

## **Red Blood Cell Salvage During Hip Replacement and Abdominal Aortic Surgery**

*(Short communication)*

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Autotransfusion of shed blood during surgery has now been used for more than a decade. In the recent years the development of safe and fast operating equipment for red blood cell salvage (1, 3) has led to a widespread use of autotransfusion.

The present study was undertaken to investigate the cost-effectiveness of the use of red blood cell salvage during surgery associated with moderate (hip replacement) and major (abdominal aortic aneurysm surgery) blood shed.

During 1989 and the first half of 1990 red blood cell salvage with Haemonetics Cell Saver 4 (Haemonetics Corp, USA) was used in both scheduled (n=19) and non-scheduled (n=10) patients operated for abdominal aortic aneurysms. During the same period red blood cell salvage was also used in 66 patients operated with hip replacement because of arthritis. As controls served age- and sex-matched patients being operated for the same diseases in 1988.

The hip replacement patients and controls were all hemodiluted perioperatively to an estimated erythrocyte volume fraction (EVF) of 30 % before any transfusion was given. Homologous blood was given at the postoperative ward during the first 24 h if the EVF was less than 30 %.

General anaesthesia was performed during aortic aneurysm surgery while spinal anaesthesia was used during hip replacement.

During red blood cell salvage and autotransfusion shed blood was suctioned from the surgical field and anticoagulated with heparin. After passing a filter, red blood cells were separated from plasma and any irrigation fluids by centrifugation. Thereafter the packed red blood cells were washed by saline which removes the heparin before the red blood cells were transferred to the patient. For technical details, see Keeling et al (3).

Differences between groups were calculated using Student's unpaired t-test or the Chi-square test. Two-tailed significance values were given.  $p < 0.05$  was regarded as significant.

*Hip replacement:* No significant differences in age or sex were found between patients and controls. The perioperative bleeding did not differ significantly between the groups ( $600 \pm 257$  and  $687 \pm 414$  ml, respectively). Only 3 % of the patients required blood transfusion during the operation compared to 78 % in the

control group ( $p < 0.001$ ). The mean red blood cell salvage autotransfused in the patients perioperatively was  $393 \pm 183$  ml, so when the total amount of blood given during the operation was compared between the groups, no significant difference was seen. The postoperative blood transfusion was not significantly different between the groups ( $256 \pm 295$  and  $222 \pm 304$  ml, respectively). When both the peri- and postoperative transfusions were considered together 50 % of the patients did not require any blood as compared to 14% in the control group ( $p < 0.001$ ).

No age and sex differences were found between the patient and control subjects. Neither differed perioperative bleeding, total amount of perioperative transfused blood, or postoperative transfusion between the groups.

*Aortic aneurysms:* The perioperative red blood cell salvage was  $1140 \pm 990$  ml, while  $750 \pm 920$  ml blood was given during the operation. 20 % of the scheduled operated patients could be managed without any blood transfusion during the first 24 h as compared to none in the control group.

At Gävle County Hospital, one unit of packed erythrocytes (275 ml) costs 400 SEK (=64 US\$), while the disposable equipment cost per procedure is 1030 SEK (=165 US\$). Thus, at least 708 ml of blood has to be saved in order to be cost-effective.

From these calculations it could be concluded that use of perioperative red blood cell salvage is cost-effective in aortic aneurysm surgery, but not when used in hip replacement surgery. Recent experience in our hospital showed that also postoperative bleeding could be effectively saved and autotransfused. Thus, by using the red blood cell saver in the postoperative ward the use of autotransfusion might be economically justified also in hip replacement surgery.

In a recent study it was concluded that red blood cell salvage was not cost-effective in patients subjected to coronary artery by-pass graft surgery (2).

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