





**IDAHO TIME SENSITIVE
EMERGENCY SYSTEM**
TRAUMA | STROKE | STEMI

Case for TXA use

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Luke's

Tranexamic acid

- Antifibrinolytic
- Lysine analog - occupies binding sites on plasminogen interfering with conversion to plasmin
- Safety and efficacy previously proven in elective surgery studies (predominately cardiac and joint replacement). Also approved by FDA for uterine bleeding and treatment of hemophilia.
- Plasmin has pro-inflammatory effects – some of increased survival rates may be attributed to the reduction in subsequent inflammatory events

- Cheap – cost around \$50.
- No mixing required
- Dose is 1 gm over 10 minutes followed by 1 mg infusion over 8 hours
- Pediatrics: Currently ASL dosing 10 mg/Kg up to 40 kg for peds patients with infusion 2 mgm/kg over 8 hours (consensus – no trauma data available for dose). Royal College of Surgeons uses 15 mg/kg for less than 12 y/o with 2 mgm/kg infusion. Use in pediatrics in Afghanistan used adult dose (PED-TRAX study)

The literature

- CRASH 2 (Clinical Randomization of an Antifibrinolytic in Significant Hemorrhage)
- MATTERs (Military Application of TXA in Trauma Emergency Resuscitation)
- PED-TRAX (Tranexamic Acid administration to pediatric trauma patients in a combat setting)
- Prehospital administration of TXA in trauma patients (Critical Care May 2016)
- Do all trauma patients benefit from TXA? (J Trauma Acute Care Surgery June 2014)

CRASH 2

- Published 2010 in the Lancet
- 20,000 patients randomized, prospective, 40 countries, 274 hospitals.
- With, or at risk for, significant hemorrhage
- SBP < 90, or HR > 120, or both
- Within 8 hours
- Subjective call by physician

Patient characteristics

- 84% male
- Average age 35
- Mean time since injury 3 hours
- Blunt trauma 68%
- Penetrating trauma 32%
- GCS 3-8 (18%) 9-12 (13%) 13-15 (68%)
- Dose 1 gm followed by 1 gm over 8 hours

Outcome

- Primary – death in hospital within 4 weeks
- TXA 14.5%
- No TXA 16%
- Absolute reduction 1.5%, (NNT 67)
- Relative reduction in hemorrhagic deaths 15%
- More severely injured and treated earlier derived greatest benefit
- No increase in thromboembolic events

MATTERs

- Retrospective cohort study
- 896 patients over 2 years, British medivac patients delivered to Camp Bastion Afghanistan
- Inclusion criteria trauma patients receiving at least 1 u PRBC
- First year TXA administered at discretion of surgeon or anesthetist or on basis of documented coagulopathy; second year it was part of MTP (massive transfusion protocol)
- Age 23 years, 96% male, GSW 31%, explosion 68%
- 1 gm bolus followed by second at provider discretion

Results

- Total in hospital mortality 17.4% TXA vs 23.9% non TXA
- In MTP cohort reduction greater (14.4 vs 28.1%) with NNT 7
- Subgroup in which TXA given in first hour had 35% reduction in death due to bleeding.
- Increased thromboembolic events (8 PE vs 2; 7 DVT vs 1) – possibly due to increased survivors – these occurred in more severely injured patients.

Pediatrics

- 766 patients under 18 admitted to Camp Bastion 2008 – 2012
- Retrospective
- 88% male, mean age 11
- 10% received TXA – more severely injured
- After correction for injuries and lab abnormalities decreased mortality shown, odds ratio 0.3. Also improved neuro outcome and decreased ventilator days.

Prehospital administration of TXA

- German study involving 258 patients matched with controls – 90% blunt trauma
- First civilian study involving prehospital administration
- No increase in thromboembolism
- Early mortality much lower (24 hour 5.8% vs 12.4%), overall mortality 14.7% vs 16.3%
- Most pronounced difference seen in patients with highest severity scores
- Weaknesses of study: given at discretion of physician on board helicopter, timing and doses not documented (majority used 1 gm dose)

Do all patients benefit study

- Retrospective analysis of 1212 patients – Miami Fl.
- 150 patients given TXA at surgeon discretion
- 1 gm bolus and 1 gm over 8 hours
- Study patient population average age 43, 54% penetrating trauma, 25% TBI, ISS 28, 22% mortality
- TXA mortality 27% vs 17% no TXA
- Mortality associated with time of administration although if over 2000 ml PRBC required this effect was eliminated

Additional information:

- Some institutions measuring hyperfibrinolysis with TEG (Thromboelastometry) or ROTEM (rotational thromboelastometry) to assist in use of TXA
- TXA is currently being studied for use in isolated head injury in the US based off data from PEDS-TRAX study, also comparing anti-inflammatory effects of TXA vs EACA (aminocaproic acid) in pediatric congenital heart surgery
- While off label, it is used (with good evidence) to reduce blood loss in total knee and hip arthroplasty and in cardiac surgery (at much higher doses than trauma dose) without complications
- FDA approval only for short term use for patients with hemophilia during and following tooth extraction.

Current Air St. Lukes Protocol

- Pediatric: for all hemorrhagic shock patients secondary to trauma with the following conditions:
 - Less than 3 hours post injury
 - Hypotension
 - 0-1 month = 60 mm Hg
 - 2-12 month = 70 mm Hg
 - Over 1 year = 70 mm = 2 x age in years
 - Risk of significant bleeding, blood transfusion, or surgery
 - Contraindicated for isolated head trauma or isolated spine injury or if strong expectation for re-implantation
 - Note – include volume of infusion in total fluid calculations

ASL protocol Adult

- Same indications/contraindications as for peds
- BP defined as systolic less than 90

