Pediatric Trauma Life Support
for Prehospital Care Providers

Thoracic-Abdominal Trauma

3rd Edition

Thoracic-Abdominal

• Objectives
  – Describe major signs and symptoms, pathophysiology, and initial management of pediatric thoracic trauma
  – Compare the clinical presentation of massive hemothorax and tension pneumothorax
  – Identify indications for emergency needle decompression of the chest in children

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• Objectives
  – Describe how undetected abdominal trauma can lead to shock and death
  – Discuss why abdominal trauma in children is usually associated with other injuries
  – Describe the assessment and management of a child with abdominal trauma
Case Study Scenario
- A 2-year-old child was backed over by the family van in the driveway.
- The driver (the child's father) immediately stopped and found child under car.

You arrive on the scene
- How would you approach this patient?
- What are the concerns about the mechanism of injury?
- Is this patient in shock?
- Is this a priority patient?
- What interventions should be performed?

Pediatric vs. Adult Thoracic Trauma
- Energy is the same
- “Target” is different
  - Much more compact
- Energy absorption is different
- Blood loss triggers shock more easily in children.
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- **Pediatric Anatomy and Pathophysiology**
  - Ribs smaller, incompletely calcified
  - Liver, spleen often project below ribs
  - Thinner chest and abdominal walls
  - Abdominal muscles less developed
  - Mediastinum more mobile

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- **Prehospital priorities**
  - Scene Size-Up
  - Airway with LOC and spinal motion restriction
  - Anticipate and recognize respiratory distress
  - Anticipate and recognize early signs of shock
  - Proper spinal motion restriction and packaging
  - Rapid transport
  - Ongoing Exam

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- **Scene Size-Up**
  - Note mechanism of injury, restraints
  - Subtle scene clues

- **Initial Assessment**
  - Airway with LOC and spinal control
    - *Modified jaw thrust, oral airway*
    - *Maintain open airway*
    - *BVM with 100% oxygen, saturation above 95%*
      - Intubate only if you cannot oxygenate or maintain airway
    - *Capnography if available*

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• Recognize respiratory distress
  – Tachypnea – rate is age-specific
  – Grunting, retractions, paradoxical movement
  – Close the open pneumothorax
  – Decompress tension pneumothorax
  – Stabilize mobile chest wall segments

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• Recognize early signs of shock
  – Tachycardia – rate is age-specific
  – Compare central and peripheral pulses
  – Skin temperature, color, capillary refill

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• Thoracic Trauma “Deadly Dozen”
  – Life-threatening injuries
  – 6 detected during ITLS Primary Survey:
    • Airway obstruction
    • Open pneumothorax
    • Tension pneumothorax
    • Massive hemothorax
    • Flail chest and rib fracture
    • Cardiac tamponade
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• Thoracic Trauma “Deadly Dozen”
  – 6 that may be detected during ITLS Secondary Survey:
    • Traumatic aortic rupture
    • Tracheal or bronchial tree disruption
    • Myocardial contusion
    • Diaphragmatic tear
    • Esophageal injury
    • Pulmonary contusion

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• Open pneumothorax
  – Caused by penetrating injury
  – Sucking chest noise
  – Respiratory distress

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• Tension Pneumothorax
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• **Tension Pneumothorax**
  – Caused by chest injury
  – Increasing pressure in the pleural space impairs blood return to the heart, decreasing stroke volume and cardiac output
  – Indicators
    • Airway compromise
    • Severe respiratory distress
    • Signs of circulatory collapse
      – Hypotension, cyanosis, traumatic cardiopulmonary arrest
    • Shock
    • Subtle changes
      – JVD

• **Needle Decompression**
  – Over-the-needle catheter inserted into midclavicular line in second or third intercostal space
  – “Walk” needle upward on the rib until it slides off upper edge and penetrates into pleural space

• **Rib fracture and flail chest**
  – Caused by blunt injury
  – Respiratory distress
  – Paradoxical chest wall movement
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- Paradoxical motion

  ![Paradoxical motion diagram](image)

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- Hemothorax and Cardiac Tamponade
  - No specific field care
  - Treat for shock
    - Maintain airway with spinal control
    - Fluid resuscitation

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- Abdominal injuries
  - Splenic injury
  - Liver injury
  - Restraint-related injury
  - Mechanisms may vary

  ![Abdominal injuries diagram](image)
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- **Abdominal injuries**
  - Splenic injury
    - Most frequently injured organ
    - Usually blunt injury
    - Tenderness, rigidity, pain
  - Liver injury
    - Second most frequently injured organ
    - Most common fatal abdominal injury
      - Second only to head injury as most common cause of traumatic death in children
    - Pain, tenderness, rigidity, shock

- **Restraint injury**
  - Note position of restraints during extrication
  - May see external bruising
  - Usually from improperly worn restraint
  - Pain, tenderness, rigidity

- **ITLS Secondary Survey**
  - Rapid transport immediately
    - Almost all are load-and-go
    - Most management at hospital
  - Assess for 2nd half of “Deadly Dozen”
  - En route to hospital:
    - Initiate IV or IO
    - Continual reassessment
    - Changes can be subtle
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• Case Study Continued
  – Initial Assessment:
    • Poor general impression – child unresponsive
    • Rapid, shallow, labored respirations at fast rate
    • Carotid pulse present, faintly palpable at fast rate
    • No radial pulses palpable
  – Load-and-go priority patient
  – Spinal motion restriction instituted
  – Airway opened
  – BVM ventilation started with high-flow oxygen

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• Case Study Continued
  – Rapid Trauma Survey:
    • Trachea midline with neck veins flat
    • Tire marks extending to sternum on left chest
    • Crepitus in left upper chest
    • No subcutaneous emphysema present upon palpation
    • Breath sounds very diminished in left lung
    • Insufficient response to BVM with high-flow, high-concentration oxygen
    • Pulse oximetry readings persistently <90%

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• Case Study Decisions
  – Child intubated in field
  – Placed on long board and transported to ambulance
  – 2 large-bore IVs initiated en route
  – 2 fluid boluses of 20 mL/kg administered for tachycardia, poor perfusion
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• Case Study Wrap-Up
  – ITLS Ongoing Exam:
    • Patent and secured airway
    • Pulse oximetry reading of 95%
    • Heart rate decreases to 130 bpm with volume resuscitations
    • Strong carotid, radial pulses upon arrival to hospital
  – Child admitted to hospital with hemothorax, pulmonary contusion
  – Discharged home 21 days later

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• Points to Remember
  – Assessment, early identification are key in management of injuries and successful interventions
  – Chest and abdominal injuries usually part of multisystem trauma
  – Fewer and minimal external injuries should not prevent you from identifying underlying injuries
  – ABCs remain paramount to successful outcome

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• Points to Remember
  – Pediatric abdominal injury is subtle, so maintain a high degree of suspicion
  – All patients exhibiting signs of shock need rapid package and transport; perform procedures en route to hospital
  – Do not overlook other injuries; abdominal injuries are often associated with other injuries