Coagulopathy in Traumatic Pelvic and Lower-Extremity Fractures Measured by Thromboelastography with Platelet Mapping

Mariano Garay Claudio, MD*; Gregory T. Altman, MD; Edward Ryan Westrick, MD*
Allegheny General Hospital, Pittsburgh, PA, United States

Purpose: Conventional coagulation tests have not been shown to be effective in determining the rate of blood loss as they only assess the role of plasma components in coagulation. Thromboelastography (TEG) is a method of measuring whole blood coagulation, including plasma and cellular components. The purpose of the study was to evaluate the rate and morphology of coagulopathy in patients with fractures to the pelvis and lower-extremity long bones using TEG.

Methods: This was a single-institution retrospective chart review over a 2-year period of patients who sustained a pelvis, femur, and/or tibia fracture and who underwent a TEG study within 24 hours of surgical intervention. All adult patients were included.

Results: A total of 40 patients met inclusion criteria. The median (range) age of patients was 70 years (18-98 years). A total of 47% of the cohort was on anticoagulation therapy preinjury, with antiplatelet agents being most common (32.5%). The clots' mean (standard deviation [SD]) reaction time (R) and maximal amplitude (MA) were 4.3 min (1.2 min) and 61.1 mm (6.6 mm), respectively. The clots' median (range) kinetic (K) time and alpha angle were 1.3 min (0.9-4.0 min) and 72.3° (45.6°-78.0°), respectively. The coagulation index (Co-I) mean (SD) was 3.9 (0.99) and 82.5% demonstrated a hypercoagulable state. When available, the median (range) admission international normalized ratio (INR), prothrombin time (PT), and partial thromboplastin time (PPT) were 1.2 (0.9-4.6), 14.9 (12.1-41.5), and 29 (4.8-80), respectively. 75% of patients required a blood product transfusion. Of the 33 patients with a hypercoagulable state, 10 did not require a blood product transfusion, while 7 patients without hypercoagulability by Co-I required a transfusion, relative risk (RR) (95% confidence interval [CI]) 0.69 (0.56, 0.87). 39 patients had platelet mapping performed. 22 of them demonstrated platelet dysfunction. In patients with platelet dysfunction, 10 patients were on an antiplatelet agent prior to admission.
Two patients on antiplatelets did not demonstrate platelet dysfunction by platelet mapping, RR (95% CI) 1.86 (1.15, 3.07). Although not significant, being on an anticoagulant prior to admission resulted in increased odds ratio (OR) of needing a blood product administration, OR (95% CI) 1.5 (0.35, 6.4). Desmopressin and tranexamic acid were used as adjuncts to correct coagulopathy in 9 and 2 of the patients, respectively.

Conclusion: The majority of patients within this cohort presented with coagulopathy and required blood product administration. More commonly, patients were hypercoagulable with platelet dysfunction. TEG could lead to better resuscitation strategies intraoperatively and in the perioperative period, and may prevent surgical delays in patients who are perceived to be coagulopathic due to outpatient anticoagulation therapy.