Prospective Evaluation of Tranexamic Acid in Metastatic Cancer Patients with Pathologic Fractures Treated with Total Hip Arthroplasty or Hemiarthroplasty

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INTRODUCTION:

Tranexamic acid (TXA), an anti-fibrinolytic agent that binds plasminogen and inhibits fibrin degradation, has gained popularity in orthopaedic surgery due to demonstrated clinical and healthcare cost benefits secondary to reduction in blood loss and postoperative need for transfusion without increased risk of venous thromboembolic events (VTE). Patient-centered clinical outcome assessments have also demonstrated decreased postoperative pain and swelling, decreased duration of hospital stay, and improved patient satisfaction with use of TXA in orthopaedic surgery. Previously, studies evaluating TXA in orthopaedic surgery had excluded patient groups at higher risk of venous thromboembolic (VTE) events, including the cancer patient population. However, more recent studies across multiple oncologic surgical specialties have shown that TXA can be safely used in the general cancer population as well. Recent retrospective data has extended this finding to the orthopaedic population, demonstrating that TXA can be safely used for primary arthroplasty surgery in patients with former or active malignancy with no increased risk of VTE, mortality, or wound complication, though the benefits of TXA in reducing blood loss in this population were not specifically assessed. Other recent data in the orthopaedic oncology literature recapitulated the benefits of TXA in reducing blood loss and transfusion in bony resections followed by megaprosthetic reconstruction in sarcoma or metastatic bony disease. At present, however, no data currently exists on the safety and efficacy of TXA use in the treatment of pathologic hip fracture with hip hemiarthroplasty (HHA) or total hip arthroplasty (THA) secondary to metastatic disease, two of the most commonly performed procedures by orthopaedic oncologists. This study assesses the efficacy and safety profile of TXA use in patients undergoing HHA or THA for impending or completed pathologic fracture fixation secondary to underlying metastatic cancer. Specifically, we evaluate postoperative decrease in hemoglobin, transfusion requirement, and rates of VTE (defined as deep venous thrombosis or pulmonary embolism), and mortality.

METHODS:

This is a prospective cohort study at a single tertiary care center. Patients undergoing HHA or THA for impending or completed pathologic hip fracture for metastatic disease above the age of 18 were enrolled. Patients were excluded if additional surgical procedures were combined with these procedures. 1000mg of TXA was administered intravenously at incision in the TXA group. Primary outcomes included decrease in hemoglobin from pre-surgical values to postoperative day 1 (POD1), units transfused, and VTE and mortality events with minimum follow up of 90 days. The independent t-test with Levene's Test for Homogeneity of Variances or the Chi-squared test with Bonferroni post-hoc correction was used for continuous and categorical variables, respectively.

RESULTS:

Thirty-seven patients were prospectively enrolled. Nineteen patients received THA and 18 received HHA. Distribution of gender, primary malignancy, preoperative hemoglobin, and patient age did not statistically differ in the THA or HHA groups between those receiving TXA vs. those who did not (Table 1).

In the HHA group, postoperative decrease in hemoglobin in the TXA group was significantly less (1.1 g/dL [standard deviation (SD) 1.0] vs. 2.3 [1.0], p=0.018) (Table 2). No transfusions occurred in the TXA group vs. a mean of 0.2 (SD 0.4) units transfused postoperatively in the control group; this trended toward significance (p=0.08). There were no DVT/PE events in the TXA group and one in the control group, which was not significantly different between groups; there were no instances of mortality at 90 days.

In the THA group, postoperative decrease in hemoglobin in the TXA group was significantly less (1.1 g/dL [SD 1.2] vs. 2.0 [1.0], p=0.048). A significantly lower transfusion requirement was noted in the TXA group compared to the control group (no transfusions vs. a mean of 0.4 [SD 0.7] units, p=0.027). No DVT/PE events occurred in the TXA group vs. one in the control group, which was not significantly different between groups; there were no instances of mortality at 90 days.

DISCUSSION AND CONCLUSION:

TXA administration reduced blood loss and transfusion requirement postoperatively in both the HHA and THA groups. No increase in VTE or mortality events were observed. Limitations include the small sample size for which ongoing patients are being accrued. This data is the first to our knowledge to support the utility of TXA in HHA or THA for treatment of pathologic hip fractures in metastatic disease.

	TXA	No TXA	p-value
HHA (n)	6	12	
THA (n)	6	13	
Age (mean, (SD))			
HHA	64.3 (13.0)	66.5(10.2)	0.703
THA	64.8 (8.6)	71.7 (9.0)	0.135
Sex (n)			
HHA			0.732
Female	4	7	
Male	2	5	
THA			0.911
Female	4	9	
Male	2	4	
Baseline Hemoglobin (g/dL (SD))			
HHA	10.1 (2.9)	11.2 (1.5)	0.283
THA	11.2 (2.0)	10.4 (1.2)	0.391
Primary Malignancy (n)			
HHA			0.387
Breast		3	
Lung adenocarcinoma	1	2	
Multiple Myeloma	3	1	
Pancreatic		1	
Prostate		1	
Small cell lung cancer		1	
Urothelial		2	
Uterine sarcomatous carcinoma		1	
Colorectal	1		
Thyroid	1		
THA			0.911
Breast	1	3	
Colorectal		1	
Lung adenocarcinoma	3	3	
Lymphoma		1	
Prostate	2	3	
Serous ovarian		1	
Thyroid		1	

Table 1. Baseline characteristics of patients undergoing hemiarthroplasty and total hip arthroplasty for impending or completed femoral neck pathologic fracture who received TXA versus those who did not receive TXA. TXA, tranexamic acid; HHA, Hemiarthroplasty; THA, Total hip arthroplasty; SD, Standard deviation. * Statistically significant

	TXA	No TXA	p-value
Post-operative Hemoglobin Decrease (g/dL (SD))			
HHA	1.1 (1.0)	2.3 (1.0)	0.018*
THA	1.1 (1.2)	2.0 (1.0)	0.048*
Post-operative transfusion (units (SD))			
HHA	0	0.2 (0.4)	0.08
THA	0	0.4 (0.7)	0.027*
DVT/PE (n)			
HHA	0	1	0.467
THA	0	1	0.485

Table 2. Outcomes of patients undergoing hemiarthroplasty and total hip arthroplasty for impending or completed femoral neck pathologic fracture who received TXA versus those who did not receive TXA. TXA, Tranexamic acid; HHA, Hemiarthroplasty; THA, Total hip arthroplasty; DVT, Deep vein thrombosis; PE, Pulmonary embolism. SD, Standard deviation. * Statistically significant