Trauma Bloodwork
Trauma Bloodwork in the Peds ED

Dr. Tim Lynch
Peds Talk Trauma
September 29, 2011
Objectives

- What are these tests?
- Why do we do these tests?
- How do we interpret these tests?
- Case Studies
- Summary
What are these tests?
## ED Paeds Trauma Care Set

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>INR/PTT</td>
<td>Total Bilirubin</td>
</tr>
<tr>
<td>Complete Blood Count and Differential</td>
<td>Total Amylase</td>
</tr>
<tr>
<td>Electrolytes</td>
<td>Aspartate Aminotransferase (AST)</td>
</tr>
<tr>
<td>Urea</td>
<td>Alkaline Phosphatase (ALP)</td>
</tr>
<tr>
<td>Creatinine</td>
<td>Creatine Kinase</td>
</tr>
<tr>
<td>Random Glucose</td>
<td>Plasma Troponin</td>
</tr>
<tr>
<td>Albumin</td>
<td>Serum Osmolality</td>
</tr>
<tr>
<td>Total Protein</td>
<td></td>
</tr>
</tbody>
</table>
### ED Paeds Trauma Care Set

<table>
<thead>
<tr>
<th>Condition</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>If the patient is over 10 years of age:</td>
<td>Serum Ethanol</td>
</tr>
<tr>
<td>If the patient is a female over 13 years:</td>
<td>Pregnancy Test</td>
</tr>
<tr>
<td>If you wish to order:</td>
<td>Blood Gas, Lactate</td>
</tr>
</tbody>
</table>
Why do we do these tests?
Complete Blood Count and Differential

- Hemoglobin
- Hematocrit
- Platelets
- Leukocytes
- Group and Reserve
INR/PTT

- INR – International Normalised Ratio
- PTT – Partial Thromboplastin Time
- Baseline
- Bleeding diathesis
Electrolytes

- Sodium
- Potassium
- Chloride
Renal Function Tests

- Urea
- Creatinine
Glucose

- Too low
- Too high
Liver Function Tests

- **Total Protein**
  - Albumin plus globulin

- **Albumin**
  - Main constituent of total protein

- **AST (aspartate aminotransferase)**
  - Not specific to liver – RBC, cardiac, skeletal muscle

- **ALP (alkaline phosphatase)**
  - Found in cells lining biliary ducts – bone and placenta
Liver Function Tests

- ALT (alanine aminotransferase)
  - L=Liver
Cardiac Enzymes

- Troponin
Muscle Enzymes

- Creatine kinase
  - Rhamdomyolysis
    - Beware stale trauma patient!!
Pancreatic Enzymes

- Amylase
- Lipase
Osmolality

- Too high
- Too Low
- Osmolal Gap
Toxins

- Ethanol
Options

- Blood gas
  - pH
  - pCO2
  - Bicarbonate
  - Base excess/deficit

- lactate
How do we interpret these tests?

- Specifics:
  - Liver Enzymes
  - Pancreatic Enzymes
  - Toxicologic Screening
To determine the criterion validity of the trauma panel at Children’s Hospital in Boston.

No routine laboratory test had excellent sensitivity, specificity, PPV, and NPV.
Elevated Liver Enzymes in Children with Blunt Abdominal Trauma
Hennes et al.
Pediatrics 1990 86(1):87-90

- 19 patients with AST > 450 and ALT > 250
- 17 with liver injury
Liver Function Tests in Children with Blunt Abdominal Traumas
Karam O. et al

- 16 patients with liver injury.
  - ten (63%) had AST < 450 and seven (44%) had ALT < 250.

- Two patients had grade 3 liver injury with
  - AST as low as 95 and 92 and ALT of 80 and 86
    - well below all cut-off values recommended in the literature!

