



Tranexamic acid dosing for extracapsular hip fractures: retrospective study in progress

Max Jiganti, DO; Justin Than, DO; Jacqueline Krummy, MD

BACKGROUND

Blood loss in hip fractures is a common complication that may lead to perioperative anemia, necessitating allogeneic blood transfusion (Spahn 2010). Tranexamic acid (TXA) is an effective medication utilized to help minimize blood as it acts to stabilize clot formation by competitively blocking the lysine-binding sites of plasminogen, inhibiting fibrinolytic activity and fibrin degradation. TXA is commonly utilized in surgical treatments of extracapsular hip fractures and it has been shown to effectively reduce intraoperative blood loss without increasing the thromboembolism risk. (Tian 2018, Lei 2017, Tengberg) TXA has been effective with a single dose at admission (Yakel 2020) or intraoperatively (Lei 2017, Tengberg 2016). It has also been shown to be effective when two doses are given at different intervals, one intra-operatively with another dose post-operatively. (Tian 2018) Although studies show that intervention with TXA is safe and helps to minimize blood loss, there is no consensus as to the most effective timing or frequency of TXA intervention.

STUDY AIM

- This study aims to look at the effectiveness of TXA given as a single dose of one gram intravenously on admission versus the addition of an intraoperative dose along with the dose at admission in patients with extracapsular hip fractures.
- To the best of our knowledge, there is no current study comparing these two protocols.
- We hypothesize that giving TXA twice, once on admission and another dose intraoperatively at incision, will be more effective at reducing blood loss and minimizing transfusion risk than TXA on admission alone.

METHODS

- Patients 50 years and older presenting with a closed intertrochanteric or subtrochanteric femur fractures at GSRMC were included. Patients who received a single TXA dose are participants from the previous TXA randomized controlled trial (Yakel 2020) at our institution from October 2015 to January 2019. Patients who received two doses of TXA are from our current hip fracture treatment protocol which was started in January 2019 after the conclusion of the study by Yakel et al.
- Patients with unclear or inadequate medical record data to determine TXA administration or blood loss/blood transfusion were excluded, as well as patients who died before estimated blood loss could be accurately calculated, patients with more than one surgery during admission, and patients with multiple fractures.
- Estimated blood volume will be calculated for each patient using Nadler's formula. Then, total blood loss will be calculated by the hemoglobin dilution method.

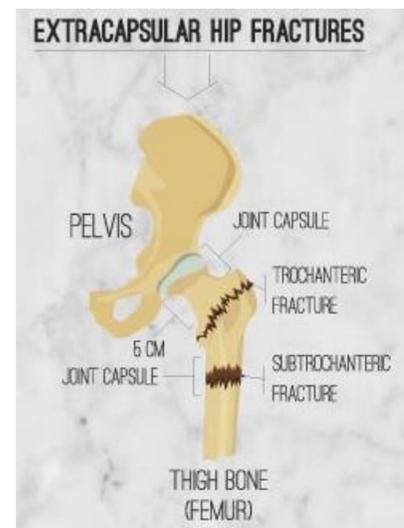
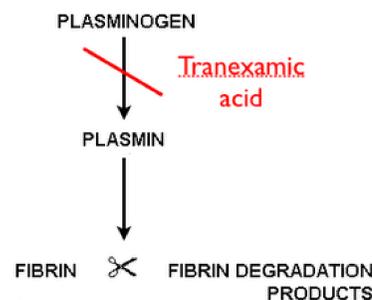
RESULTS

Table 1. Participant Characteristics

	Pre-op TXA Only (N=40)	Pre-op with Intra-op TXA (N=66)	P-value
Gender, % (N) Female	72.5% (29)	71.2% (47)	>0.99
Age (years) Mean (SD)	82.2 (10.2)	79.9 (9.9)	0.26
Min, Max	56, 98	59, 94	
BMI Mean (SD)	24.0 (4.3)	26.3 (5.5)	0.03
Min, Max	16.7, 34.4	16.0, 42.1	
ASA, % (N) 1	2.5% (1)	0.0% (0)	0.01
2	30.0% (12)	9.1% (6)	
3	62.5% (25)	74.2% (49)	
4	5.0% (2)	16.7% (11)	
Fracture Type, % (N) Intertrochanteric	85.0% (34)	78.8% (52)	0.59
Subtrochanteric	15.0% (6)	21.2% (14)	
Hardware Type Cephalomedullary Nail	97.5% (39)	100.0% (66)	0.38
Dynamic Hip Screw	2.5% (1)	0.0% (0)	
Hemoglobin on hospital arrival (g/dl) Mean (SD)	12.5 (1.6)	12.0 (1.6)	0.08
Min, Max	7.3, 16.0	8.4, 15.9	

