Abdominal Trauma & FAST – case studies and clinical pearls

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Logan ED Sun am

- 3 staff called in sick
- All resuscitation bays full
- No Coffee available in hospital!!

8 yo F Triage at 1030

- Fell up the stairs yesterday, hitting chin, sleeping overnight
- Now headache, pain on urination and abdo pain, left shoulder pain and neck pain
- Tender abdo on palpation
- CRT 2 secs  HR 140  RR 25  temp 37.9
- 109/62  BSL 5.7
Challenges

- PEM in a mixed ED
- Skill Differentials
- Triage
- Location
- Personnel
- Difficulty in accessing specialist help – limited experience with pediatric trauma

Trauma vs Medical model

- Primary Survey and history - 1056
- Mechanism - ‘low fall’ at 0800, 24 hrs ago, up steps
- A - patent, in hard collar - tender midline
- B - nad but ? rib #
- C - ‘no instability’
Primary and Secondary Survey

- C - no ‘hidden blood loss’
- D - very difficult - GCS 15, alert, oriented - but in pain and distressed, petrified of ‘the needle’.
- E - pyrexial, very tender chest wall
- F - ‘adequate volume’
- G - bsl 5, abdo – guarding, ?needle phobia
- H - no petechiae - but ‘suspected splenic / liver injury’
The Art of Paediatric Trauma

- Behaviour vs physiology / anatomy
- Imaging limitations
- Analgesia
- ‘Control for clinical assessment’
- ‘Intubation to investigate’
- FAST – how do we achieve this
Imaging- 1110

- FAST positive for fluid in abdomen
- Surgeon notified - not available for another 2 hrs
- C spine film - bizarre findings
- Significant chest tenderness and normal CXR
- HB 120 INR 1.2, rest nad.

Retrieval to CT-1120

- ED consultant
- ED Reg
- ED JHO
- Senior nurse
Summary of Injuries - 1200

- Complex splenic laceration - transecting upper pole but vascular pedicle maintained
- Compensated shock - large hemoperitoneum
- Pneumomediastinum
- No cervical or bladder injury
- CRT 2 secs
- HR 140
- RR 25
- temp 37.9
- 109/62
- BSL 5.7
Approach to BAT

BAT issues for discussion

- What patterns of injury are seen in BAT in children (& how do they differ from adults?)
- What are the challenges in assessing children with BAT?
- What is the role of FAST? Should we order a CT & lab tests?
- What are the management principles of children with BAT?
Injury patterns in stable BAT

- **Solid visceral injury is predominant** – often occult presenting as compensated haemorrhagic shock
- Anatomical predisposition to injury cf adults
- External signs, absent bowel sounds, tenderness do not discriminate need for laparotomy/presence of injury
- Seatbelt sign: bowel, duodenum, pancreas, spine
- Handlebar injury: spleen, liver, pancreas

  *Exquisite ability to survive*

Occult Injury Common

- Always assume abdominal haemorrhage till proven otherwise
- Liver/ splenic laceration (?predisposing illness – EBV, lupus, lymphoprolif dis)
- NAI – all injury is abuse till proven otherwise – great potential for occult injury – parents often do not disclose extent of injury
Challenges in Paediatric BAT

- ‘Minor trauma’ presenting to the regional centre, often delayed, often ‘well’, usually seen by the most junior staff – *delayed diagnosis*

- Assessment of injured child difficult – age, concurrent injury, GCS, substance use

- Occult injury requires high index of suspicion

- Lack of evidence based guidelines re investigations and disposition

Overcoming challenges in paediatric BAT

- Optimise situation to improve assessment
  - Early intubation
  - vs sedation
  - vs good paediatric nursing care

- Knowledge of mechanism, physiology, anatomy

- Serial examination

- Judicious use of imaging and pathology, observation vs operation
FAST in paediatric BAT

- Quick / repeatable / noninvasive
- Bedside
- Simultaneous with resuscitation
- Improving technology
- No radiation
- Can assess various organ systems

Technique of eFAST

- Patient / Positioning
- Recording
- Probe
- Anatomy/ Areas of exam
- Depth/Focus/TGC
- Physics and artifacts
Technique of eFAST

Subxiphoid View

Technique of eFAST

Morrison’s Pouch
Technique of eFAST

**Splenorenal Recess Views**

A. Image showing a patient's abdomen.
B. Ultrasound image of the spleen and kidney.
C. Ultrasound showing the spleen, kidney, and hemotorax.
D. Ultrasound image of the hemotorax.

**Suprapubic Views**

A. Image showing a patient's abdomen.
B. Ultrasound showing the pubic symphysis.
C. Ultrasound images of the bladder in sagittal and transverse views.
D. Ultrasound showing fluid in the bowel and free fluid.
E. Ultrasound showing fluid in the bowel and free fluid.
F. Ultrasound showing the bladder in transverse view.
Using FAST in paeds

![FAST Image]

Use of FAST in paed BAT

- Triage tool: determine further Ix/Mx:
  - OT if unstable with pos FAST
  - CT if stable with pos FAST (not pelvic FF)
  - Potential observation without CT (with serial exam, clinical gestalt) with neg FAST

- Identify non-abdo injuries eg pneumothorax
- Tips – cardiac probe in small children
CT in paediatric BAT

- “Gold standard” to define intraabdominal injury
- Used to investigate stable patient with
  - significant blood loss
  - postive FAST
  - ongoing pain, fever
  - abdominal tenderness
  - mechanism of handlebar-type injury or suspected NAI
  - otherwise difficult exam +/- mod-high pretest-prob IAI
  - gross haematuria

CT in paediatric BAT

- Low sensitivity (<30%) in hollow visceral injury
  - Rapid accel/decel mechanism – lap belt, NAI
  - High index suspicion with fever, ongoing pain
- IV contrast standard, oral contrast controversial –
  - less useful for distal bowel injuries, more useful for duodenal and pancreatic injuries
  - Similar detection rate for perforation with and without oral contrast.
- Radiation concerns – does your pt need a CT? Implement ALARA principle
Pathology tests in BAT

- **FBC:** only for comparison of serial results if injured
- **Lipase/amylase:**
  - sens ~ 80%, specificity ~75%,
  - not useful to screen for injury.
  - may be indicated in high probability of pancreatic injury
- **AST/ALT:** multiple studies, different cut-offs, evidence unclear – not possible to give a “safe” level to rule out liver injury ie as a screen
- **Urine microscopy:** evidence unclear – CT if gross haematuria

PECARN: low risk IAI

- Multicentre, prospective derivation study, n= 12,044, IAI in 6%
- NPV 99.9%, sens 97%, neg LR 0.07
- 7 hx/ex features to identify very low risk IAI
  - GCS ≥ 14
  - No abdominal pain
  - No abdominal tenderness
  - No vomiting
  - No evidence abdominal wall trauma/seat belt sign
  - No thoracic wall trauma
  - No decreased breath sounds
- **Failure to meet above ≠ need for CT**

Stable BAT - Management

- **Non-operative** approach 90-95% success
- Significant reduction in post-splenectomy sepsis syndrome
- Variable compliance with guidelines esp in non-paediatric trauma centres
- Low volume resuscitation vs traditional 40ml/kg NS followed by blood – research pending

Questions?
Summary - Trauma

- Develop systems for paediatric trauma
- Mechanism - Physiology - Anatomy
- Occult injury and NAI
- FAST in unstable vs ‘stable’
- CT – judicious use and ALARA
- Challenges in paediatrics – behaviour & compensation

References