Chest Trauma

William Schecter, MD
Rib Fractures

- Control Pain
  - Analgesics
    - Opiates
    - NSAIDS
  - Local rib blocks
  - Thoracic Epidural

- Admit if patient elderly, > 3 rib fractures, suspicion of other injury

- Pulmonary toilet
Pneumothorax

Tension Pneumothorax

http://kuriakon00.tripod.com/tension.html

http://info.med.yale.edu/intmed/cardio/imaging/cases/pneumothorax_tension/
Needle Decompression

http://nursing.umaryland.edu/students/~jkoehl/scenario/needle.htm
Hemothorax


http://nursing.umaryland.edu/students/~jkohl/scenario/needle.htm
Chest Tube Placement

- Anterior axillary line, posterior to pectoralis major muscle
- 5th intercostal space (opposite the nipple)
Open Pneumothorax

- Open Penetrating Wound
- Lung Laceration
- Inability to ventilate due to open chest cavity

http://www.trauma.org/imagebank/imagebank.html
Sucking Chest Wound - First Aid Treatment

http://www.vnh.org/FirstAidAnatomy/ChestWound.html
Sucking Chest Wound - Definitive Treatment

- Intubation
- Mechanical Ventilation
- Chest Exploration

http://www.trauma.org/imagebank/imagebank.html
Flail Chest

- Fractures of two or more ribs in two or more places
- Unstable segment of chest wall
- Paradoxical motion of chest wall

http://www.trauma.org/imagebank/imagebank.html
Obsolete Treatment

http://www.trauma.org/imagebank/imagebank.html
Unstable Chest Wall Treated with “Internal Pneumatic Stabilization”

http://www.trauma.org/imagebank/imagebank.html
Same patient after stabilization of ribs

http://www-trauma.org/imagebank/imagebank.html
The Main Problem is usually underlying Pulmonary Contusion NOT mechanical chest wall instability
Principles of Flail Chest Treatment

• A,B,C
• Chest Wall Analgesia
  – Thoracic Epidural
  – Rib Blocks
• Mask CPAP
• Intubation and Mechanical Ventilation
• VERY RARELY – Internal Fixation
Pulmonary Contusion

- A bruise to the lung
- Airspace opacification
- No air bronchogram

http://medweb.bham.ac.uk/wmaet/presentations/Pulmonary%20Contusion.ppt
Components of Pulmonary Contusion

http://www.cvmbs.colostate.edu/clinsci/wing/trauma/pulmcont.htm
Clinically

- Dyspnoea
- Tachypnoea
- Tachycardia
- Hypoxaemia/
  Hypercarbia
- Hypotension
- Chest wall bruising
- 50% haemoptysis
- Wheeze or creps or absent BS

http://medweb.bham.ac.uk/wmaet/presentations/Pulmonary%20Contusion.ppt
Treatment of Pulmonary Contusion

- ABC
- Oxygen
- Analgesia
  - Parenteral
  - Chest wall
    - Rib blocks
    - Thoracic epidural
- Mask CPAP/BIPAP
- Intubation and Mechanical Ventilation
- Fluid Restriction
Indications for Endotracheal Intubation

- Hypoventilation
- Hypoxia
- Pulmonary Toilet
- Airway Protection
- “Semi-stable” Trauma Victim requiring multiple radiologic procedures (relative indication)
- “Prophylactic Intubation” – eg. A big burn
Pulmonary Blast Injury

- 74 yo woman injured in a bus bombing Jan. 29, 2004

- Admitted with rt rib fxs, pulmonary contusion, hemothorax and amputations rt and lt 2\textsuperscript{nd} digits.

- Required 10 days of mechanical ventilation
Pulmonary Blast Injury

- 14 yo boy injured in bus bombing Jan 29, 2004
- Admitted with profound hypoxia, acidosis and hypercarbia
- Intubation/mechanical ventilation
Pulmonary Blast Injury

- HD 3 Respiratory Status improved but sudden deterioration in abdominal findings and right lateral decubitus suggestive of free air
- Exploratory laparotomy: negative
Pulmonary Blast Injury

- Left hemiparesis
- Hyperagitation
- Question air embolus +/- blast injury to brain
- Head CT negative
- Outcome: extubated, disposition: rehab center
Pulmonary Blast Injury at SZMC January 29, 2004, Bus Bombing

- 23 patients evaluated
- 11 patients admitted
- 10/11 admissions had radiographic evidence of pulmonary blast injury
- 4/10 patients with blast injury patients required intubation and mechanical ventilation
- Deaths: 0
Case Presentation

