Clinical Use of the Activated Partial Thromboplastin Time and Prothrombin Time for Screening

A Review of the Literature and Current Guidelines for Testing

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KEYWORDS

• Activated clotting time • Anticoagulation • Monitoring
• Activated partial thromboplastin time • Prothrombin time • Surgery

KEY POINTS

- Although the activated partial thromboplastin time (aPTT), prothrombin time (PT), and international normalized ratio (INR) are widely used in routine preoperative testing, these hemostatic tests are not reliable predictors of perioperative bleeding in patients without known bleeding risk factors.
- A preoperative bleeding history and physical examination are usually obtained in an attempt to identify important bleeding risk factors. However, current questionnaires used to assess bleeding history are notoriously poor at characterizing bleeding. In such cases, follow-up hemostatic testing may be appropriate.
- The aPTT is extensively used to monitor therapy with unfractionated heparin and other anticoagulant agents, including direct thrombin inhibitors, whereas the PT and INR are used to monitor the anticoagulant effects of warfarin and other vitamin K antagonists, and to adjust their dosages.

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INTRODUCTION

Standard coagulation monitoring is used to manage hemostasis and bleeding in hospitalized patients, including those undergoing surgical procedures and during cardiac surgery with cardiopulmonary bypass (CPB). Multiple factors influence coagulation in hospitalized patients, especially in a perioperative setting. Such factors include type of procedure, previous surgery at the same anatomic site, degree of tissue injury, and the underlying state of the hemostatic system. Surgical procedures that may be associated with increased bleeding potential due to high tissue vascularity include tonsillectomy and vascular and cardiac surgery. In other cases, bleeding risk is associated with the potential for related adverse events, especially if bleeding occurs in the central nervous system or other closed spaces, such as in ophthalmic procedures.

Multiple assessments are routinely undertaken to assess the risk of bleeding in a given patient, including patient history, history of prior procedures with excessive bleeding, and family history. However, laboratory testing is often also extensively used in this evaluation. Tests that are performed most commonly include the activated partial thromboplastin time (aPTT), prothrombin time (PT), international normalized ratio (INR), and activated clotting time (ACT) for patients during cardiac surgery. The ACT is more often used for monitoring anticoagulation for CPB.

Although laboratory testing with the aPTT and PT is appropriate to monitor anticoagulation, and the tests evolved soon after the introduction of warfarin to determine hemostatic abnormalities, the value of these tests to predict bleeding in surgical patients is not well documented despite their widespread use. Their usefulness is further complicated by underlying bleeding disorders, test characteristics, and the potential for false-positive and false-negative results. In the presence of a lupus anticoagulant or factor XII deficiency, for example, the aPTT may be prolonged, but this prolongation is not associated with an increased risk of bleeding.[1]

A systematic review of the literature published in 1997 suggests that preoperative laboratory tests of hemostasis before elective surgery in patients without a positive personal history for abnormal bleeding are not helpful and rarely lead to a change in clinical management of the patient.[2] Furthermore, guidelines on the preoperative assessment of bleeding risk state that hemostatic tests are poor predictors of bleeding and that routine tests in patients without a history indicative of bleeding are not generally recommended.[3,4]

Despite these perspectives, these coagulation tests are frequently used for clinical decision-making in hospitalized patients. The purpose of this review is to examine the clinical applications of the aPTT and PT tests and their role in assessing perioperative bleeding risk for perioperative screening. In addition, the use of the ACT will be considered for anticoagulation monitoring for CPB as it is used extensively in the hospital setting.

aPTT

The aPTT is a global coagulation screening test that is used for assessment of the coagulation status in patients with suspected acquired deficiencies of coagulation factors of the intrinsic and common pathways of the coagulation system. The test is affected by multiple factors, including the levels of factors VIII, IX, XI, XII, X, II, and fibrinogen. The aPTT is widely used for monitoring anticoagulation therapy with low levels of heparin (from 0.1 IU/mL to approximately 1 IU/mL). In a normal population, the aPTT varies, and this interindividual variability is reflected in a wide reference interval. The aPTT reference interval also differs between laboratories that use reagents with different factor sensitivities and different lipid compositions as well as different instrumentation. The aPTT reagent is a mixture of phospholipids and activators (eg, kaolin,