

ADVANCES IN HEMATOLOGY

Current Developments in the Management of Hematologic Disorders

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Research in Intraoperative Blood Salvage



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H&O What is the process of intraoperative blood salvage?

JW The process of intraoperative blood salvage involves the collection of shed surgical blood. The blood undergoes centrifugation, concentration, and washing. It is subsequently readministered to the patient, with the goal being to minimize the exposure of the patient to allogeneic transfusion. Intraoperative blood salvage is used primarily in high blood loss surgeries, typically cardiac procedures, open vascular procedures, and transplantation. Other procedures that use intraoperative blood salvage include radical hysterectomies, prostatectomies, and orthopedic surgeries.

H&O Could you please describe your study examining the volume of returned red blood cells in a large blood salvage program?

JW In this retrospective observational study, we analyzed trends in the volume of returned red blood cells by a blood salvage program in a health care system consisting of 12 hospitals throughout a 5-year period. Among 19,867 surgeries, the median volume of blood returned to each patient was 405 mL. The range of return in the 25th through 75th percentiles was 135–750 mL.

Our analysis demonstrated the need for intraoperative blood salvage in high blood loss procedures, such as cardiac surgeries and transplants. However, the effectiveness of the systems was less demonstrative in procedures in which the amount of blood loss was not terribly significant, such as total knee replacements. Our conclusion was

that the program should be looked at in its entirety, rather than on a case-by-case basis.

Critics of intraoperative blood salvage will refer to cases where blood has been collected but not returned, and make the claim that the technology is not cost effective. With broad variability in the amount of blood that is produced for any one case, and a lack of predictability of how much blood loss is going to occur in any particular case, a blood salvage program should be evaluated on the basis of all the cases performed, rather than any one individual case.

H&O What are the goals of your research?

JW In our analysis, we tried to create a metric that can be used to assess the efficacy of this technology in specific types of surgical procedures. The classic way of assessing the efficacy of typing and crossing for allogeneic transfusion is to look at the type and screen in relation to the amounts of blood that are transfused, which is known as the cross-matched to transfused (CT) ratio. We tried to create a similar approach that would allow us to compare all of our cases. Another goal is to determine how to optimize the utilization of this technology.

In addition, we are trying to identify what we are doing poorly and what we are doing correctly, in terms of maximizing the capture of the red cells. There is a certain amount of damage that occurs during the processing of the blood. There are ongoing studies to determine what predisposes some red cells to mechanical shear stress, which basically ruptures them, while other cells are resistant. We are looking at variables that might be intrinsic to the red cell and

that we might be able to manipulate. Our work has shown that the red blood cells in premenopausal women are able to tolerate mechanical shear forces better than the red blood cells in men. We are trying to discover why this is the case, and whether anything can be done to manipulate the ability of the red cell to tolerate mechanical shear stress. This area is one of the outgrowths of our work, in which we are looking at ways to maximize the capture of the red blood cell.

Suggested Readings

Waters JH, Dyga RM, Waters JF, Yazer MH. The volume of returned red blood cells in a large blood salvage program: where does it go? *Transfusion*. 2011;51:2126-2132.

Waters JH, ed. *Blood Management: Options for Better Patient Care*. Bethesda, MD: AABB Press; 2008.

Waters JH, ed. *Perioperative Blood Management: A Physician's Handbook*. 2nd ed. Bethesda, MD: AABB Press; 2009.