SD: standard deviation ASA: American Society of Anesthesiologists Score. P-values: two-sample t-test for age, BMI, hemoglobin level on hospital arrival. Chi-squared test for gender and fracture type. Fisher's exact test for ASA and hardware type.

Table 1 reveals no significant difference between pre-operative TXA group and preoperative + intraoperative TXA group regarding gender, age, fracture or hardware type, or hemoglobin on arrival. BMI, ASA score, and hemoglobin on hospital arrival should be explored as potential confounding effects on the need for blood transfusion and total blood loss.



DISCUSSION

Tranexamic acid is a medication that helps stabilize blood clots, and it was anticipated that an extra dose in the setting of a hip fracture would lead to fewer blood transfusions and less blood loss. In this study, a preliminary analysis of the study groups displayed in Table 1 actually showed more blood loss in the group with two doses.

This result led investigators to revisit the study inclusion/exclusion criteria. Several inadequacies of the current study population inclusion criteria were revealed. Specifically, inclusion and exclusion criteria were not identical in each arm of the study. The initial population, with only the intraoperative dosing, had more stringent exclusion criteria, which could have led to erroneous study results. Any patient with recent blood thinner use or renal impairment should have been excluded.

For this reason, we intend to review our current Pre-op with Intra-op TXA study patients and adhere to the same exclusion criteria that was applied to the Pre-Op TXA Only study patients. Once this has been done and an adequate sample size has been achieved (goal N=80), we will be able to effectively explore whether a difference truly exists in blood loss between single versus twice dosing of perioperative extracapsular hip fractures.

ACKNOWLEDGEMENTS & SOURCES

We would like to acknowledge Olivia Pipitone for her continuous support and guidance through this project.

Tian S, Shen Z, Liu Y, Zhang Y, Peng A. The effect of tranexamic acid on hidden bleeding in older intertrochanteric fracture patients treated with PFNA. *Injury*. 2018 Mar;49(3):680-684. doi: 10.1016/j.injury.2018.01.026. Epub 2018 Feb 2. PMID: 29426608.

Lei J, Zhang B, Cong Y, Zhuang Y, Wei X, Fu Y, Wei W, Wang P, Wen S, Huang H, Wang H, Han S, Liu S, Zhang K. Tranexamic acid reduces hidden blood loss in the treatment of intertrochanteric fractures with PFNA: a single-center randomized controlled trial. *J Orthop Surg Res*. 2017 Aug 15;12(1):124. doi: 10.1186/s13018-017-0625-9. PMID: 28810918; PMCID: PMC5558747.

Tengberg PT, Foss NB, Palm H, Kallemose T, Troelsen A. Tranexamic acid reduces blood loss in patients with extracapsular fractures of the hip: results of a randomised controlled trial. *Bone Joint J*. 2016 Jun;98-B(6):747-53. doi: 10.1302/0301-620X.98B6.36645. Erratum in: *Bone Joint J*. 2016 Dec;98-B(12):1711-1712. PMID: 27235515.

Spahn DR. Anemia and patient blood management in hip and knee surgery: a systematic review of the literature. *Anesthesiology*. 2010 Aug;113(2):482-95.

Lei J, Zhang B, Cong Y, et al. Tranexamic acid reduces hidden blood loss in the treatment of intertrochanteric fractures with PFNA: a single-center randomized controlled trial. *J Orthop Surg Res*. 2017;12(1):124.

Images:
 Left: RebelEM
<https://rebelem.com/topical-tranexamic-acid-epistaxis-oral-bleeds/>
 Right: Yashoda hospitals
<https://www.yashodahospitals.com/blog/how-to-treat-hip-fractures/>