High Risk Emergency Medicine

Controversies in Trauma

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• No relevant financial relationships to disclose

Topics:

• Pan CT scan based on mechanism of injury
• Use of Tranexamic acid
• FAST exam for stable blunt trauma patients
Case:

72 yo f BIBA s/p witnessed ground level fall, +LOC c/o HA and wrist pain, no blood thinners

180/110, P98, R30, O2 94%
GCS E4 V4 M6, scalp hematoma, +wrist deformity

The patient is prepared for CTH, do you order a pan CT scan?

Case:

51 yo F unrestrained driver in 30mph rollover MVC w/ +LOC, c/o HA, and lower abd pain

BP 100/60 P110 R20 O2 95%
There is scalp hematoma, no neck ttp, and lower abd TTP w/o peritonitis, GCS 15

Does this patient need a Pan CT?
Issues:
- Diagnostic accuracy
- Length of stay
- Cost
- Morbidity & Mortality
- Radiation risk

Cost:
- CTH $2301
- Cervical Spine $2739
- CT Chest $4161
- CT Abd/Pelvis $987
- Charge for a “Pan Scan:” $10,188
**Whole Body Imaging in Blunt Multisystem Trauma Patients Without Obvious Signs of Injury**

*Results of a Prospective Study*

Ali Salim, MD; Barapat Sangthong, MD; Matthew Martin, MD; Carlos Brown, MD; David Plurad, MD; Demetrios Demetriades, MD

*Arch Surg.* 2006 May;141(5):468-73; discussion 473-5

**Methods:** Prospective observation study – single level 1 trauma center, 592 patients with (1) no visible evidence of chest or abdominal injury, (2) hemodynamically stable, (3) normal abdominal examination results in a neurologically intact patient or unevaluable abdominal examination results secondary to a depressed level of consciousness, and (4) significant mechanisms of injury

**Outcome measures:** alterations include early hospital discharge, admission for observation, operative intervention, and additional diagnostic studies or interventions

**Results:** Treatment plan changed in 19% of cases

**Conclusion:** The use of pan scan based on mechanism in awake, evaluable patients is warranted.

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**Selective Use of Computed Tomography Compared With Routine Whole Body Imaging in Patients With Blunt Trauma**

Malkeet Gupta, MD, MS, David L. Schenger, MD, MPH, Jonathan R. Hstatt, MD, Henry G. Cryer, MD, PhD, Arch Tillou, MD, MSeD, Jerome R. Hoffman, MA, MD, Larry J. Baroff, MD


**Question:** Can selective imaging decrease CT scan use without missing clinically important injuries?

**Design:** Prospective observational study of 701 patients with blunt trauma at an academic trauma center.

**Results:** Pan CT was performed on 600 patient; 101 had selective imaging, 10% of the 102 undesired scans found abnormalities; 3 patients required predefined critical actions. There is disagreement among the authors about the clinical significance of the abnormalities found on the 99 undesired scans that did not lead to a critical action.

**Conclusion:** Selective scanning could reduce the number of scans, missing some injuries but few critical ones. The clinical importance of injuries missed on undesired scans was subject to individual interpretation, which varied substantially among authors.
Radiographic assessment of ground-level falls in elderly patients: Is the “PAN-SCAN” overdoing it?

Christopher R. Dwyer, MD, Aaron M. Scifres, MD, Kurt R. Stahl, MD, Alain C. Corcos, MD, Jenny A. Ziemnicki, MD, Jessica I. Sumners, MD, Andrew B. Peitzman, MD, Timothy R. Billiar, MD, and Jason L. Sperry, MD, MPH, Pittsburgh, PA

*Surgery. 2013 Oct;154(4):816-20*

**Methods:** Retrospective analysis of Pennsylvania trauma registry Age >65, ground-level falls, hemodynamically stable, admitted > 24 hours

**Results:** 13,043 patients included – no benefit in mortality, but there was an independent association with decreased ICU requirements, step-down days, and a decreased overall duration of stay.

**Conclusion:** Whole-body computed tomography imaging may benefit trauma center resource use for patients with ground-level falls.

Effects on mortality, treatment, and time management as a result of routine use of total body computed tomography in blunt high-energy trauma patients

Raoul van Vugt, MD, Digna R. Kool, MD, Jaap Deuk, MD, PhD, and Michael J. R. Edwards, MD, PhD, Nijmegen, The Netherlands


**Design:** Literature review on total body CT scan for the outcome measures: mortality, change of treatment, and/or time management.

**Methods:** 183 articles reviewed, 9 included in consensus

**Results:** One article described decreased mortality, four described treatment changes, five found decreased length of stay.

