Pediatric Chest Trauma

Catherine J Goodhue, MN, CPNP
Division of Pediatric Surgery/Trauma Program

Disclosures

• No Disclosures

Learning Objectives

After attending this lecture, the participant will be able to:
• Discuss common mechanisms of injury in pediatric thoracic trauma and likely subsequent injuries
• Review common traumatic injuries and diagnosis of thoracic trauma
• Describe interventions and treatment of thoracic trauma

Case Study #1 - PJ

• 11 year old male MVC crash
  – Front seat passenger
• ??LOC at scene/+death on scene
• Vitals
  – HR 116 beats/min
  – RR 24 breaths/min
  – BP 110/70
• 3 minute ETA

WHAT IS THE INCIDENCE OF PEDIATRIC CHEST TRAUMA?

a. 5%
b. 10%
c. 15%
d. 20%
WHAT PERCENTAGE OF PEDIATRIC CHEST TRAUMA IS BLUNT?

a. 40-50%

b. 51-60%

c. 61-70%

d. 71-80%

e. 81-90%

Mechanisms - Blunt

• Motor vehicle crashes

• Auto vs pedestrian

• ATV accidents

• Falls

• Sports injuries

What’s in the Chest?

• Bones
  – Rib fractures
  – Spine fractures

• Things that Bleed
  – Heart
  – Major vessels
  – Medium/small vessel

• Things that Leak
  – Major airways
  – Esophagus
  – Minor airways

• Diaphragm and Below
  – Liver/spleen
  – Hollow viscera

Pediatric Chest Anatomy/Physiology

• More compliant chest wall

• Less muscle mass

• Mobile mediastinum

• Hypoxia develops faster

• Babies obligate nose breathers

• Kids abdominal breathers

WHAT RADIOLOGIC STUDY(IES) WOULD YOU ORDER TO RULE OUT CHEST TRAUMA?

a. No radiological studies are necessary

b. Chest CT scan

c. Chest x-ray

d. Spiral chest CT scan

e. Normal chest x-ray

WHAT IS YOUR DIAGNOSIS?

a. Normal chest x-ray

b. Pulmonary contusion

c. Hemothorax

d. Pneumothorax

e. Rib fractures
### Pneumothorax
- Physical findings may include:
  - Tachycardia
  - Hypoxia
  - Diminished breath sounds
  - Crepitus
  - Hyperresonance

### Tension Pneumothorax
- Kids at greater risk
- Beck’s triad
  - Hypotension
  - Distended neck veins
  - Distant heart sounds

### Chest Tube Maintenance
- Daily chest x-ray
- Do not milk
- Removal at bedside
- No flying or scuba for at least 2 weeks

### Other Diagnostic Studies
- Labs
- Type and screen/cross
- Imaging studies
  - CXR
  - FAST?
- EKG?
- Echocardiogram
- Bronchoscopy

### Secondary Survey
- Thorough head to toe physical exam
  - Don’t forget the back
  - Inspect
  - Palpate
  - Percuss
  - Auscultate

### Disposition Case Study #1 PJ
- Admitted
- Close monitoring
- Tertiary survey
- Trauma f/u clinic
Case Study #2 - CJ
• 14 year old male ATV crash
• Vitals
  – HR 112 beats/min
  – RR 24 breaths/min
  – BP 120/70
• 5 minute ETA

Secondary Survey - Case Study #2 - CJ
• 14 year old male ATV crash
• Physical findings
  – Left suprachondylar fracture
  – Road rash on hands and face

WHAT IS YOUR DIAGNOSIS?
a. Rib fractures
b. Normal chest x-ray
c. Pulmonary contusion
d. Cardiac contusion

Pulmonary Contusions
• Pathophysiology
  – Alveolar-capillary wall damage
• Treatment
  – Avoid overhydration
  – Monitoring
  – Adequate gas exchange
  – Good PULMONARY TOILET
  – Pain control

Disposition Case Study #2 - CJ
• Discharged home after 4 days
• Long arm cast
• Ortho f/u

Case Study #3 - JT
• 5 year old female ATV crash
• Vitals
  – HR 124 beats/min
  – RR 32 breaths/min
  – BP 104/64
• 3 minute ETA
Secondary Survey #3 - JT

- 5 year old female ATV crash
- Physical exam
  - Right side facial edema
  - Right wrist deformity
  - Right rib pain/erythema
  - RUQ abdominal pain
  - Abrasion RUQ
  - Pulse now 140 beats/minute

Next Step #3 - JT

WHAT RADIOLOGIC STUDY IS MOST APPROPRIATE?

