

**The Value of Thromboelastography in Orthopaedic Trauma Pelvic Fracture Resuscitation**

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**Purpose:** Thromboelastography (TEG) evaluates real-time hemostatic integrity by measuring the ability of whole blood samples to form a clot. Recent combat and civilian trauma research has demonstrated the value of TEG in directing blood component therapy (BCT) during hemostatic resuscitation. Despite the emerging use of TEG at trauma centers in the United States and Europe, its role in orthopaedic trauma remains largely unknown and unreported in the literature. We describe the use of TEG-guided resuscitation in patients presenting to a Level II trauma center with pelvic fractures, and the financial impact TEG had on directing individualized BCT.

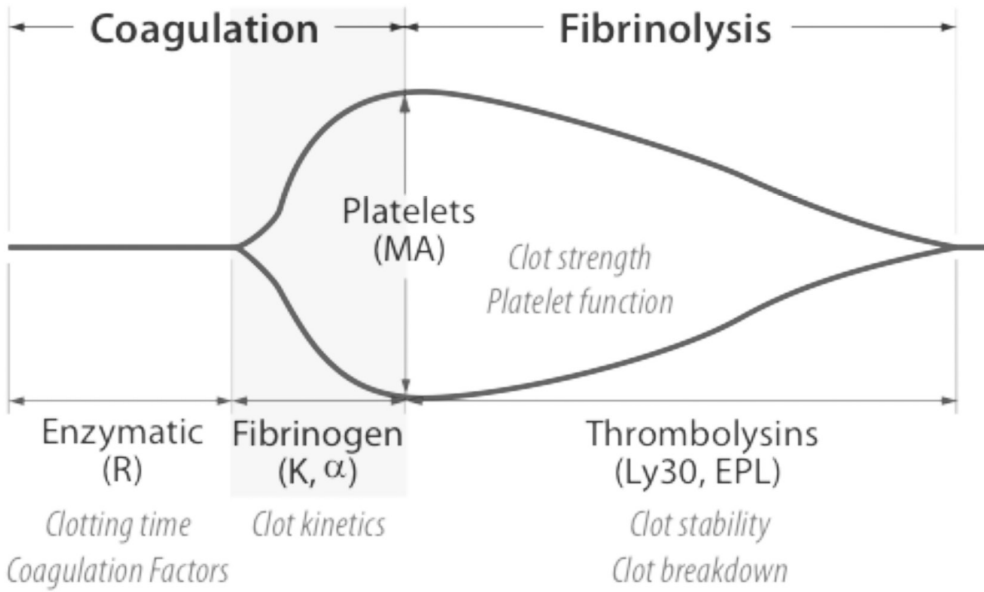
**Methods:** This study retrospectively reviewed patients with acute pelvic fractures treated with standard fracture care and an index TEG to guide their initial resuscitation. Patients were excluded if they were not classified a trauma activation with a pelvic fracture, age <15 years, ISS <9, and/or if a TEG perfusionist was unavailable. Whole blood samples were drawn and analyzed via TEG for the following stages of clot formation: *initiation* (R measurement: reflective of INR/PTT [international normalized ratio/partial thromboplastin time] status), *amplification* ( $\alpha$  angle: fibrin and fibrinogen activity), *propagation* (maximum amplitude [MA]: strength of clot through fibrin/platelet contact), and *termination through fibrinolysis* of the clot (LY30 [percentage reduction in MA at 30 minutes]) (Figure 1). Based on prior studies, standard BCT resuscitation was defined as a 1:1:1 ratio of packed red blood cells (PRBCs) to fresh-frozen plasma (FFP) to platelets. We compared the standard BCT ratio to ratios of blood products directed from individualized patient resuscitative needs as defined by the TEG. A cost analysis was performed of the actual transfusion requirements compared to anticipated requirements using the 1:1:1 protocol.

**Results:** From May 2010 to July 2013, 40 patients met criteria for review. The average age was 44.7 years. All types of pelvic and acetabular fractures were included. The average ISS was 30. In the first 24 hours, the cohort received 282 units of PRBCs, with 250 given in the first 6 hours. FFP requirements were a total of 112 units (105 given in the first 6 hours). 54 single-donor apheresis platelets (SDAP) were given, which translates into 324 units of platelets (42 SDAP given in the first 6 hours). Patients with TEG-guided resuscitation were transfused greater volumes of platelets and RBCs versus FFP ( $P = 0.017$ ). Empirical standard BCT 1:1:1 protocols would have misused 42 units of PRBCs and 212 units of FFP. Given the average price of PRBCs and FFP our institution, TEG-guided resuscitation saved \$71,086 in 40 patients.

**Conclusion:** TEG-guided BCT can individualize orthopaedic pelvic fracture resuscitation with cost effective transfusion requirements. When compared to the standard 1:1:1 BCT resuscitation protocol, TEG-resuscitated patients may be exposed to fewer units of component blood products that may otherwise not improve their resuscitation. The increased institutional costs and potential complications of unwarranted transfusions can have detrimental effects.

The routine use of TEG may reduce the costs of hemostatic resuscitation in multiply injured trauma patients with pelvic fractures.

**Figure 1.** Physiologic TEG tracing (reprinted with permission from Haemonetics). EPL = estimated percent lysis.



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