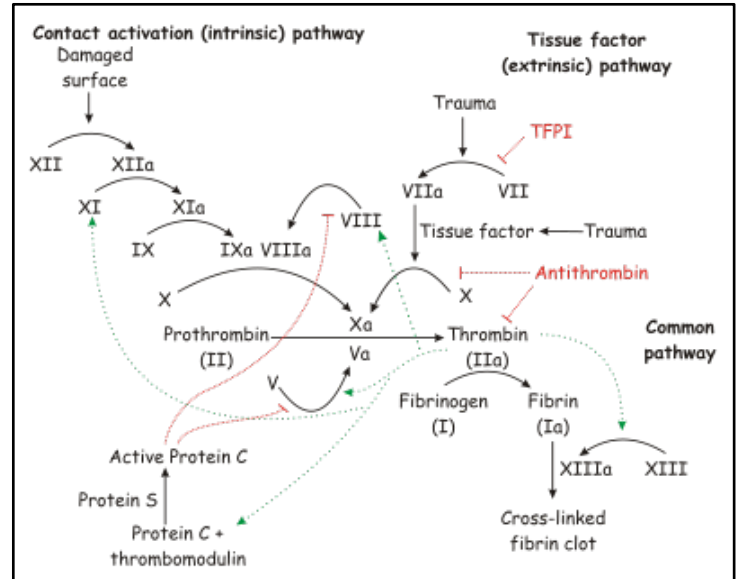


Activated Clotting Time

Anesthetic Pearls: Clinical Use and Implications of ACT

I. Activated Coagulation Time (ACT)

The ACT is a modification of the whole blood clotting time used clinically to monitor the effect of Heparin on coagulation. It is a measure of the intrinsic pathway of coagulation. Fresh whole blood (~ 2 ml) is added to a test tube that contains a particulate activator such as diatomaceous earth [clay] (celite or kaolin) which causes activation of factors XII and XI and consequently the coagulation cascade. The tube is heated to 37°C and the mixture is continuously agitated. The time from the introduction of blood into the tube until the first clot is formed is called the ACT. This measurement can be performed manually (like at LLUMC) looking for time to visual identification of first micro-clot formation on the test tube wall while mixing or by an automated method. One automated method (Hemochron) uses stoppered tubes containing celite activator and a small magnet. The tube is warmed to 37°C and continuously rotated. When the magnet becomes trapped in clot, the magnet rotates away from a detector, activating an audible tone and halting a timer.



II. Clinical Use

ACT is used to monitor the level of anticoagulation with Heparin (usual dose 3-4 mg/kg, 300-400 units/kg) just prior to and throughout cardiopulmonary bypass (CPB) during cardiac surgery. ACT is relatively insensitive to platelet abnormalities; conversely hypothermia will prolong the measurement. Following termination of cardiopulmonary bypass, Heparin is neutralized with Protamine (electrostatic interaction) and the ACT should return to within 10% of baseline.

Normal	~ 107 +/- 13 seconds
ACT < 300 sec	Do <u>NOT</u> initiate CPB (may clot oxygenator & tubing)
ACT > 300 sec	Probably safe to initiate CPB if ACT re-checked immediately after starting CPB and 3-5K units of heparin used in pump prime
ACT > 400 sec	Prevents fibrin monomer formation during CPB (prevents ongoing fibrin formation [clot] followed by fibrinogen breakdown to fibrin monomers [fibrinolysis])
ACT > 480 sec	Classic recommendation to maintain prior to and throughout CPB

III. Factors Affecting ACT

Heparin	Increase
Hypothermia	Increase
Hemodilution	Increase or no effect
Thrombocytopenia	Increase or no effect
Platelet Function Inhibition	Increase
Aprotinin	Decrease (proposed: use empiric timed dosing of Heparin during CPB, keep celite ACT > 600 sec, and/or use kaolin as the activator which is less influenced by Aprotinin)

