Management of abdominal trauma in children

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“If a disease was killing our children in the proportion that injuries are, people would be outraged and demand that this killer be stopped.”

C. Everett Koop, MD
US Surgeon General
1982-1989

Pediatric Trauma

OBJECTIVES
• Understand injury patterns in children
• Describe management options for abdominal trauma

TAKE HOME MESSAGE
• Injury is the leading cause of death in children 0-18
• Motor vehicle collisions is the leading cause of injury & death
• Solid organ injuries are common but usually do not need intervention.
• Abdominal wall seatbelt signs = bad

The Statistics – The Country

Annual United States pediatric mortality [2010]

– Heart disease 599
– Birth defects 952
– Cancer 1,700
– Trauma 9,523

The Statistics – The Country
The Statistics – Bexar County

2012

- Total deaths ages 0-14 = 67
  - Total traumatic deaths = 28 (~42%)
    - Motor vehicle crashes = 18
    - Intentional/Unintentional deaths = 10

The Statistics - UHS

- Total Trauma patients = 4303
- Pediatric Trauma patients [0-16] = 1085 (25%)
  - Top 5 pediatric injuries
    - Motor vehicle related crashes
    - Burn
    - Falls
    - Sports injuries
    - Violence

How are kids different?

- Fractures are rare, abdominal injuries are common
- Non-accidental trauma = common [age 1-4]
- Anatomy and Physiology
  - Age related injuries
    - Infants/children
    - Adolescents

BLUNT ABDOMINAL TRAUMA [BAT]

- Solid organ injuries are most common
  - Liver, Spleen, Kidneys

- Bowel injuries are difficult to diagnose
  - Tenderness on exam
  - Abdominal wall seat belt sign
  - Associated injuries [femur fractures, depressed GCS, ejection from vehicle, fall >10 ft, pedestrian struck]

- Past medical history
  - Conditions that affect a child’s development
  - Bleeding disorders
    - hemophilia
  - Children on anticoagulation
    - Congenital heart defects
  - Epstein-Barr viral infections
BLUNT ABDOMINAL TRAUMA [BAT]

- Physical Exam which increases the risk of abdominal injury
  - Abdominal tenderness
  - Abdominal wall Ecchymosis
  - Abdominal wall Abrasions

- Lab tests
  - CBC: Initial hct <30 increases risk of IAI by 2.6 folds
  - LFTs
    - AST/ALT are markers for liver injury
  - UA: >5 rbcs + 1 additional clinical sign
    - In 1095 patients <16 years old
      - Low systolic blood pressure
      - Abdominal tenderness
      - Femur fracture
      - Elevated LFTs


- Liver and Spleen
  - Most commonly injured solid organs
BLUNT ABDOMINAL TRAUMA [BAT]

- Liver injury
  - Pedestrian struck
  - Motor vehicle collision
  - Falls or discrete blows to abdomen
  - Bicycle injuries
  - Non-accidental trauma
- Liver laceration
  - 80-90% of patients are managed non-operatively

BLUNT ABDOMINAL TRAUMA [BAT]

- Spleen
  - High index of suspicion in children with
    - Abdominal tenderness
    - Left sided rib fractures
    - Abdominal wall contusions
  - Splenic preservation is the preferred modality of management
    - Massive disruption and hemodynamic instability
    - 90-95% successful
  - EBV virus: splenomegaly
    - 0.1 to 0.2% splenic rupture (surgery)

BLUNT ABDOMINAL TRAUMA [BAT]

Table 7. Grades Of Splenic Injuries

<table>
<thead>
<tr>
<th>Grade</th>
<th>Extent of Splenic Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hematoma subcapsular, non-expanding, &lt; 15% of surface area, Laceration or tear, non-blending, &lt; 1 cm of parenchymal depth</td>
</tr>
<tr>
<td>2</td>
<td>Hematoma subcapsular, non-expanding, 15-100% of surface area, intraparenchymal, non-expanding, &lt; 2 cm in diameter, Laceration or tear, active bleeding, 1-5 cm of parenchymal depth that does not involve a trabecular vessel</td>
</tr>
<tr>
<td>3</td>
<td>Hematoma subcapsular, &gt; 50% of surface area or expanding, ruptured subcapsular hematomas with active bleeding, intraparenchymal hematomas, &gt; 2 cm or expanding, Laceration or tear, &gt; 2 cm of parenchymal depth or involving trabecular vessels</td>
</tr>
<tr>
<td>4</td>
<td>Hemorrhage ruptured intraparenchymal hematomas and active bleeding, Laceration, laceration involving segmental or hilar vessel (excluding major vessel occlusion of &lt; 25% of spleen)</td>
</tr>
<tr>
<td>5</td>
<td>Hemorrhage completely shattered spleen, Laceration, hilar vascular injury that devascularizes spleen</td>
</tr>
</tbody>
</table>

BLUNT ABDOMINAL TRAUMA [BAT]

- Return to activity
- Contact sports
  - Additional restrictions [4-8 weeks]
  - Consider Grade solid organ of injury

BLUNT ABDOMINAL TRAUMA [BAT]

**Intestinal trauma**
- 2-5% of children who present to trauma centers have intestinal injuries
  - Perforation
  - Hematomas
  - Mesenteric tears
- Patients with seat-belt sign, abrasions, ecchymosis
  - Surgical consultation
  - Observation for a minimum of 24 hours

**Pancreatic trauma**
- Fall over handlebar of bicycle
- Abdominal seatbelt sign
- Clinical exam and amylase/lipase values

**Renal injuries**
- Most commonly caused by motor vehicle collision
- Hematuria (microscopic) indicates work-up
- Most heal without intervention

The Seatbelt Syndrome

- Field or triage signs/symptoms:
  - Seat belt mark across the abdomen
  - Abdominal pain
  - Abnormal vital signs
The Seatbelt Syndrome

NICK – 6 year old s/p MVC

Injuries:
- Small bowel
- Right colon
- Abdominal wall
- Aorta
- Compartment syndrome - lower extremities
- Lumbar spine

Initial hospital stay: 74 days
Number of initial surgeries: 9

The Seatbelt Syndrome

LEANa – 6 year old s/p MVC

Injuries:
- Small bowel
- Sigmoid colon
- Common iliac artery
- Abdominal wall
- Lumbar spine

Initial hospital stay: 64 days
Number of initial surgeries: 9

The Facts About Pediatric Trauma

- Intra-abdominal injuries
- Vertebral fracture + spinal cord injuries
- **KEY POINT:**
  - LOOK FOR THE ASSOCIATED INJURIES

Role of injury prevention

SAFEKIDS Worldwide: Buckle up every ride, every time Sept 2013

https://www.txdps.state.tx.us/director_staff/public_information/childPassSafetyFAQs.pdf

Texas = 8 years old
Safe Kids = 4 feet 9 inches
TAKE HOME MESSAGE

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