Guest editorial

Autotransfusion

A complement to conventional transfusion

The immunologic and infectious risks of homologous blood transfusions have become a topic for both public and medical discussions (Haljamäe and Rosenberg 1988). A renewed interest in alternative transfusion methods, as well as in the evaluation of oxygen-carrying artificial solutions has arisen. Today, the autotransfusion of whole blood or erythrocyte concentrate has become routine at several surgical departments, as described in the present issue of this journal by Elawad and Fredin (1992), Elawad et al. (1992), and Kristensen et al. (1992).

Reinfusion of autologous blood using the so-called Sorenson system was first reported by Noon et al. (1976). The system consists of a plastic container with a soft collection bag inside. Citric acid has generally been used as anticoagulant and filters on both sides of the container are needed. Because of its limited capacity, and relatively slow retransfusion, the system is mainly used for collection and retransfusion of blood in the postoperative period. When used in aortic surgery during systemic heparinization, additional anticoagulant is not added (Clifford et al. 1987). The most recent recommendation by the manufacturer is not to add any anticoagulant after arthroplasties. The collected blood contains only minute amounts of fibrinogen.

In the Sorenson system, mechanical damage to erythrocytes is common; free plasma hemoglobin is increased (Imhoff et al. 1986, Clifford et al. 1987). Kristensen et al. (1992) found no additional hemolysis when reinfusion with drainage blood was compared to transfusion with homologous bank blood. Surprisingly few hematologic changes occur after transfusion of filtered drainage blood (Imhoff et al. 1986, Clifford et al. 1987, Bengtson et al. 1990, Kristensen et al. 1992). However, in the collected blood substantial complement activation and formation of terminal complement complexes take place (Bengtson et al. 1990). The increase in fibrin-degradation products, decrease in platelet count and decrease in fibrinogen concentration suggest that the coagulation system is activated. An important observation in studies of the quality of erythrocytes of both filtered drainage blood and blood processed in a centrifuge system is that the 2,3-diphosphoglycerate level and the oxygen transporting capacity remain good, and usually better than in bank blood. Considering the complement activation and the hemolytic changes which occur in collected drained blood, it has not yet been determined how much drained blood can be safely retransfused to a patient. While Bengtson et al. (1990) retransfused only 280–500 mL, Kristensen et al. (1992) have retransfused up to 1900 mL without complications. Time latency may be a crucial factor; the latter authors claim that the quality of the collected erythrocytes rapidly deteriorates after 24 hours. In clinical practice, retransfusion is usually performed shortly after the collection.

Erythrocyte destruction during collection can be reduced by applying only a low negative pressure (75–100 mmHg) to the collection bag.

For intraoperative mechanic autotransfusion, systems based on blood centrifugation are in clinical use (Elawad and Fredin 1992, Elawad et al. 1992). By centrifugation and simultaneous washing of the collected heparinized blood with isotonic saline, plasma components, cell fragments, free hemoglobin, tissue particles, potassium, fat globules, heparin, etc., can be separated from the erythrocytes. Recent automatization and computerization have speeded up the processing, making intraoperative transfusions of anticoagulant-free autologous erythrocytes (hematocrit 55–60 percent) in saline an important part of the overall transfusion strategy. Autotransfusion of washed erythrocytes is commonly used in major thoracic and vascular surgery, in liver transplantation, and in spine and hip surgery. Administration to the patient of plasma components (frozen plasma) and platelets may be required if considerable amounts of autologous blood are processed and erythrocytes retransfused.

The washing process will not eliminate all free hemoglobin: 0.1–0.4 g/dL of free hemoglobin may be found. Potassium can easily be washed off; potassium concentrations of < 1 mmol/L can be readily achieved.

To further reduce the need for homologous blood transfusions in elective surgery, preoperative autologous blood banking, combined with intraoperative

blood salvage, has been successfully practiced (Elawad et al. 1992).

Contraindications for any type of autotransfusion are malignancy and infection at the site of the aspiration of the blood. Blood contaminated with feces or bile has been processed by washing in a centrifugation apparatus, and retransfusion in a few known cases did not cause serious problems. Such practice is not recommended, however (Solem and Vagianos 1988).

The use of peri- and intraoperative autotransfusion techniques will reduce the need for homologous erythrocytes and blood, as well as plasma, when the filtration technique is used, and thereby also save money (Elawad et al. 1991). In cases of major bleeding, homologous erythrocyte concentrate from the blood bank still remains the main source of transfusion. Thanks to the efficient screening for compatibility and infectious agents (including HIV and hepatitis C virus) performed by the blood bank laboratories, homologous erythrocyte concentrate and other blood components transfused in the Scandinavian hospitals are extremely safe.

Transfusion of autologous blood or erythrocyte concentrate is also safe, as shown by the three studies in this issue. Recent technical developments, and studies of the quality of the collected and processed blood, as well as economic considerations, should stimulate the further use and applications of autologous transfusion.

Per H Rosenberg, MD, PhD

Department of Anesthesiology
Surgical Hospital
Helsinki University Central Hospital
SF-00130 Helsinki, Finland

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