LAB TEST NAME:

- Activated Clotting Time (ACT, Activated Coagulation Time)

Other names:

- Ground glass clotting time
- Whole blood activated clotting time

DESCRIPTION:

- Measures the time for whole blood to clot after the addition of particulate activators that are known to activate factor XII, which measures the intrinsic pathway's ability to begin clot formation.
- It is mainly used to measure the anticoagulant effect of unfractionated heparin (UFH) or other direct thrombin inhibitors (DTI) during cardiac angioplasty, extracorporeal membrane oxygenation (ECMO), hemodialysis (HD), and cardiopulmonary bypass graft (CABG) surgery.
- It tends to be more accurate than the aPTT when higher doses of heparin are being used. This is due to the PTT being unclottable at high doses of heparin use.
- It is less expensive, and more easily and rapidly performed than the traditional aPTT providing immediate information on how to titrate the medications for the acute clinical situation.

REFERENCE RANGE:

- Normal: 70 - 120 seconds (some assays will say up to 180 seconds)
- Therapeutic range for anticoagulation: 150-600 seconds. (Note: This will vary according to the indication – see below)

INDICATIONS & USES:

- Hemodialysis: therapeutic range of 132 to 234 seconds. It can also help guide the use of protamine sulfate needed to reverse the effect.
- PTCA: HemoTec > 275 to 300 seconds, or Hemochron > 340 to 400 seconds.
- CABG: The accepted goal for the ACT is 400-480 seconds.
- Vascular catheterization, hemodialysis, or extracorporeal membrane oxygenation (ECMO): determine the heparin dose from a standard nomogram adjusted for the patient's baseline ACT.
- The modified ACT test requires a smaller-volume blood specimen, automated blood sampling, standardized blood/reagent mixing and faster clotting times results that the conventional ACT.

CLINICAL APPLICATION:

For increased levels:

- Patients receiving heparin which binds to antithrombin to inhibit clotting factors mainly of the intrinsic pathway.
- Patients receiving warfarin (Coumadin) which reduces the functional activation of vitamin K dependent clotting factors
- Cirrhosis which results in decreased production of clotting factors
- A deficiency in clotting factors.
- Lupus anticoagulants against components involved in the activation of the coagulation cascade

Assess the patient to detect possible bleeding including blood in the urine and the presence of bruises, petechiae, and/or low back pain.

For decreased levels:

- Activate of the thrombotic pathways can shorten the ACT.

RELATED TESTS:

- Partial Thromboplastin Time (PTT)
- Prothrombin Time
- Coagulating Factor Concentration

LAB INTERACTIONS:

The ACT can be affected by several biologic variables, including:

- Hypothermia
- Hemodilution
- Platelet number & functions
- Factors affecting the pharmacokinetics of heparin (e.g., kidney or liver disease)
- Antithrombin (AT) deficiency
- A partially or completely occluded specimen can increase ACT measurements

TEST TUBE NEEDED:

- Black top tube containing a particulate activator (celite (diatomaceous earth), kaolin, or glass particles)

LAB PROCEDURE:

- If the patient is receiving a continuous heparin drip, the whole blood sample should be obtained from the arm without the intravenous catheter with the medication being administered.
- Less than 1 ml of blood is collected into a commercial container.
- The container is placed into a whole blood micro-coagulation analyzer.
- When a clot has formed, the ACT value is displayed on the machine's panel.
- time will be prolonged because of anticoagulation therapy.
- For clinical significance, the test results must be correlated with the time of the heparin administration. A clinical flow sheet is used to list the test results with the time and route of heparin administration.

STORAGE & HANDLING:

- The sample should not be stored. It should be tested immediately after it has been obtained.

WHAT TO TELL THE PATIENT BEFORE & AFTER:

- No preparation needed by the patient.

REFERENCES:

- Olson JD et al. College of American Pathologists Conference XXXI on Laboratory Monitoring of Anticoagulant Therapy. Laboratory monitoring of unfractionated heparin therapy. Arch Pathol Lab Med 1998;122(9):782-98. PMID: 9740136