Blood Transfusion in Cardiac Surgery

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Impact of Transfusion on Outcome in Cardiac Surgery

- Increased morbidity and mortality
- Increased risk of severe postop infections
- Risk of transferring pathogens
- High cost
- Shortage of blood bank products

Hemodilution Challenge

- CPB: 20-30% hemodilution
- Hb < 6.0 g/dl: increased postop mortality if coexisting CV disease
- Cardiac surgery especially in CAD: 7 g/dl as the lower limit

Continued Antiplatelet Therapy

- Aggravate periop bleeding and blood loss, increased tx requirements and hemodynamics instability
- Clopidogrel: 2-5 fold increase of re-exploration and 30-100% increase in CT output
- Guidelines: d/c ASA 2-10 d and d/c ADP receptor antagonist (clopidogrel) min 5 days before elective operation
Cessation of Warfarin before Cardiac Surgery

- Stop 2-4 days before surgery
- IV heparin when sub-therapeutic INR if higher risk of thrombosis

Perioperative Intervention: Aprotonin

- Reduces blood loss
- Postop renal dysfunction
- Small but significant increase in graft occlusion in CABG pts
- Increased mortality (BART study in Canada by Mangano et al)
- No longer available in the US

Perioperative Intervention: Tranexamic Acid

- Reduces blood loss, requirement for blood tx and risk of reoperation for bleeding
- No randomized studies looking at vein graft patency and its safety

Perioperative Intervention: Hepcon

- Calculates heparin dose by establishing heparin dose response
- Measures heparin concentration during CPB
- Calculates protamine dose based on residual heparin
- Associated with higher heparin and lower protamine dose
- Decrease activation of coagulation and inflammatory cascade
- May decrease postop bleeding and blood product requirement
**Postoperative Intervention: Thromboelastography**

- Viscoelastic hemostatic assay that measures the global visco-elastic properties of whole blood clot formation under low shear stress
- Shows the interaction of platelets with the coagulation cascade (aggregation, clot strengthening, fibrin cross linking and fibrinolysis)
- Does not necessarily correlate with blood tests such as INR, APTT and platelet count (which are often poorer predictors of bleeding and thrombosis)
- May be used to guide tx requirements
- Possible reduction in blood and blood product usage

**TEG AS A GUIDE TO TREATMENT**

- Increased R time => FFP
- Decreased angle => cryoprecipitate
- Decreased MA => platelets (consider DDAVP)
- Fibrinolysis => tranexamic acid (or aminocaproic acid)

**Postoperative Intervention: Postop Protamine**

- Excessive dose: impair platelet function and increase bleeding
- When protamine/heparin > 2.6:1
Postoperative Intervention: Recombinant factor VIIa

- Can be used for intractable bleeding refractory to conventional hemostatic intervention
- Small risk of serious or fatal thrombotic complications