- 17 year old girl struck by car
- Presents to ER hemodynamically stable, awake and alert with RR = 22 with CXR similar to the one on the right
- Pneumomediastinum is present

http://www.amershamhealth.com/medcyclopaedia/Volume%20V%201/TRAUMATIC%20RUPTURE%20TRACHEOBRONCHIAL%20TREE.asp#
Chronic Tamponade

http://www.emedicine.com/med/topic283.htm
Cardiac Tamponade

http://www.trauma.org/imagebank/imagebank.html
Beck’s Triad

- Hypotension
- Jugular Venous Distension
- Muffled Heart Sounds
Additional Signs of Cardiac Tamponade

- Pulsus Paradoxicus
- Kussmaul’s Sign: Elevated Jugular Venous Pressure on Inspiration
- Water bottle heart on chest x-ray
Case Presentation

- Patient with stab wound to the chest in the box
- BP on admission 70 systolic
- BP rises to 90 systolic with fluid
- FAST exam: no blood in abdomen. Examiner thinks heart is ok
Blunt Cardiac Injury

http://www.vh.org/adult/provider/surgery/bluntcardiacinjury/
Blunt Cardiac Injury

• Spectrum of Disease ranging from “concussion” manifested by arrhythmias to cardiac rupture

• Cardiac Contusion a problematic term
  – EKG evidence
  – Ultrasound evidence
  – Technician Scan--NO
Cardiac Contusion

- Patients with a normal EKG in the ER do not need ICU admission to R/O a diagnosis of myocardial contusion (They may need ICU admission for other reasons)
- Patients who have an abnormal EKG in the ER should be admitted to a monitored bed
Patient at Risk for BCI

Severe mechanism
Significant concomitant injury (sternal fracture)
History of cardiac disease
Age >55

NO  YES

ECG

Normal  Abnormal

Observe 24h Serial ECG
Serial troponin I

Discharge from ED

Normal serial ECGs
Normal troponin
Clinically normal

Discharge if no other reason for admission or observation

ECG changes*
Elevated troponin
Hemodynamically labile

Admission
Consider diagnostic echocardiography

*ECG Changes Warranting Admission
1. Heart block
2. Ischemia / injury current
3. Frequent ectopy

http://www.vh.org/adult/provider/surgery/bluntcardiacinjury/withoutrupture/management.html
Thoracic Aortic Injury
Spectrum of Injury

- Intimal Tear
- Tear of Intima and Media
- Free Rupture

Ruptured Thoracic Aorta

- 90% of patients dead at the scene
- 50% of the patients who arrive at the hospital are dead within 24 hours without proper diagnosis and Rx.
Radiologic Signs Suggesting Ruptured Thoracic Aorta

- Widened Mediastinum
- Blurring of the Aorta Knob
- Extrapleural cap
- Depression of left mainstem bronchus
- Ng tube shifted to the right
- 1st and 2nd rib fractures
- Fractured sternum/scapula
Diagnosis and Rx of Ruptured Thoracic Aorta

- High Index of Suspicion
  - Mechanism of Injury
  - Associated Radiologic Findings
- Arterial Line
- Beta Blockade
- Additional blood pressure control
Methods of Diagnosis

Arteriogram
http://www.trauma.org/imagebank/imagebank.html

Helical CT

TEE

http://radiology.rsnajnls.org/cgi/content/full/227/2/434
Methods of Treatment

• Observation with blood pressure and wall tension control

• Repair
  – With or without graft
  – With or without cardiopulmonary bypass

• Stent placement
Ruptured Left Hemidiaphragm

Ruptured Diaphragm

http://www.trauma.org/imagebank/imagebank.html
Transmediastinal Penetrating Trauma

- Unstable – OR
- Stable—CT
- R/O injury to
  - Aorta
  - Esophagus
  - Heart
  - Tracheobronchial tree
  - Lung
  - Great Vessels
Summary

• ABCDE

• Diagnoses to make in the Primary Survey
  – Simple/Tension Pneumothorax
  – Open Pneumothorax
  – Hemothorax
  – Flail Chest
  – Cardiac Tamponade

• Stage of Resuscitation
  – Pulmonary contusion
  – Ruptured Diaphragm
  – Ruptured bronchus
Summary

• Diagnoses to make in the Secondary Survey
  – Blunt Cardiac Injury
  – Blunt Injury to the Aorta
  – Esophageal Injury (rare)