

Anticoagulation for Patients with Known or Suspected Heparin Induced Thrombocytopenia During Cardiac Surgery

The Problem

Heparin-induced thrombocytopenia (HIT) is an antibody-mediated, adverse drug reaction that can lead to life threatening complications. It occurs when patients develop antibodies to a complex of heparin and platelet factor 4 that has platelet activating properties. This platelet activation can lead to devastating thromboembolic complications. The avoidance of heparin exposure is critical during the time that these antibodies persist. However, during cardiac surgery, the avoidance of heparin is extremely problematic and risky. This stems from the fact that no other clinically available anticoagulant can be so quickly and easily monitored at the point-of-care and have its activity so quickly reversed. Our current protocol for anticoagulation in cardiac surgical patients with known or suspected HIT calls for the use of heparin with a potent anti-platelet medication known as alprostadil. Unfortunately, the safety of this protocol has never been well established. Bivalirudin, a direct thrombin inhibitor with a relatively short half-life has been suggested as a possible alternative.

Aim/Goal

To develop a new heparin-free anticoagulation protocol in cardiac surgery for patients with known or suspected HIT.

The Team

Anesthesia: Jacob Clark, MD; Adam B. Lerner, MD

Perfusion: Kyle Spear CCP, Christopher Dacey CCP, Ralph Deyo CCP, Lauren Finkelstein CCP, Robert Marquis CCP

CT Surgery: Kamal Khabbaz, MD; David Liu, MD; Senthil Nathan, MD

CVI Nursing – Verna Rettagliati, Mary Francis Cedorchuk

The Interventions

- Reviewing current literature and other institutional protocols regarding anticoagulation for HIT patients in cardiac surgery
- Soliciting input from anesthesiologists, surgeons, perfusionists, and pharmacists at multidisciplinary meetings
- Develop a preliminary protocol for review and modification
- Finalize protocol via multidisciplinary meetings
- Purchase necessary equipment (heparin free bypass circuitry)
- Program infusion pumps with institutional standards
- Educate residents, fellows, and staff through information sessions, internal communications, and publication to the institution's PPGD
- On-going performance measurement and safety monitoring

The Results/Progress to Date

- Completion of literature review
- Multi-disciplinary meeting between cardiac anesthesia and perfusion completed
- Institutional standard for bivalirudin concentrations obtained
- Preliminary protocols established as follows:

On-Pump Cases

1. Bolus of 1 mg/kg bivalirudin
2. Start infusion at 2.5 mg/kg/hr
3. 50 mg added to pump prime
4. Check ACT 5 minutes after bolus and every 30 minutes after
5. 0.1 to 0.5 mg/kg boluses as necessary
6. ACT target – 400 s vs. 450 s vs. 2.5 x baseline ACT
7. Shut off infusion 15 to 30 minutes before coming off
8. Infuse venous line blood to patient and fill circuit with saline
9. Once off, add 50 mg to pump, start infusion of 50 mg/hour, and recirculate
10. Once CPB definitely not needed, run pump contents through cell saver (cell saver removes bivalirudin)

Surgical Issues

1. Flushing of grafts and testing of flows should be performed with saline or, if blood with bivalirudin is used, should be flushed out with saline and bull-dogged while there is pressure on syringe.
2. IMAs should be transected only just before grafting is performed to avoid stasis

Lessons Learned

- Multi-disciplinary meetings reveal issues not even considered by individual disciplines
- Regular reevaluation of protocols for relatively infrequent circumstances is difficult but important
- Finding scientific support for developing protocols related to rare clinical conditions can be an enormously unfulfilling exercise

Next Steps/What Should Happen Next

- Review preliminary protocol at multidisciplinary meeting with entire cardiac anesthesia and cardiac surgical teams
- Modify protocol as necessary and finalize
- Program infusion pumps
- Educate anesthesia staff and residents as to new protocol
- Publish protocol to PPGD and anesthesia intranet
- Monitor effectiveness and safety of protocol

