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Fulminant Hyperfibrinolysis Diagnosed by Rotational Thromboelastometry

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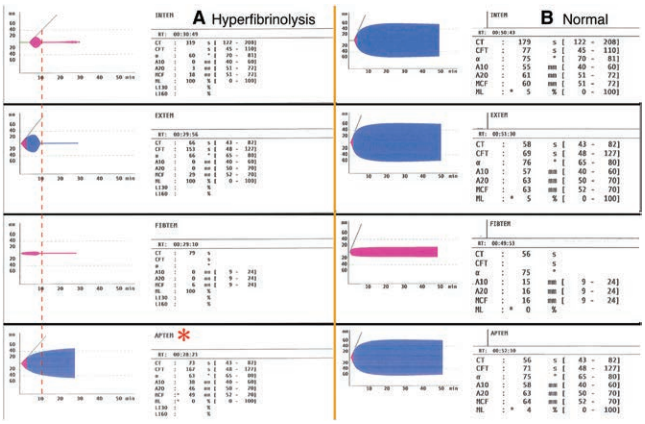

ROTATIONAL thromboelastometry (ROTEM; TEM Innovations, Germany) is a viscoelastic point-of-care test that measures changes in elasticity of a small pin oscillating in citrated whole blood. Reaction curves using different reagents and isolating specific coagulation components are created simultaneously. We present ROTEM images diagnosing fulminant hyperfibrinolysis (Panel A) with normal curves (Panel B) for comparison. INTEM and EXTEM measure contact activation and tissue factor activation, correlating with activated partial thromboplastin time and prothrombin time.[1] FIBTEM uses cytochalasin D, eliminating platelet contribution and therefore magnifying fibrinogen's contribution to clot. APTEM uses aprotinin to inhibit fibrinolysis. Parameters recorded reflect time until clot formation (CT), clot firmness at specific time (A), maximum clot firmness (MCF), and maximum lysis (ML).

Hyperfibrinolysis is a frequently missed cause of coagulopathy that is worsened with hemodilution and loss of endogenous fibrinolysis inhibitors, including plasminogen activator inhibitor-1.[2] Common etiologies include tissue plasminogen activator release and disseminated coagulation. APTEM shows how EXTEM would appear without hyperfibrinolysis. Excluding APTEM (*), all tests in panel A have an early (< 10 min) drop in amplitude to zero (*dotted line*), demonstrating rapid and fulminant lysis of fibrin clot, as opposed to milder cases of fibrinolysis, where peak amplitude is maintained before lysis. Maximum clot firmness, reflecting mechanical strength of the clot, is markedly increased on APTEM. Additionally, APTEM helps predict whether antifibrinolytic treatment will correct hyperfibrinolysis. Other marked coagulation abnormalities depicted include hypofibrinogenemia with a very low amplitude at 10 min (A10 = 0 mm) on FIBTEM. Rapid recognition of hyperfibrinolysis using viscoelastic assays is of paramount importance because untreated hyperfibrinolysis is associated with refractory bleeding and increased mortality.[3]

Competing Interests

The authors declare no competing interests.

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References

1. Levrat A, Gros A, Rugeri L, Inaba K, Floccard B, Negrier C, David JS: Evaluation of rotation thrombelastography for the diagnosis of hyperfibrinolysis in trauma patients. Br J Anaesth 2008; 100:792–7
2. Brohi K, Cohen MJ, Ganter MT, Schultz MJ, Levi M, Mackersie RC, Pittet JF: Acute coagulopathy of trauma: Hypoperfusion induces systemic anticoagulation and hyperfibrinolysis. J Trauma 2008; 64:1211–7; discussion 1217
3. Theusinger OM, Wanner GA, Emmert MY, Billeter A, Eismon J, Seifert B, Simmen HP, Spahn DR, Baulig W: Hyperfibrinolysis diagnosed by rotational thromboelastometry (ROTEM) is associated with higher mortality in patients with severe trauma. Anesth Analg 2011; 113:1003–12

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