Thrombelastography Identifies Hypercoagulability in Hip Fracture Patients Despite Thromboprophylaxis

Daniel You, MD; *Robert Korley, MD; Richard E. Buckley, MD; Paul James Duffy, MD; Ryan Martin, MD; Tanja Harrison, MPH; Andrea Soo; Prism Schneider, MD, PhD, FRCSC*
University of Calgary, Calgary, AB, Canada

Purpose: Venous thromboembolism (VTE) is the second most common complication and pulmonary embolism (PE) is the fourth most common cause of death after a hip fracture. Despite thromboprophylaxis, deep vein thrombosis (DVT) is detected in up to 45% of hip fracture patients. Thrombelastography (TEG) is a whole- blood, point of care test capable of providing clinicians with a global assessment of the clotting process, from fibrin formation to clot lysis. Maximal amplitude (mA) from TEG analysis is a measure of clot strength. Elevated admission mA values of ≥65 mm and ≥72 mm have been determined to be independent predictors of in-hospital PE. The coagulation index (CI) is calculated based on TEG parameters and defines hypercoagulable state as CI >3. This study aimed to use serial TEG analysis to determine the duration of hypercoagulable state after hip fracture.

Methods: A prospective cohort of hip fracture patients >50 years of age amenable to surgical treatment (AO 31A1-A3 and 31B1-B3) were enrolled at a Level-I trauma center. Serial TEG analysis (TEG 6S) was performed every 24 hours from admission until 5 days postoperatively and at 2- and 6-week follow-up visits. All patients received a minimum of 28 days of thromboprophylaxis. Results were summarized using descriptive statistics and single sample t-tests were used to compare mean mA values to the 65-mm threshold.

Results: 35 patients (26 female) with a median age of 83 years (interquartile range [IQR] = 71-86 years) were included. On admission, 34.3% and 82.9% of patients were hypercoagulable based on mA ≥65 mm and CI, respectively. At 2 weeks, all patients remained hypercoagulable; however, mA ≥72 mm showed that 17 patients (50.0%) were at even higher risk for VTE. At 6 weeks, 65.7% and 97.1% of patients were hypercoagulable based on mA ≥65 mm and CI, respectively. When compared with the mA ≥65-mm threshold, patients were hypocoagulable at the time of admission (mean 62.2, standard deviation [SD] 6.3; $P = 0.011$) but became significantly more hypercoagulable at 2 weeks (mean 71.6, SD 2.6; $P < 0.001$), followed by continued hypercoagulability at 6 weeks; however, not significantly elevated above 65 mm (mean 66.2, SD 3.8; $P = 0.058$). One patient developed a symptomatic DVT at 2 weeks and had an mA of 72.9 and a CI of 5.9.

Conclusion: This is the first study to demonstrate that >50% of hip fracture patients remain hypercoagulable 6 weeks postfracture despite thromboprophylaxis, and there are individual hypercoagulable responses. This is critical, as guidelines only recommend 28 to 35 days of thromboprophylaxis in this high-risk population. Previously determined mA thresholds may be a more sensitive test for risk-stratifying patients' VTE risk than the CI threshold. Additionally, assessing ΔmA using serial TEG may better predict VTE risk.