- a. Chest CT scan
- b. Abdominal CT
- c. Spiral chest CT scan
- d. No further radiologic tests

Abdominal CT findings

- Grade I liver laceration
- Rib fracture

Rib fractures in pediatrics

- Significant amount of force
- Look for underlying organ damage
- 1st rib fractures in kids
- Mortality rate

Hospital Course #3 - JT

- Close monitoring
  - Pain control
  - Pulmonary toilet
- Casting right wrist
- CT face – negative
- Discharged home

Case Study #4 - MZ

- 15 year old male
- Healthy with no health issues
WHAT IS YOUR INITIAL RESPONSE?
- Run to the teen and assess CAB
- Let the coach check him out
- Let his parent take him to the hospital

WHAT IS YOUR INITIAL DIAGNOSIS?
- Heat stroke
- Commotio cordis
- Prolonged QT syndrome
- Cardiac tamponade

WHAT IS YOUR NEXT STEP AFTER STARTING CPR?
- Asking parents to take him to hospital
- Telling someone to get the AED
- You’ve done all you can

Disposition #4 - MZ
- Shock x 2
- Paramedics arrived
- Hospitalized

Case Study #5 - MC
- 3 month old female presents with wheezing
- Vitals
  - HR 128 beats/min
  - RR 36 breaths/min
  - BP 124/70
- Normal birth history

WHAT DO YOU DIAGNOSE ON THE CHEST X-RAY?
- Cardiomegaly
- Infiltrate
- Rib fractures
- No findings
WHAT IS YOUR NEXT STEP?
- Do nothing, the chest x-ray was normal
- Call child’s pediatrician for more history
- Call local police department
- Call Social Work

WHAT OTHER TESTS/CONSULTS, IF ANY, WOULD YOU OBTAIN?
- None
- Skeletal survey and Ophthalmology consult; AST/ALT
- Have family follow up with Pediatrician

Results of Ophtho consult and Skeletal Survey

Disposition #5 - MC
- Baby hospitalized
- Eventually discharged to foster care

Mechanisms - Penetrating
- GSW
- Stabbing
- Impalement

Penetrating Chest Trauma
- THE BOX – “high-risk” for cardiac injury
Case Study #6 - AB

- 3 year old female
- Shot by sibling accidentally with BB gun
- Vital signs
  - Heart rate 144 beats/minute
  - Respiration 32/minute
  - BP 108/62
- ETA 2 minutes

What’s in the Chest?

- Bones
  - Rib fractures
  - Spine fractures
- Things that Bleed
  - Heart
  - Major vessels
  - Medium/small vessels
- Things that Leak
  - Major airways
  - Esophagus
  - Minor airways
- Diaphragm and Below
  - Liver/spleen
  - Hollow viscer

WHAT RADIOLOGIC STUDY(IES) WOULD YOU ORDER TO RULE OUT CHEST TRAUMA?

a. No radiological studies are necessary
b. Chest CT scan
c. Chest x-ray
d. Spiral chest CT scan

What is your next step?

a. Take to OR for removal
b. Admit for observation
c. Discharge home from ED

Disposition #6 - AB

- Admitted for 24 hour observation
- Injury prevention consult
- Discharged home
- Trauma Clinic f/u

Case Study #7 - ZZ

- 15 year old male
- Drive by shooting
- Vital signs
  - Pulse 110 beats/minute
  - Respiration 18/minute
  - BP 110/70
- 1 minute ETA
What’s in the Chest?

- Bones
  - Rib fractures
  - Spine fractures
- Things that Bleed
  - Heart
  - Major vessels
  - Medium/small vessels
- Things that Leak
  - Major airways
  - Esophagus
  - Minor airways
- Diaphragm and Below
  - Liver/spleen
  - Hollow viscera

WHAT IS YOUR DIAGNOSIS?
- a. Pneumothorax
- b. Cardiomegaly
- c. Hemothorax
- d. Normal chest x-ray

WHAT IS YOUR NEXT STEP?
- a. Get a chest CT scan
- b. Insert chest tube
- c. Nothing as chest x-ray normal

Chest Tubes – To operate or not?
- >20 cc/kg blood from first tube
- Inability to expand lung with chest tube
- Persistent air leak after several days

Disposition #7 - ZZ
- Admitted under alias
- Resolution of hemothorax
- Discharged home

ED Thoracotomy
Cardiac tamponade

- Beck’s triad
  - Hypotension
  - JVD
  - Muffled heart sounds
- Pulsus paradoxus
- OR IMMEDIATELY

References