

Thromboelastography Demonstrates Less Hyperfibrinolysis in Multiply Injured Trauma Patients with Pelvic Fractures

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Background/Purpose: Hyperfibrinolysis is an abnormal physiologic response and marker of trauma severity in multiply injured patients (MIPs). Tranexamic acid (TXA), an antifibrinolytic used in two landmark studies, demonstrated improved survival rates and fewer transfusion requirements when given as an adjunct to hemostatic resuscitation in bleeding trauma patients (CRASH-2 trial and MATTERS study). Despite these potential benefits, there are thromboembolic risks that have raised concern about its use in acute orthopaedic trauma fracture cases when compared to TXA use in elective arthroplasty procedures. Differences in hyperfibrinolysis between trauma MIPs receiving massive transfusions may account for the increased thrombosis. Using a pilot study, we hypothesized that MIPs with acute pelvic fractures have less hyperfibrinolysis than MIPs without pelvic fractures, leaving them at greater risk for thromboembolic events if TXA were added to the resuscitation protocol.

Methods: A cohort of MIPs at a Level II trauma center were retrospectively reviewed for the presence or absence of hyperfibrinolysis. Inclusion criteria included: trauma activation, ISS >9, age >15 years old, and an available perfusionist. Whole blood samples taken from each patient during the index resuscitation were analyzed for real-time clotting using thromboelastography (TEG). Standard TEG parameters were measured: R, α -angle, maximum amplitude, and incipient plateau LY30% (% clot lysis at 30 minutes). The termination of clot and existence of fibrinolysis was based on LY30 values. Based on previous research, hyperfibrinolysis was classified as an LY30% value $\geq 3\%$. Massive transfusion (MT) was defined as ≥ 10 units of blood components transfused within 24 hours. Subgroup analysis was performed between four groups: MIP with MT, MIP without MT, pelvic MIP with MT, and pelvic MIP without MT.

Results: 89 MIPs met criteria for review: 15 MIPs with MT, 48 MIPs without MT, 7 pelvic MIPs with MT, and 19 pelvic MIPs without MT. The mean LY30% values were: 15.5 for MIP with MT, 1.2 for pelvic MIP with MT, 3.12 for MIP without MT, and 1.7 for pelvic MIP without MT. When comparing only patients who demonstrate fibrinolysis (LY30% >0), there was a significant difference in the amount of measureable fibrinolysis between the MIP with MT (mean 38.63) and both pelvic MIP with MT (mean 2.67, $P = 0.036$) and pelvic MIP without MT (mean 3.36, $P = 0.042$). There was no significant difference between MIP without MT (7.19) and pelvic MIP without MT (3.36, $P = 0.33$) or between MIP groups ($P = 0.56$).

Conclusion: Index TEG evaluation suggests the incidence of hyperfibrinolysis is significantly less in MIPs with pelvic fractures. Although trauma studies have advocated benefits of TXA dosing early in the resuscitation protocol, this pilot study raises concerns for its use in MIPs with pelvic fractures. Because of the increased concern for thromboembolic events

in orthopaedic trauma patients, we suggest that TXA be given cautiously by restricting its use to patients demonstrating hyperfibrinolysis defined by TEG LY30 levels $\geq 3\%$.

- The FDA has not cleared this drug and/or medical device for the use described in this presentation (i.e., the drug or medical device is being discussed for an “off label” use). For full information, refer to page 600.