Prolonged Postoperative Hypercoagulability Occurs in Patients with Metastatic Bone Disease

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Purpose: Malignancy and systemic cancer treatments place patients with metastatic bone disease (MBD) at 7-fold increased risk for venous thromboembolism (VTE) compared to patients without cancer. Postoperative thromboprophylaxis guidelines are limited in this population, as the extent and duration of postoperative hypercoagulability and increased VTE risk remains unknown. Thrombelastography (TEG), a point-of-care coagulation test of whole blood, has been used to define hypercoagulability and predict VTE risk in non-cancer orthopaedic trauma patients using the maximal amplitude (MA; a measure of clot strength) threshold of 65 mm or greater. This study aimed to use serial TEG analysis to evaluate postoperative hypercoagulability in patients with MBD.

Methods: Consecutive adults with MBD undergoing orthopaedic surgery for acute or impending pathologic fracture were enrolled into this single-center, prospective cohort study. Whole blood samples were collected preoperatively; on postoperative day (POD) 1, 3, and 5; and at 2, 6, and 12 weeks postoperatively for analysis using TEG 6s hemostasis analyzers (Haemonetics Corporation). Hypercoagulability was defined as MA of 65 mm or greater. Screening lower-extremity Doppler ultrasound was performed on POD 3, and image-confirmed deep vein thrombosis (DVT) or pulmonary embolism (PE) was used to define VTE event rate. Thromboprophylaxis prescription and compliance were recorded. Descriptive statistics and t tests were performed to compare MA values in patients who did versus did not experience VTE.

Results: 19 participants (10 female; 52.6%), with a mean age of 68 years (standard deviation [SD] = 12 years) were included. Breast (n = 4), colorectal (n = 4), and lung (n = 4) primary cancers were predominant in this cohort. VTE incidence rate was 21.1% (1 PE; 3 DVTs), and all events occurred by POD 5. One DVT on POD 3 (MA = 73.7 mm) was significantly elevated compared to the mean MA at that time point of those who did not experience VTE (MA = 65.1, SD = 6.0 mm; $P<0.001$). All patients with VTE complications were hypercoagulable prior to VTE incidence, and at time of diagnosis, mean MA of those with VTE was 68.3 mm (SD = 5.3 mm) ($P<0.05$). In those without VTE complications, hypercoagulability increased beginning on POD 3 (78.6%; P = 0.43), peaked at 2 weeks (91.7%; P = 0.14), persisted at 6 weeks (45.5%; P = 0.50), and normalized at 12 weeks (45.5%; P = 0.86) postoperatively.

Conclusion: Risk for VTE complications is highest within the first 2 weeks postoperatively in patients with MBD. Nearly half of these patients remain hypercoagulable at 6 weeks postoperatively and normalizing to preoperative MA level is delayed until 12 weeks postoperatively. Therefore, patients with MBD demonstrate prolonged postoperative hypercoagulability, which warrants further investigation into identifying disease-specific hypercoagulability thresholds for this high-risk patient group.