

An Early Coagulation Factor Dominant Hypercoagulability is Followed by a Prolonged Platelet-Dominant Hypercoagulability in Patients Requiring Hip Fracture Surgery

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Purpose: The risk for venous thromboembolism (VTE) after hip fracture surgery (HFS) remains high. A subanalysis of the FAITH and HEALTH trials demonstrated a 2.5% VTE rate, with 45.3% of VTE events occurring more than 6 weeks post-fracture, beyond currently recommended thromboprophylaxis. Thrombelastography (TEG) is a whole-blood assay that provides a comprehensive analysis of hemostasis from clot initiation to fibrinolysis. This study used serial TEG analysis to determine the different phases of coagulation responsible for hypercoagulability after HFS.

Methods: In this single-center prospective cohort study, consecutive patients requiring HFS underwent serial TEG analysis until 12-week follow-up. Hypercoagulability was defined by TEG parameter values beyond the reference range for clot initiation (Activated Clotting Time [ACT], Reaction-time [R-time]) and clot propagation (Kinetic-time [K-time] and Alpha-angle). A hypercoagulable threshold of >65 mm was used for Maximal Amplitude (MA), a measure of platelet contribution to maximal clot strength. Paired sample t-tests were used to compare admission values to time points when TEG parameters were beyond reference ranges. One-sample t-tests were used to compare MA values and the hypercoagulability threshold at each time point.

Results: In total, 251 patients were included with a median age of 79 years (interquartile range [IQR] 71-87) and with 66% being female. There were 6 symptomatic VTE events (2.4%), where significantly elevated MA occurred on postoperative day (POD)5 (mean MA = 70.7, standard deviation [SD] = 1.5; $P < 0.001$) and at 2 weeks (mean MA = 76.1, SD = 4.2; $P < 0.001$). In the overall cohort, ACT and R-time demonstrated shorter time to clot initiation until 2-week follow-up (ACT mean difference = 6.7 sec, 95% confidence interval [CI], 3.79-9.66; $P < 0.0001$ and R-time mean difference = 0.07 min, 95% CI, 0.04-0.1; $P < 0.0001$), signifying early increased coagulation factor-dominant hypercoagulability. MA values (clot strength) peaked at 2 weeks (mean MA difference = 8.87, 95% CI, 7.90-9.84; $P < 0.0001$), as well as Alpha-angle (rate of clot formation; mean difference = 5.75, 95% CI, 5.15-6.35; $P < 0.0001$). A total of 86% of patients had persistently elevated MA at 4 weeks (mean = 67.5, SD = 3.5; $P < 0.0001$) and 72% remained hypercoagulable at 6 weeks (mean = 65.7, SD = 4.6; $P = 0.021$), supporting prolonged platelet-predominant hypercoagulability.

Conclusion: TEG analysis demonstrated early hypercoagulability after HFS related to increased procoagulant factor activity, supporting early thromboprophylaxis with anticoagulants that target procoagulant factors (oral anticoagulants or low molecular-weight heparin). Prolonged platelet-dominant hypercoagulability extended beyond currently recommended thromboprophylaxis, suggesting that extended antiplatelet thromboprophylaxis may be beneficial. Future studies targeting procoagulant factors and platelet hyperactivity may help prevent VTE after HFS.

See the meeting website for complete listing of authors' disclosure information. Schedule and presenters subject to change.

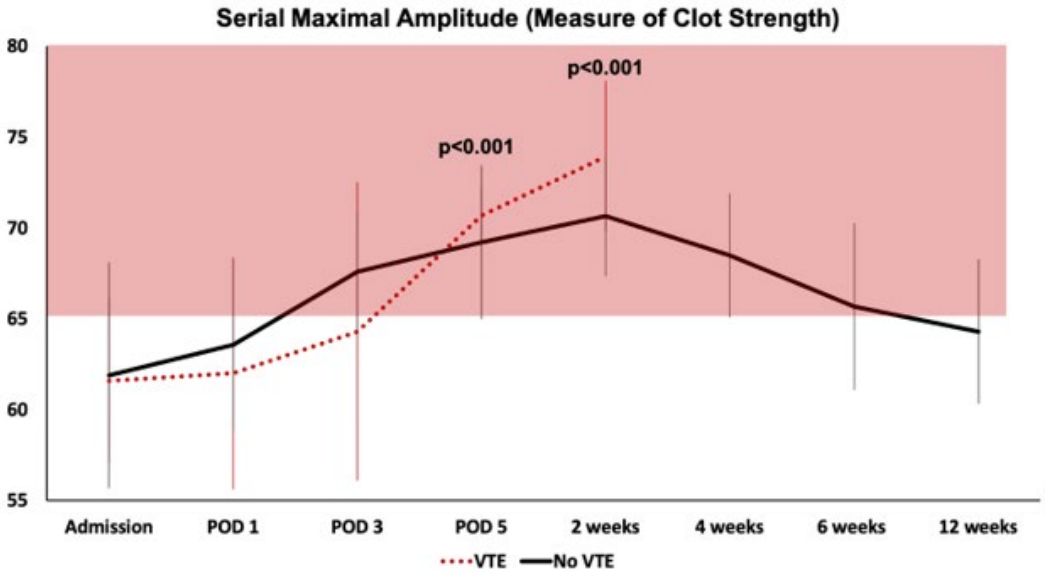


Figure 1: Maximal amplitude (MA) in patients requiring hip fracture surgery, demonstrating elevated MA in those who suffered symptomatic VTE above the hypercoagulability threshold of ≥ 65 mm (indicated by p-values) and prolonged platelet-mediated hypercoagulability until at least 6-weeks post-operatively (indicated by red shaded area). All VTE events occurred within two weeks post-operatively in this cohort.

The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or medical device they wish to use in clinical practice.