

Hemodynamic, hemostatic and inflammatory effects of cardiotomy suction blood in cardiac surgery

Akademisk avhandling

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av

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This thesis is based on the following studies:

- I. Westerberg M, Gäbel J, Bengtsson A, Sellgren J, Eidem O, Jeppsson A. Hemodynamic effects of cardiotomy suction blood. *J Thorac Cardiovasc Surg.* 2006 Jun;131(6):1352-7
- II. Gäbel J, Westerberg M, Bengtsson A, Jeppsson A. Cell salvage of cardiotomy suction blood improves the balance between pro- and anti-inflammatory cytokines after cardiac surgery. *Eur J Cardiothorac Surg.* 2013 Sep;44(3):506-11
- III. Gäbel J, Shams Hakimi C, Westerberg M, Radulovic V, Jeppsson A. Retransfusion of cardiotomy suction blood impairs haemostasis: Ex vivo and in vivo studies. *Scand Cardiovasc J.* 2013 (Epub ahead of print)
- IV. Gäbel J, Radulovic V, Shams Hakimi C, Westerberg M, Jeppsson A. Cell saver processing ameliorates negative effects of cardiotomy suction blood on systemic platelet function: An ex vivo study. (Manuscript)



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ABSTRACT

Background: Cardiac surgery with cardiopulmonary bypass induces an inflammatory response and a coagulopathy, which may contribute to perioperative complications. Retransfusion of unprocessed cardiotomy suction blood may contribute to the inflammatory response and coagulopathy.

Aims: To investigate the hemodynamic, hemostatic and inflammatory effects of retransfusion of unwashed cardiotomy suction blood and their potential associations, and to study the effect of cell saver processing of cardiotomy suction blood before retransfusion.

Materials and methods: Four studies were performed. I: 25 patients were randomized to cell saver processing of cardiotomy suction blood or not before retransfusion. Hemodynamic effects and inflammatory markers were assessed. II: Pro- and anti-inflammatory markers were analyzed in cardiotomy suction blood and the systemic circulation in 25 patients randomized to cell saver processing of cardiotomy suction blood or not. III: Hemostatic markers were assessed in cardiotomy suction blood and in the systemic circulation in 30 patients randomized to retransfusion of unwashed cardiotomy suction blood or not. In an ex vivo study on 13 patients hemostasis was assessed when increasing amounts of unprocessed cardiotomy suction blood was added to systemic blood. IV: In an ex vivo study on 10 patients hemostasis was investigated when increasing amounts of cell saver processed or unprocessed cardiotomy suction blood was added to systemic blood.

Results: I: Retransfusion of unprocessed cardiotomy suction blood causes a transient reduction in systemic vascular resistance that is attenuated if the cardiotomy suction blood is cell saver processed before retransfusion. II: Cardiotomy suction blood has an unfavorable balance between pro- and anti-inflammatory cytokines. Cell saver processing of cardiotomy suction blood before retransfusion improves the postoperative balance. III: Cardiotomy suction blood has poor hemostatic properties and ex vivo addition of cardiotomy suction blood to systemic blood impairs clot formation and platelet function dose-dependently. Retransfusion of small amounts of cardiotomy suction blood in vivo does not affect systemic markers for hemostasis. IV: Cell saver processing of cardiotomy suction blood ameliorates the negative effects on platelet function but does not influence the negative effects on clot formation.

Conclusions: Cardiotomy suction blood is inflammatory activated and has poor hemostatic properties. Retransfusion of unwashed cardiotomy suction blood impairs the balance between pro- and anti-inflammatory cytokines, impairs hemostasis and reduces vascular resistance. These negative effects can be reduced if cardiotomy suction blood is cell saver processed before retransfusion. Alternatively, small to moderate amounts of unwashed suction blood may be discarded.

Keywords: Cardiopulmonary bypass, inflammatory activation, hemostasis, coagulation

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