Enhanced thrombin generation after cardiopulmonary bypass surgery.

Abstract:
Thrombin generation has a key role in the pathophysiology of hemostasis. Research has focused on the intraoperative course of hemostasis, while little is known about postoperative hemostatic activation. Thrombin generation assays quantify the potential for thrombin generation ex vivo and may be useful for determining hypercoagulability. The thrombin dynamics test (TDT) assesses the initial kinetics of thrombin formation. We hypothesized that there would be an increase in thrombin generation as well as thrombin capacity after cardiac surgery. Two hundred twenty patients undergoing primary coronary artery bypass grafting or aortic valve replacement (AVR) surgery were prospectively enrolled. Patients undergoing AVR received warfarin beginning on the second postoperative day. In addition to prothrombin fragment (F(1+2)), TDT, d-dimer, and troponin T were assessed. Blood samples were obtained preoperatively, at the end of the operation, 4 hours postoperatively, and the morning of postoperative days (PODs) 1, 3, and 5. The primary end point was the change of thrombin dynamics on POD 1. In all patients, F(1+2) peaked at the end of the operation and remained significantly elevated until POD 5. Compared with baseline and after an initial decrease, TDT was found to be significantly elevated on POD 1. After coronary artery bypass graft, TDT remained significantly elevated, whereas in AVR
patients with warfarin treatment, TDT was significantly reduced on PODs 3 and 5. After cardiac surgery, thrombin generation continues, accompanied by a high thrombin-generating capacity and elevated fibrinogen levels. This constellation suggests a marked procoagulopathic state in the postoperative period with the potential to aggravate the risk of thromboembolic complications. Warfarin treatment after AVR significantly reduced thrombin-generating capacity.