

## Can Thrombelastography Predict Venous Thromboembolic Events in Patients with Spine Trauma?

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**Purpose:** Despite increased bleeding risk during the acute trauma resuscitation, trauma-induced coagulopathy is associated with greater likelihood of hypercoagulability, and eventual venous thromboembolic events (VTEs). Rapid thrombelastography (r-TEG) is a whole blood assay that identifies both hypo- and hypercoagulable states. It has been shown that an elevated maximal amplitude (mA) value on admission can identify general trauma patients with increased risk of VTE. We hypothesized that (1) the risk of VTE is higher in patients with spine trauma than those without and (2) an elevated admission mA value could be used to identify patients with spine fractures at risk for VTE during initial hospital admission.

**Methods:** This is a retrospective review of a prospectively collected database of 9090 trauma patients admitted to an urban Level I trauma center between September 2009 and February 2011. We then evaluated only those patients who met highest-level trauma activation criteria, were 18 to 85 years of age, and were direct scene transports. Patients with burn wounds greater than 20% total body surface area or who died within 30 minutes of arrival were excluded. Two groups were created, one presented with a spine fracture (SPINE) and those without a spine fracture (non-SPINE). VTEs were defined as those pulmonary emboli (PEs) confirmed by CT angiography and those symptomatic deep vein thromboses (DVTs) confirmed by venous duplex. Univariate analyses were conducted followed by purposeful regression analysis.

**Results:** 3005 patients met the inclusion criteria (722 SPINE, 2233 non-SPINE). SPINE patients were older (36 vs 33 years), were more likely to be white (61% vs 52%), and blunt trauma (93% vs 74%); all  $P < 0.05$ . SPINE patients were more badly injured according to individual systems AIS (Abbreviated Injury Scale) scores, all  $P < 0.001$ . They also had lower systolic blood pressure (117 vs 130), higher pulse (100 vs 95), and lower Glasgow Coma Scale (GCS) (9 vs 13) on arrival; all  $P < 0.05$ . Despite more hypocoagulable r-TEG values on arrival (alpha angle 72 vs 73 and mA 63 vs 64, both  $P < 0.05$ ), SPINE patients had higher rates of VTE (8.5% vs 3.4%,  $P < 0.001$ ) and PE (5.2% vs 2.4%,  $P < 0.001$ ). Stepwise regression generated three values to predict development of VTE (SPINE, ISS, and mA >65). After controlling for gender effect, admission mA = 72 (odds ratio 4.81) was an independent predictor of VTEs during hospitalization.

**Conclusion:** Admission r-TEG mA values can identify patients with spinal injuries who present with an increased risk of in-hospital DVT and PE. Patients presenting with admission r-TEG mA value of 72 are at a 4.81-fold increased risk for in-hospital VTE. Admission r-TEG values can help to identify patients at greatest risk for VTE and best target those who might benefit from an early, aggressive prophylaxis strategy.