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Considerations on autologous blood transfusion

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Introduction

Several strategies exist regarding blood donation and transfusion in preoperative period. These strategies include autologous preoperative donation, normovolemic hemodilution, cell saver, and heterogenic transfusion. We always consider the criteria for blood donation, taking present the type of surgery, preoperative patient condition, and likelihood and amount of bleeding. The American Association of Blood Banks (AABB) Standards for Blood Banks and Transfusion Services requires that the donor-patient's hemoglobin (Hb) be no less than 11g/dL or the hematocrit (Hct) be less than 33% before each donation.[1]

Autologous donation

Indications and patients selection for autologous blood donation (AD): Patients undergoing elective surgery may donate preoperatively if the propability of bleeding is high. There are no age or weight limits. Patients may donate 10.5mL/kg, in addition to testing samples. Donations may be scheduled more than once a week, but the last should occur no less than 72 hours before surgery to allow time for restoration of intravascular volume. Candidates for preoperative collection should be stable patients scheduled for surgical procedures in which blood transfusion is likely. The most common surgical procedures that probably required transfusion are major orthopedic procedures, vascular surgery, cardiac or thoracic surgery, and radical prostatectomy.[2] When the transfusion is not likely (less than 10%) the use of preoperative blood collection is not recommended. Those cases include cholecystectomy, herniorrhaphy, vaginal hysterectomy, and uncomplicated obstetric delivery.[3]

Contraindications of autologous blood donation: The contraindications of autologous blood transfusion are summarized in Table 1. In the patients with cardiac current diseases, the risks that are associated with autologous blood donation[4] in these patients are greater than estimated current risks of allogeneic transfusion.[5,6] The autologous blood donation from pregnant women is not recommended,[7] because blood is so seldom needed. AD can be considered for women with alloantibodies to multiple or high-incidence antigens or with placenta previa or other conditions placing them at high risk for antepartum or intrapartum hemorrhage.[8] AABB Standards no longer permit allogeneic transfusion of unused autologous units ("crossover") because autologous donors are not, in the strictest sense, volunteer donors. That experience concorde with our experience.

Aggressive phlebotomy vs. Standard phlebotomy: If the erythropoietic process does not respond to blood phlebotomy in order to maintain the patient's hematocrit level during the donation interval, the donation may be harmful[9] causing preoperative anemia and an increased possibility of allogeneic blood transfusion. "Aggressive" autologous blood phlebotomy means donation twice weekly for 3 weeks, beginning 25 to 35 days before surgery. The endogenous erythropoietin levels will increase, along with enhanced erythropoiesis representing RBC volume expansion of 19% to 26% (Table 2). Exogenous erythropoietin (Eprex) therapy can further stimulate erythropoiesis (up to 50% RBC volume expansion.[10–17] Preoperative use of erythropoietin is approved for anemic (Hct<39%) patients scheduled for no cardiac, nonvascular surgeries.

Advantages and Disadvantages of Autologous Blood Donation: Table 3 summarizes the advantages and disadvantages of autologous donation. Although autologous blood collections have become popular, the costs associated with their collection are higher than those associated with the collection of allogeneic blood.

Normovolemic hemodilution: Normovolemic hemodilution (NH) is the removal of whole blood from a patient while restoring the circulating blood volume with an acellular fluid shortly before an anticipated significant surgical blood loss. NH relies on the premise that if the concentration of red blood cells is decreased total red cell loss is reduced when large amounts of blood are shed; meanwhile the cardiac output remains normal because intravascular volume is maintained. Decisions about NH should be based on the surgical procedure and on the patient's preoperative blood volume and hematocrit, target hemodilution hematocrit, and other physiologic variables (Table 4).

Table 1 Contraindications of autologous blood donation

Evidence of infection and risk of bacteremia
Scheduled surgery to correct aortic stenosis
Unstable angina
Active seizure disorder
Myocardial infarction or cerebrovascular accident within 6 months of donation
Patients with significant cardiac or pulmonary disease who have not yet been cleared
High-grade left main coronary artery disease
Cyanotic heart disease
Uncontrolled hypertension

The blood is then stored at room temperature and reinfused during surgery after major blood loss has ceased, or sooner if indicated. Simultaneous infusions of crystalloid (3mL crystalloid for each 1mL of blood withdrawn) and colloid (dextrans, starches, gelatin, albumin [1mL for each 1mL of blood withdrawn]) have been recommended.[18] Blood must be collected in an aseptic manner, ordinarily into standard blood collection bags with citrate anticoagulant. Units must be

properly labeled and stored. The label must contain, at a minimum, the patient's full name, medical record number, date and time of collection, and the statement "For Autologous Use Only." Room temperature storage should not exceed 8 hours. All of these studies found NH to be equivalent to AD in eliminating the need for allogenic blood transfusions and suggest that NH and AD are equivalent for avoiding allogenic blood transfusions during elective surgery.[19] Long-term outcomes including anesthesia and surgery times, intraoperative hemodynamic values, and length of hospital stays were also equivalent in AD and NH, but NH is much less costly than AD.[19,20]

Table 2 Endogenous erythropoietin-mediated erythropoiesis

	Patients (n)	RBC (mL)		Net RBC		Ref
		Removed (Donated)	Produced	Expansion (%)	Iron therapy	
Standard Phlebotomy	108	522	351	19	PO	13
	22	590	220	11	None	14
	45	621	331	17	PO	14
	41	603	315	16	PO, IV	14
	30	540	397	19	None	14
Aggressive Phlebotomy	30	558	473	23	PO	14
	30	522	436	21	IV	14
	24	683	568	26	PO	15, 16
	23	757	440	19	PO	17

Table 3 Advantages and disadvantages of autologous blood donation

Advantages	Disadvantages
Prevents transmitted disease	Does not affect risk of bacterial contamination
Prevents red cell alloimmunization	Does not affect risk of ABO incompatibility error
Supplements the blood supply	Is more costly than allogeneic blood
Provides compatible blood for patients	Results in wastage of blood not transfused with alloantibodies
Prevents adverse transfusion reactions	Increased incidence of adverse reactions to autologous donation
Provides reassurance to patients concerned about blood risks	Subjects patient to perioperative anemia and increased likelihood of transfusion

Table 4 Criteria for selection of patients for normovolemic hemodilution

Likelihood of transfusion exceeds 10% (i.e., blood requested for crossmatch according to a maximum surgical blood order schedule)
Preoperative hemoglobin level of at least 12g/dL
Absence of clinically significant coronary, pulmonary, renal, or liver disease
Absence of severe hypertension
Absence of infection and risk of bacteremia

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Conflicts of interest

The authors declare there are no conflicts of interest.

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