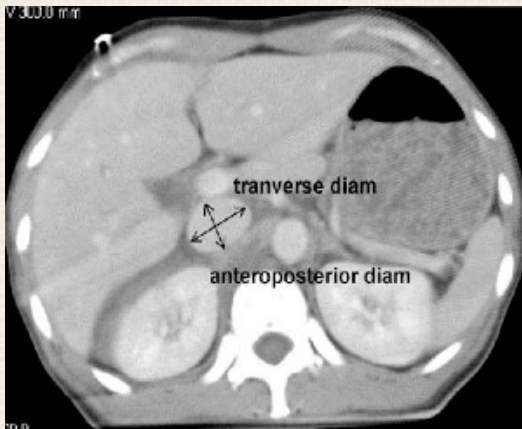


# EMERGENCY MEDICINE CASES



EPISODE 39: UPDATE IN TRAUMA  
LITERATURE WITH DR. MACKINNON &  
DR. BRZOZOWSKI

## Predict Sick Patients

### One Drop in BP:

- A single hypotensive episode in polytrauma, including prehospital BP, predicts a poor outcome (1)
- In patients with SBP < 105, 38% required immediate OR/angio vs. 10% with SBP between 105-110 (2)

### Predictive Lab Values:

- Base Deficit (BD), Lactate, Hematocrit

### Identifying the 'Crump

**Factor' Rule:** SBP < 105 and FAST positive and BD > -6... consider no CT & direct to OR (1)

- **ABG vs. VBG:** good correlation between the two in polytrauma although studies conflicting
- **Serial hematocrit:** may be useful but not as predictive as serial lactate
- **Serial lactate:** patients who clear lactate slowly may have occult hypoperfusion

### ETCO2:

- In penetrating trauma: higher ETCO2 via nasal cannula correlates with serum lactate and need for surgical intervention (3)

### Flat IVC: see image above

- Flat IVC on CT (defined as a infrarenal transverse to anteroposterior IVC ratio of 1.9) was an independent predictor of mortality (4)

## IV Bicarbonate in the Acidotic Polytrauma Patient increases mortality:

Retrospective study of 225 severely acidotic trauma patients, with a pH less than 7.10. Bicarbonate increased HCO<sub>3</sub><sup>-</sup> and PaCO<sub>2</sub>. PaCO<sub>2</sub> rise was associated with increased risk of mortality (5).

In the acidotic patient, fluid resuscitation, initiating massive transfusion protocols if necessary, and transfer to OR/angio continue to be the most important resuscitative measures.

## Video vs

## Direct Laryngoscopy in Trauma

- RCT (single centre, 623 adults) of video laryngoscopy compared to direct laryngoscopy showed (6):
  - No mortality difference
  - Severely head injured patient mortality: 30% with video vs. 14% with direct laryngoscopy
  - Intubation time (average): 56 sec with video vs. 40 sec with direct laryngoscopy
  - Desaturation below 80%: 50% with video vs. 23% with direct laryngoscopy

## Damage Control Resuscitation (DCR)

### DCR is 5 components:

- Avoiding hypothermia
- Permissive hypotension
- 1:1:1 RBC:FFP:PLT transfusion
- Coagulopathy correction
- Damage control surgery

### Evidence for Permissive Hypotension?:

Moderate evidence in *penetrating* trauma for a short period of time (i.e. during bridge to OR). No evidence for *blunt* trauma.

\*Avoid hypotension in head injured patients.

### 1:1:1 Transfusions:

PROMTT Study (8): decreased 6h mortality with increased ratio of plasma:RBC and RBC:platelets. In the first 6h, patients with ratios less than 1:2 were 3-4 times more likely to die than patients with ratios of 1:1 or higher.

Identifying patients who may require activation of massive transfusion protocol (9):

- Base deficit > 5 and
- INR >=1.5 and
- Hemoperitoneum

**Thromboelastometry (TEG/ROTEM)** may help guide hemostatic resuscitation

**Fluid Resuscitation** ATLS update: start with 1L crystalloid bolus instead of traditional 2L, to emphasize a switch to blood products early.

Greater than 1.5L crystalloid to 1 unit PRBC ratio has been shown to be related to an increased incidence of ARDS, abdominal compartment syndrome, multi-organ failure. No difference in mortality (7).

## Imaging Decisions

### C-Spine Imaging: What's a 'Distracting Injury'?

Distracting injury is trigger to imaging as per NEXUS criteria. Study from 2012 (10) showed that in patients with a GCS of 14-15 with a distracting injury, clinical exam picked up 85 of 86 C-Spine injuries.