**Conclusion:** Compared with selective use, TBCT can give a change of treatment and improves time intervals in the emergency department. There is inadequate evidence to prove improved survival in blunt high-energy trauma patients.
Primary pan-computed tomography for blunt multiple trauma: can the whole be better than its parts?

Dirk Stengel¹, Matthias Frank¹, Gerrit Matthes¹, Uli Schmucker¹, Julia Seifert¹, Sven Mutze², Michael Wich¹, Beate Hanson³, Peter V Giannoudis⁴ and Axel Ekkernkamp¹


Methods: Literature review, critical appraisal, 115 articles cited

Conclusions: Diagnostic accuracy of Pan CT is unclear.

Pan-CT increases injury severity by detecting lesions that would not have been recognized by conventional methods but still do not affect treatment decisions, thus artificially lowering the ratio of observed to expected deaths.

Consensus is needed about the definitions of true and false positive and negative findings in blunt multi-trauma patients.

The gain of this technology needs to justify the price in terms of a higher chance of survival, lower morbidity or better function.

Comparison of radiation exposure of trauma patients from diagnostic radiology procedures before and after the introduction of a panscan protocol

Stephen Asha,¹,³ Kate Anne Curtis,⁵,⁶ Nicole Grant,¹ Colman Taylor,⁷ Serigne Lo,⁷ Richard Smart,¹,³ and Katherine Compagnoni¹


Background: Radiation doses above 20 mSv have a cancer risk greater than one in 1000. Panscan radiation dose = 23.9 mSv.

Methods: Data collected before and after introduction of a panscan protocol for blunt trauma.

Results: The proportion of patients exposed to radiation >20 mSv increased by 8%, which equated to one extra person being exposed to >20 mSv for every 13 patients treated after the introduction of the protocol. There were six missed injuries before and four after.

Conclusion: Introduction of a panscan protocol increased the proportion of trauma patients receiving a radiation dose >20 mSv. This increased risk occurred regardless of age or injury severity.
Methods: Retrospective review at 2 urban trauma centers, blunt chest trauma patients >14yo who underwent chest imaging

Results: CT after normal CXR found major clinical injuries in 12/589 patients (2%). Of 202 patients with CXRs suggesting injury, 87.6% had injury confirmed on CT, and 12.4% had no injury on CT.

Conclusion: Chest CT after a normal CXR result in patients with blunt trauma detects injuries, but most do not lead to changes in patient management.

NEXUS Chest Imaging Rule:
Significant thoracic injury is ruled out if none of:
• 1. Age >60 y
• 2. Rapid deceleration mechanism defined as fall >20 ft [>6.0 m] or motor vehicle crash > 40 mph [>64 km/h]
• 3. Chest pain
• 4. Intoxication
• 5. Abnormal alertness/mental status
• 6. Distracting painful injury
• 7. Tenderness to chest wall palpation
Background: Use of CT in trauma care is rising without demonstrable improvement in outcomes. Patient-centered care mandates disclosure of the potential risks, costs and benefits of diagnostic testing whenever possible.

Methods: Surveyed 941 English speaking patients at 4 level one trauma centers.

Results: Most patients would prefer to discuss radiation risk (73%) and cost (53%) with physicians. As the odds of detecting life-threatening injury decreased, preferences for receiving CT decreased accordingly.

Conclusion: Most non-critically injured patients prefer to discuss radiation risks and cost of CT prior to receiving imaging.

Pearls: High Risk Features

- Elderly
- Altered mental status
- Abnormal vital signs
- Severe mechanism of injury
Alternatives to Pan Scan

- Observation
- Serial exams
- Serial blood testing
- X rays
- Ultrasound

Case: Stab Wound

- 30 yo intoxicated M BIBA s/p stab wound to the right flank
- HR 145, BP 76/38, RR 22, sat 99% RA
• Other than blood transfusion and surgery, what might help this patient?

Tranexamic acid?
Effects of tranexamic acid on death, vascular occlusive events, and blood transfusion in trauma patients with significant haemorrhage (CRASH-2): a randomised, placebo-controlled trial

CRASH-2 trial collaborators


Design: prospective randomized trial of 20,211 trauma patients at 274 hospitals in 40 countries.

Results: All-cause mortality was significantly reduced with tranexamic acid [14.5%] tranexamic acid group vs [16.0%]. The risk of death due to bleeding was significantly reduced (489 [4.9%] vs 574 [5.7%].

Conclusion: Tranexamic acid safely reduced the risk of death in bleeding trauma patients in this study. On the basis of these results, tranexamic acid should be considered for use in bleeding trauma patients.

The importance of early treatment with tranexamic acid in bleeding trauma patients: an exploratory analysis of the CRASH-2 randomised controlled trial

The CRASH-2 collaborators

Lancet. 2011 Mar 26;377(9771):1096-101

Methods: Examined the effect of tranexamic acid on death due to bleeding according to time to treatment, severity of haemorrhage as assessed by systolic blood pressure, Glasgow coma score (GCS), and type of injury.