- AST/ALT ratio >1
Pancreatic Enzymes: Biomarkers Of Pancreatic Injury

- Amylase
- Lipase
- Notoriously unreliable when used to help diagnose blunt or penetrating trauma to the pancreas
Serum amylase level on admission in the diagnosis of blunt injury to the pancreas: its significance and limitations


- Retrospective analysis of 73 patients with blunt injury to the pancreas
- Determination of the serum amylase level is not diagnostic within 3 hours or fewer after trauma
Amylase and lipase measurements in paediatric patients with traumatic pancreatic injuries
Matsuno W et al.

- 26 patients with traumatic pancreatic injuries
- Patients with initial amylase and lipase levels measured greater than 2 h post-injury were more consistently elevated
- Delayed amylase and lipase measurements may be helpful
Substance use in paediatric trauma: setting the stage for an injury prevention programme
Martin K, Charyk-Stewart T, Girotti M, Parry N
Inj Prev 2010;16:A85

- Review of the London Health Sciences Centre Trauma Database (1999–2009) was conducted to identify patients <18 years who suffered severe injury (ISS >11).

- 799 patients over 10 years:
  - Blood alcohol concentration testing was completed in 30%
    - 21% were positive.
  - Toxicology screens were done in 7% of patients
    - 44% were positive.
Substance use in paediatric trauma: setting the stage for an injury prevention programme
Martin K, Charyk-Stewart T, Girotti M, Parry N
Inj Prev 2010;16:A85

- The most common drugs ingested were:
  - alcohol, benzodiazepines, cannabinoids and opiates.

- Screening for substance use is sporadic

- A prospective study utilizing universal screening is needed
Clinical Vignettes
Case 1

- 15 year-old male snowmobile driver, helmeted and hit tree, complains of right-sided chest pain
  - Chest, right ribs, right elbow
  - Sti
Represented 10 hours later ...

- Gross hematuria and right-sided chest/abd/flank pain
ED Paeds Trauma Care Set

- Hb=161, Hct=.46, plt=178, LK=11.7 (N=9.9)
- ALT=487, AST=340, ALP=204, INR=1.2, PTT=44, Bili=11
- Amylase = 45, Lipase=11
- Glucose=5.3, Na=141, K=4.2, Cl=103, bicarb = 27, osmolality=296
- Urea = 7.3, creatinine = 96
- CK=899
- Troponin < 0.01
Case 1

- AST = 340 (> 400)
- ALT = 487 (>250)
- AST: ALT = 340/487 = 0.7 (>1)
- Normal pancreatic enzymes > 3 hours
- ck
Case 2

- 8 year-old female ATV driver, helmeted and impaled self with handlebars as thrown
  - Abdominal bruising and peritonitis
ED Paeds Trauma Care Set

- Hb=143, Hct=.41, plt=227, LK=17.6 (N=15.7)
- AST=35, ALP=285, INR=1.1, PTT=42 Bili=9.1
- Amylase = 36, Lipase=15
- Glucose=5.3, Na=137, K=4.1, Cl=101, bicarb = 22, osmolality=295
- Urea=4.7, creatinine=39
- CK=241
- Troponin < 0.01
Case 2

- Leukocytosis
- Normal pancreatic enzymes > 3 hours
Summary

- Clinical suspicion should guide management
- Tests: baseline tests versus serial
- ALT and lipase should be added
- Gas and lactate should be standard
- Universal toxicologic screening
Summary

- Thank you!
- Questions?
Contact

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Utility of amylase and lipase as predictors of grade of injury or outcomes in pediatric patients with pancreatic trauma

Herman R et al.
Journal of Pediatric Surgery 2011 46;5:923-926

- Can serum amylase and lipase serve as good predictors of grade of injury and outcomes in patients with pancreatic trauma?
Utility of amylase and lipase as predictors of grade of injury or outcomes in pediatric patients with pancreatic trauma

Herman R et al
Journal of Pediatric Surgery 2011 46;5:923-926

- Limited value for repetitive amylase and lipase levels in the management of pediatric trauma patients with pancreatic injury