Autotransfusion — pros and cons

Semi-continuous flow centrifugation systems
- The shed blood is aspirated from the surgical field, mixed with anticoagulant, filtered, centrifuged and processed. “Cell-saving.”

Single or multiple-use, self-contained devices
- The blood is collected and anticoagulated. The blood is then re-infused to the patient through a filter without being washed. “Simple autotransfusion”

Intermediate/“mixed” systems

What is autotransfusion?

What are the options?

- Intra-operative cell-saving
- Intra-operative simple autotransfusion
- Post-operative cell-saving
- Post-operative simple autotransfusion

Is autotransfusion beneficial?

How low does Hgb have to be before you decide to transfuse?

Are blood-bank transfusions not OK?
Is autotransfusion beneficial?

How low does Hgb have to be before you decide to transfuse?

Are blood-bank transfusions not OK?

Autotransfusion After Coronary Artery Bypass Grafting Halves the Number of Patients Needing Blood Transfusion

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Background: Several methodological studies about autotransfusion have been published, but the consensus among surgeons is still not well defined. Several of these studies have been performed as part of routine surgical procedures, which may lead to misinterpretations of the results. However, a recent study showed that autotransfusion can reduce blood transfusion requirements by 50%. This study was performed in a randomized clinical trial

Objectives: To evaluate the efficacy of autotransfusion in reducing blood transfusion requirements after coronary artery bypass grafting (CABG) surgery.

Methods: A randomized clinical trial was conducted in a single institution with 150 patients scheduled for CABG surgery. Patients were randomized to either the autotransfusion group (n = 75) or the control group (n = 75). In the autotransfusion group, blood was collected from the surgical field and retransfused back to the patient during surgery. In the control group, blood was discarded. Blood transfusions were required if hemoglobin (Hgb) levels fell below 10 g/dL.

Results: Patients in the autotransfusion group had significantly lower blood transfusion requirements compared to the control group (mean ± SD: 1.5 ± 1.8 vs. 2.0 ± 2.1), and the difference was statistically significant (p = 0.01). The median length of stay in the hospital was 5 days in the autotransfusion group and 6 days in the control group (p = 0.03). No adverse events attributable to autotransfusion were observed.

Conclusion: Autotransfusion after coronary artery bypass grafting is a safe and effective method for reducing blood transfusion requirements and improving patient outcomes.
Pandas are so damn cute, and the parents knew they could just get another child.

Is autotransfusion beneficial?

How low does Hgb have to be before you decide to transfuse?

Are blood-bank transfusions not OK?

...define “necessary”!
Bad Santa?

- Expensive
- Time consuming
- Donor availability
- Adverse reactions
- Infection
- Quality of blood

Are transfusions safe?

### Table: Cement Extracted Data of Transfusion

| Procedure | Whole Blood | Fractionation
<table>
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<tr>
<td>HS</td>
<td>1.9 million</td>
<td>1.7 million</td>
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<tr>
<td>Platelets</td>
<td>1.1 million</td>
<td>1.0 million</td>
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<tr>
<td>PRBC</td>
<td>1.3 million</td>
<td>1.3 million</td>
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<tr>
<td>Fresh PRBC</td>
<td>1.0 million</td>
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</table>

**Allogeneic:** CMV, latex, viral, heparin, heparin, TNF, transfusions; 
**Autologous:** CMV, latex, viral, heparin, heparin, TNF, transfusions.

**Quality of blood**

- Flying (plane crash): 1/1 million
- Swimming (shark attack): 1/3.7 million
- Driving (car crash): 1/5000
- Being a Danish soldier in Afghanistan: 1/100

Are transfusions safe?

Is bank blood as good as shed mediastinal blood?

- “This suggests that red cells saved from shed mediastinal blood have better oxygen transport capacity and may have longer survival compared to stored blood.”


“Waiter...there is too much blood in this soup!”

- Education on unwanted side-effects of blood transfusion
- Tranexamic acid for all patients
- Lowered the acceptable Hgb. for selected patients
- Introduced ROTEM (thrombo-elastometry)
- Introduced a new transfusion protocol, where the indication had to be specified
- Focused on pausing platelet-inhibitors pre-op
- Introduced a local transfusion algorithm

What were the results of our “blood saving” policy?
What were the results of our "blood saving" policy?

So...something happened... but was it enough?

Our system for autotransfusion

Unwashed blood ("simple autotransfusion")

- Tissue debris
- Activated platelets
- Activated leucocytes
- Thrombin and other pro-coagulants
- Activated complement proteins
- Fibrin degradation products
- Red cell stroma
- Micro-aggregates
- Surgical debris
- Anticoagulant solutions

Potential complications:
- Hemolysis
- Air embolism
- Dilution coagulopathy
- Protein loss
- Contaminants

Potential contraindications:
- Citrate-based anticoagulants in patients with impaired liver function
- Gross contamination or septic procedures
- Surgery within a malignant area
- Biological contaminants
- Contamination of blood with drugs not intended for intravenous administration
- Collagen-based hemostatic agents
- Certain coagulopathies
Maybe autotransfusion is bad?

1st August 2007 we stopped using autotransfusion

What were the results of our "no autotransfusion" policy?

Before

After

How do we improve data??

Baseline characteristics of CABG patients

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<tr>
<td>Male sex (%)</td>
<td>91.2</td>
<td>78.2</td>
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<td>Age (y)</td>
<td>69.2±10.0</td>
<td>71.1±9.4</td>
<td>71.2±9.2</td>
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<td>Height (cm)</td>
<td>172±6.2</td>
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<td>Weight (kg)</td>
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<td>Body mass index (kg/m²)</td>
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<td>Hemoglobin (mmol/L)</td>
<td>135±1.6</td>
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<td>Creatinine (mmol/L)</td>
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<td>Ejection fraction (%)</td>
<td>62.3±10.6</td>
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<td>COMOR (%)</td>
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<td>17.7±17.7</td>
<td>0.25</td>
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Before After Registration changed

Should cell-saving be used?

What were the results of our "no autotransfusion" policy?

So...the numbers for 2007 are a mix of +/- autotransfusion

What were the results of our "no autotransfusion" policy?
Why Wash Recovered Blood?

Washing serves the purpose of removing all other substances except the red blood cells from collected blood. The removed substances can include:
• Plasma-free hemoglobin
• Hemolyzed red blood cells
• Pharmacologic agents
• Bone fragments
• Activated platelets
• Irrigation solutions
• Activated clotting factors

Is cell saving worth the money and the effort?

What did they review?

Methods of cell salvage

Of the 75 included trials, 48 studied cell salvage during the postoperative period, 16 studied intra-operative cell salvage, and 11 studied both intra-operative and post-operative cell salvage. One trial (Sait 1999) failed to describe the timing of cell salvage. Twenty-six trials studied cell salvage systems that reinfused washed salvaged blood, and 44 trials studied cell salvage systems that reinfused unwashed filtered salvaged blood. One trial (Rollo 1995) studied both washed and unwashed cell salvage (four-arm trial) and provided two comparisons of cell salvage (Rollo 1995a; Rollo 1995b). One trial (Shin 2008) studied intra-operative washed and post-operative unwashed cell salvage. For three trials (Mercer 2004; Sait 1999; Zhang 2008) the method used to process salvaged autologous blood prior to re-transfusion was unclear. The post-operative transfusion trigger for haemoglobin (Hb) ranged from 7.0 g/dL to 10.0 g/dL, whereas the intra-operative Hb transfusion trigger value ranged from 5.6 to 10.0 g/dL.

Are there other options?

When science fails......

...try religion....???