The use of Thromboelastography (TEG) to correct Trauma-Induced Coagulopathy

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Introduction:
During a major trauma, many factors contribute to the stability of the patient such as mechanism and location of injury, amount of bleeding, acidosis, and temperature. Many of these factors also contribute to the major coagulopathy seen in trauma patients. It is estimated that approximately 25% of trauma patients have a major coagulopathy and that those with Trauma-Induced Coagulopathy (TIC) are at much higher risk for increased transfusion requirements and death compared to those without TIC (Walsh). The goal during any trauma is to stabilize the patient as quickly as possible with damage control surgery, blood and fluid replacement, while correcting acidosis, hypothermia, and coagulopathy (Figueiredo). Goal directed blood product therapy to correct coagulopathy has been greatly assisted with the use of thromboelastography (TEG) monitoring. TEG is a rapid analysis of whole blood clot capability to form and sustain clot and has been recognized as a more sensitive test to identify TIC over traditional coagulation tests (Wang).

Case presentation:
Patient is a 27-year-old male that presented to our trauma bay at 3am on a Friday morning with multiple gunshot wounds to his abdomen and right thigh. As the primary survey was being conducted, he went into cardiac arrest and ACLS was performed for 5 minutes. An ED thoracotomy was performed and a pulse was regained. He was taken to the operating room emergently where a 12 french central venous catheter and arterial lines were placed. Significant intra-operative blood loss was encountered due to right external iliac artery and vein injuries. Our massive transfusion protocol was initiated and the rapid infuser system, the Belmont, was used to transfuse blood, products and fluids. We guided our resuscitation efforts based off hemodynamics, labs and TEG. Patients initial TEG is presented below as well as serial TEGs throughout the case.

Discussion:
The diagnosis of TIC is associated with increased mortality (up to 50%), increased transfusions, increased risks of complications and longer hospital stays (Hunt). The use of TEG monitoring to direct blood component therapy has helped to improve trauma resuscitation by identifying specific deficits in coagulation. TEG parameters include R-time (reaction time), K-time (speed of clot formation), Î±-angle (A), maximal amplitude (MA), and lysis at 30 minutes (LY30%). In general, FFP (and sometimes Prothrombin Complex Concentrate (PCC)) is usually given for prolonged R values since that is a reflection of coagulation factor deficiency. Prolonged K or decreased and/or flattened Î±-angle corresponds with deficiency in fibrinogen or fibrin levels or function and is treated with cryoprecipitate or fibrinogen concentrate. A reduced or narrow MA reflects lack of clot formation.
and is a signal for platelet transfusion. Lastly, and increase in LY30% indicates fibrinolysis and is treated with and antifibrinogenic agent such as TXA or aminocaproic acid (Abdelfattah, Walsh). The early diagnosis of TIC followed by targeted blood product therapy leads to more efficient use of blood components and adjunct therapies, such as fibrinogen concentrate and PCC, with less multi-organ failure (Walsh). We were able to use the TEG to direct resuscitation efforts from a nearly immeasurable TEG to relatively normal TEG within a period of two hours.

References:


Hunt, H., et al. Thromboelastography (TEG) and rotational thromboelastometry (ROTEM) for trauma-induced coagulopathy in adult trauma patients with bleeding. Cochrane Database of Systematic Reviews 2015, Issue 2.

