Thrombus in the Venous Reservoir

Linda Shore-Lesserson¹, MD, Kenneth G. Shann, CCP², Philip E. Hess, MD³
¹Department of Anesthesiology, Montefiore-Einstein Heart Center, New York, NY, ²Department of Cardiothoracic Surgery, Montefiore-Einstein Heart Center, New York, NY, ³Department of Thoracic and Cardiovascular Surgery, Gainesville, FL

Thrombus recognized in the venous reservoir of the cardiopulmonary bypass (CPB) circuit at the end of CPB is uncommon, but presents significant challenges if CPB needs to be re-initiated. The causes of post-CPB circuit thrombosis may be related to underlying patient hypercoaguable conditions or iatrogenic interventions. Hypercoaguable states that may predispose the circuit to thrombotic complications include heparin induced thrombocytopenia (HIT), Factor V Leiden mutation, protein C and S deficiencies, and fibrinolytic disorders. Iatrogenic complications might include thrombus in the arterial or venous cannula after CPB. In addition, thrombus can develop secondary to the aspiration of shed blood after administration of protamine or hemostatic blood products.

Case

A 68 year old female was admitted with an inferior wall MI. She underwent an emergent percutaneous transluminal coronary angioplasty (PTCA) that was complicated by dissection of the right coronary artery (RCA) and necessitated the placement of 3 stents in the RCA. The patient was subsequently treated with Plavix for the next 3 days and suddenly developed cardiogenic shock requiring intubation and placement of an intra-aortic balloon pump. After resuscitation, she had a left hemiparesis presumed to be from her hypotensive event. Cardiac catheterization revealed reocclusion of the RCA and she was treated with fibrinolytics and heparin. 2 days later a cerebral computed tomography (CT) scan was normal. 5 days later, on a heparin infusion, she became ischemic again in the RCA territory and an emergent coronary artery bypass graft (CABG) surgery was scheduled.

At presentation to the operating room lab values included HCT 30, WBC 16, PLT 80, Cr. 1.8, electrolytes normal. The patient continued to be unstable now requiring pressors to maintain her mean arterial pressure at 70mmHg. Emergent CPB was initiated with a heparin coated circuit (standard practice at this institution) and systemic heparinization at 300IU/kg. CABG X 2 with 2 saphenous vein grafts was performed with a CPB time of 63 minutes and cross clamp time of 38 minutes. Patient was successfully weaned from CPB on minimal norepinephrine. Protamine was administered at a 1:1 (protamine:heparin) ratio according to the HMS Hepcon analyzer. 5 minutes after termination of CPB the patient was decannulated and the perfusionist recognized an organized white colored thrombus in the bottom of the venous reservoir. 5 minutes later the patient becomes hemodynamically unstable with evidence of active ischemia. The surgeon decides to reinitiate CPB to stabilize the patient and identify the problem.
Study Questions

1. What preoperative coagulation testing/screening could have been done prior to bringing this patient to the operating room?
2. What coagulation disorder do you suspect this patient had?
3. What other anticoagulation strategies would you consider for CPB?
4. What other point-of-care tests would you consider using for this case?
5. Would you have used a heparin coated CPB circuit?
6. What would be your strategy to reinitiate CPB in light of the thrombus in the venous reservoir?

References

12. Donahue BS, discussion: Thrombosis after deep hypothermic circulatory arrest with antifibrinolytic therapy: is factor V leiden the smoking gun? Anesthesiology. 2002;97