrit of 30% or less (4); severe preeclampsia (2); and failed induction (1). All but the last group demonstrated a fairly high incidence of transfusion when cesarean section was performed (table 2). There were no transfusion reactions.

DISCUSSION

Only 3.06% of our cesarean section patients received a perioperative blood transfusion. This includes patients

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transfused in the immediate postoperative period. This is identical to the 3.02% incidence of preoperative and intraoperative transfusion recently reported by Davies for the same operation.[4] In addition, our review has identified not only which categories of patients received blood products but the frequency of transfusion given their diagnosis and the need for cesarean section. As noted above, approximately 30–40% of the patients with placenta previa, anemia, or severe toxemia received blood products during cesarean section. None of these patients had hemodynamic instability intraoperatively; therefore, it is assumed that these transfusions were administered because of concern for low initial hematocrits or apparent large operative blood loss. Those patients who may have received late postoperative transfusions but no perioperative transfusions were not determined because their need for immediate transfusion is rare. Thus, not only is the incidence of transfusion with cesarean section small, those patients most likely to receive blood can be identified.

The crossmatch-to-transfusion ratio has been utilized by others as a guide to the need for changing their practice to type and screen in place of the preoperative crossmatch. The C/T ratio in surveys of obstetric patients has ranged from 17.6/1 to 64.1/1.[3] One group reduced their overall C/T ratio to 4.9/1 by widespread application of the type and screen. The C/T ratio for cesarean section alone has not been determined previously. In our series of patients it was 43.5/1 for intraoperative units and 27.7/1 when postoperative transfusions are included. Since the ideal goal of many transfusion services is a ratio of 2.5/1 or less,[5] we obviously are overutilizing the crossmatch procedure. Interestingly, if two units of blood were crossmatched for those patients in this survey with the diagnosis of placenta previa, anemia, or severe toxemia the C/T would have been 2.6/1. This suggests an acceptable application of the crossmatch for this group of patients.

The type and screen offers a tantalizing method to reduce this high ratio for cesarean section patients as well as reduce direct costs to the patient. A type and screen costs about $60 in our community while a full crossmatch for two units of whole blood is $120. There is therefore a cost-effective reason to utilize type and screen. However, even if only a small number of patients receive blood at cesarean section, and if the C/T ratio is too high, we must be sure of the safety of abandoning what has been a time-honored, widespread, and still espoused practice of a full crossmatch for two units of blood prior to cesarean section.[6,7]

TABLE 1. Distribution of Patients Transfused

Type of Cesarean Section	Number	Transfused	
		Number	Percent
Primary	309	13	4.2
Repeat	148	1	0.7
Total	457	14	3.06

A type and screen procedure for a preoperative patient is performed by determining the potential recipient's ABO group and Rh factor. The patients serum is then mixed with reagent red blood cells from two different donors. This should identify nearly all antibodies to red blood cell antigens. A patient with a positive antibody screen is studied further with an additional panel of reagent erythrocytes to identify the antibodies involved. If a type and screen is negative, the serologic safety of receiving an ABO and Rh compatible unit of blood (type and Rh specific) is reported to be 99.99%, virtually the same as for a crossmatch.[8] There is an increased risk of receiving serologically incompatible blood if a type-specific unit of blood is administered without a type and screen. This has been shown to be about 1:1,000 (89/71,000) in a series of patients with low risk for sensitization, *e.g.*, no prior exposure to blood or blood products.[9] Even so, the risk of hemolytic transfusion reaction is slight as most of these antibodies are in low titer and not reactive at physiologic temperatures. Patients at high risk are those with previous exposure to blood or blood products and patients who have been or are pregnant. Their relative risk of having a hemolytic transfusion reaction is 1:100 if they receive type-specific blood without an antibody screen.[9] Pregnant patients are included in this group because transplacental hemorrhage of fetal red blood cells occurs in 50%

TABLE 2. Blood Utilization for 457 Cesarean Section Patients

Preoperative Diagnosis	Number	Number Transfused	Units Administered		
			Intraoperative	Postoperative	Total
Placenta previa	18	7(39%)	10	9	19
Low hematocrit	15	4(27%)	5	3	8
Severe toxemia	7	2(29%)	4	0	4
Failed induction/Failure to progress	108	1(0.9%)	2	0	2
Elective repeat and other	309	0	0	0	0
	457	14	21	12	33

of women during pregnancy or at delivery. This may be as few as 5% during the second month of pregnancy to as many as 25% in the third trimester, and frequently results in maternal sensitization to red blood cell antigens.[10]

Therefore, since the incidence of blood transfusion at cesarean section is low, the crossmatch-to-transfusion is high and the type and screen is both medically safe and cost-effective, the type and screen procedure for the majority of patients undergoing this operation seems justified. If the screen is positive, the attending physician should be notified, the antibody identified, and compatible blood be set aside for this patient by crossmatch. In the event that blood is needed urgently during operation for the patient with a negative screen, an immediate spin (partial) crossmatch will assure proper ABO labeling and compatibility and rule out a few antibodies, while for less urgent situations a low ionic strength saline crossmatch can be performed. This technique is a complete crossmatch with the same sensitivity as the standard crossmatch but may be completed in 15 minutes.[11] While the need for ever performing a crossmatch for the patient with a negative antibody screen is currently under question, it is still the recommended standard of care, if there is time, and blood is to be given.[12] Thus, cesarean section patients with a positive antibody screen, a coagulopathy, or severe preoperative hemorrhage should still have a full crossmatch, and perhaps those with placenta previa, anemia, and severe toxemia as well. The only negative ramification to such a program could be reduction of a blood bank inventory below a level adequate to meet emergency demands. This should not occur with proper administration and observation of local blood use patterns.

In conclusion, this study has demonstrated the high crossmatch-to-transfusion ratio in cesarean section patients and identified those most likely to be transfused. The rationale for use of the type and screen procedure for cesarean section patients has been presented with the ultimate goal of patient safety in an environment of cost-effective and efficient blood resource utilization.

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