Results: Early treatment (<1 h from injury) significantly reduced the risk of death due to bleeding [198/3747 [5.3%] events in tranexamic acid group vs 286/3704 [7.7%] in placebo group. Treatment given after 3 h seemed to increase the risk of death due to bleeding [144/3272 [4.4%] vs 103/3362 [3.1%].

Conclusion: Tranexamic acid should be given as early as possible to bleeding trauma patients. For trauma patients admitted late after injury, tranexamic acid is less effective and could be harmful.
Military Application of Tranexamic Acid in Trauma Emergency Resuscitation (MATTERs) Study

Jonathan J. Morrison, MB ChB, MRCs; Joseph P. Dubose, MD; Todd E. Rasmussen, MD; Mark J. Midwinter, BMedSci, MD, FRCS


Methods: Retrospective observational study comparing TXA administration with no TXA in patients receiving at least 1 unit of packed red blood cells. A subgroup of patients receiving massive transfusion (≥10 units of packed red blood cells) was also examined.

Setting: A Role 3 Echelon surgical hospital in southern Afghanistan.

Patients: A total of 896 consecutive admissions with combat injury, of which 293 received TXA, were identified from prospectively collected UK and US trauma registries.

Results: The TXA group had lower unadjusted mortality than the no-TXA group (17.4% vs 23.9%, respectively; P = .03) despite being more severely injured. This benefit was greatest in the group of patients who received massive transfusion (14.4% vs 28.1%, respectively; P = .004).

Conclusion: The use of TXA with blood component-based resuscitation following combat injury results in improved measures of coagulopathy and survival, a benefit that is most prominent in patients requiring massive transfusion.

Tranexamic acid in trauma: How should we use it?

Lena M. Napolitano, MD, Mitchell J. Cohen, MD, Bryan A. Cotton, MD, MPH, Martin A. Schreiber, MD, and Ernest E. Moore, MD, Ann Arbor, Michigan


Methods: Literature review, critical appraisal

Conclusion:

A Rational Approach for TXA use in Trauma:

*In adult trauma patients with severe hemorrhagic shock (SBP ≤ 75 mm Hg), with known predictors of fibrinolysis, or with known fibrinolysis by TEG (LY30 > 3);*

*Only administer TXA if less than 3 hours from time of injury; & TXA administration:*

*1 g intravenously administered over 10 minutes, then 1 g intravenously administered over 8 hours.*
Case:

• 48 year old female BIBA after restrained 30 mph MVC. + LOC, c/o HA, neck pain and L clavicle pain
• BP 150/60, HR 100, RR 18, sat 95% on RA.
  Scalp hematoma
  C spine TTP
  L clavicle TTP
  No chest, back, or abd TTP

Does this patient need a FAST exam?
What is the role of the FAST exam in hemodynamically stable trauma patients?

FAST scan: Is it worth doing in hemodynamically stable blunt trauma patients?


Methods: retrospective review of 2105 patients at academic trauma center

Results: 88 true positives confirmed by CT, 5 false positives. 118 False negatives, 44 of these requires exploratory laparotomy. Sensitivity 43%, specificity 99%.

Conclusion: Given its low sensitivity, a negative FAST without confirmation by computerized tomography may result in missed intra-abdominal injuries. The use of FAST in hemodynamically stable blunt trauma patients seems not worthwhile. It should be reserved for hemodynamically unstable patients with blunt trauma.
Randomized Controlled Clinical Trial of Point-of-Care, Limited Ultrasonography for Trauma in the Emergency Department: The First Sonography Outcomes Assessment Program Trial


**Methods:** Prospective, randomized controlled clinical trial of point-of-care limited ultrasound for trauma at 2 Level I trauma centers, 262 blunt trauma patients.

**Outcome Measures:** Time from ED arrival to transfer to operative care; secondary outcomes included computed tomography (CT) use, length of stay, complications, and charges.

**Results:** Time to operative care was 64% less for PLUS compared to control patients. PLUS patients underwent fewer CTs (odds ratio 0.16), spent 27% fewer days in hospital, and had fewer complications (odds ratio 0.16), and charges were 35% less compared to controls.

**Conclusion:** A PLUS-inclusive protocol significantly decreased time to operative care in patients with suspected torso trauma, with improved resource use and lower charges.

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**Take-Home Message:**

- **FAST** = specific, not sensitive
- **FAST** = a rule-in test for large volume hemorrhage, should not be used as a rule-out strategy.
Summary:

• Pan CT scan based on mechanism of injury

• Use of Tranexamic acid

• FAST exam for stable blunt trauma patients

Thank You!

Any questions?