### Chest Imaging Decisions

CT chest usually done if concern of thoracic spine or aortic injury

**SCRAP Rule** – Indications for chest CT in blunt trauma (11). Retrospective study of 434 patients with GSC >8, ISS score >12, all had CT at admission. Rule consists of: S(saturation) C(CXR) R(Resp Rate) A(Auscultation of chest) P(Palpation of chest). If O<sub>2</sub> sat normal (95% RA or 98% with supplemental O<sub>2</sub>), normal or unchanged CXR, RR =<25, Chest auscultation normal, Palpation of chest normal = 100% sensitivity and NPV for major thoracic injuries. Our experts believe this rule adds little to clinical judgement.

**Occult Hemothorax** – not seen on CXR, seen on CT. In a 2012 study of 81 patients with occult hemothorax followed clinically, 83% could be managed without chest tube (12).

### Pan-Scanning Trauma

Recent study (2013) showed that chest-abdo-pelvis CT in the initial evaluation of blunt trauma compared to clinical exam with FAST examination did not result in mortality difference, missed injuries or delay to diagnosis (13).

## Tranexamic Acid

**CRASH-2 Trial** (14): Reanalysis showed TXA within 1 hr had the most benefit, 1-3 hours some benefit, greater than 3 hours, increased mortality. Therefore, give TXA within the first 3 hours. Beneficial in all groups (massive vs. minor bleeds, OR vs no OR, etc.).

**MATTERs Trial** (15) – in trauma pts requiring RBC transfusion, overall mortality decreased in TXA group by 5%.

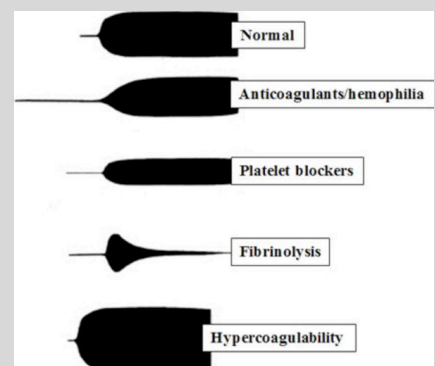
TXA Administration:

- 1g IV over 10 min

Then 1g IV over 8h

### Thromboelastography (TEG/ROTEM)

Measure of the visco-elastic properties of blood as it clots. Shows interaction of platelets with the coagulation cascade. Generates graphical and numerical output. Fast turnaround



Example of TEG Tracings

### Found Down Patients

Urban level I Trauma centre, 201 patients 'found down', includes intoxicated, psychiatric, homeless patients. 40% had injuries, 4.5% required urgent surgical intervention (16).

## Specific Injuries

### Blunt Aortic Injuries

CT Chest should be done if suspect aortic injury.

Suspicion of aortic injury based on mechanism of injury (i.e. high energy, including lateral impact pelvic fractures, anteroposterior deceleration, fall from height).

Our experts recommend that in low risk mechanism with low clinical suspicion can use CXR for screening. Normal CXR has a 98% NPV for blunt aortic injury.

Management: treat medically first, manage BP, coagulopathy, hypothermia. Surgical treatment once patient is stable, unless the patient is unstable from an aortic injury.

### TRAINS Score (TRAumatic Aortic INjury Score)

Predicting aortic injury in trauma:

- Widened mediastinum (4 pt)
- BP < 90 (2 pt)
- Long bone fracture (2 pt)
- Pulmonary contusion (1 pt)
- Left scapular fracture (1 pt)
- Hemothorax (1 pt)
- Pelvis fracture (1 pt)

Score  $\geq 4$  high risk

Not a very sensitive score

### Blunt Cardiac Injury

Includes myocardial contusion, free wall rupture, valvular injury and pericardial injury.

Suspect in any high mechanism blunt, crush or deceleration injury to the chest.

Start work-up with CXR, FAST & ECG

### Role of ECG, troponin and Echocardiogram:

- ECG: with normal ECG, risk of complication from myocardial contusion is low. Observe or discharge. Newer guidelines, consider troponin. Normal ECG with normal trop, observe and discharge.
- Troponin: no consensus on timing of troponin or what to do with a positive Trop; poor sensitivity. Consider Echocardiogram in stable patients with positive Trop.

### Sternal Fractures

Patients with **isolated** sternal fractures, a normal ECG & CXR and normal vital signs are at low risk for requiring intervention, and can be safely discharged (17)



## References:

**Click on reference for Abstract**

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