Thromboelastography Can Identify Patients With Femur Fractures at Increased Risk for Venous Thromboembolism and Prolonged Platelet-Dominant Hypercoagulability

Prism Schneider, MD, PhD*; Andrew Dodd; Paul J. Duffy, MD; Ryan Martin, MD; Jessica Duong; Casandra Tan; Haiyan Hou; Golpira Elmi Assadzadeh; Robert Korley, MD*

Purpose: The risk for venous thromboembolism (VTE) after femur fracture remains high, supporting a need for early identification of those at increased risk for these potentially life-threatening events. Thromboelastography (TEG) is a whole-blood assay that provides a comprehensive analysis of hemostasis from clot initiation to fibrinolysis. This study aimed to use serial TEG analysis to identify those at increased risk for VTE and to determine the different phases of hypercoagulability after a femur fracture.

Methods: This single-center prospective cohort study enrolled consecutive adult patients requiring femur fracture fixation who underwent serial TEG analysis until 6 weeks postoperatively. Hypercoagulability was defined as maximal amplitude (MA; a measure of platelet contribution to maximal clot strength) of 65 mm or greater. Independent sample t-tests or Mann-Whitney U tests and Fisher exact tests were used to compare demographics and TEG parameters between those who had a VTE event and those who did not. Wilcoxon tests compared MA values and the hypercoagulability threshold at each time point.

Results: 85 patients were included (mean age = 45.1 [±20.1] years; 64.7% male). There were 5 symptomatic VTE events (5.9%; 1 pulmonary embolism [PE] and 4 deep vein thromboses [DVTs]), with no difference in age or sex between those with VTE and without VTE. Patients with VTE had a significantly elevated preoperative TEG parameters of clot propagation (median kinetic-time [K-time] in VTE group = 0.95 vs no VTE group = 1.65; P = 0.033 and median alpha-angle [α-angle] in VTE group = 77.7 vs no VTE = 72.3; P = 0.036). At the time of hospital admission, those with VTE also demonstrated significantly impaired clot breakdown (median LY-30 in VTE group = 0.0 vs no VTE = 0.3; P = 0.026). This early coagulation factor-dominant hypercoagulability was followed by a prolonged platelet-dominant hypercoagulability, with 93.4% demonstrating elevated MA above the threshold at 2 weeks (median = 70.6 mm) and 51.2% remained hypercoagulable at 4 weeks (median = 64.9 mm).

Conclusion: This study supports that preoperative TEG analysis in patients with femur fractures can be used to identify increased VTE risk by elevated parameters of clot propagation (K-time and α-angle) and impaired clot breakdown (reduced LY-30). The prolonged platelet-dominant hypercoagulability suggests that extended antiplatelet thromboprophylaxis may be beneficial.