

ATLS

ADVANCED TRAUMA LIFE SUPPORT

AMERICAN COLLEGE OF SURGEONS

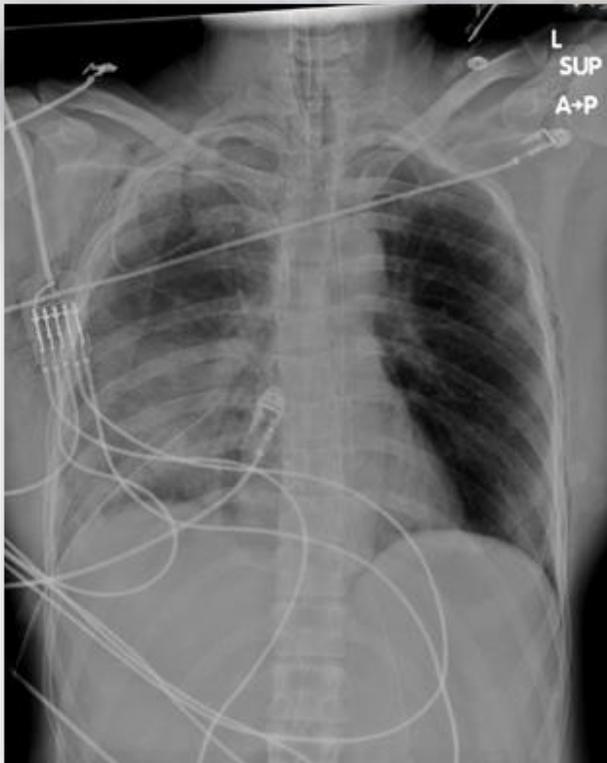
This lesson is based on ACS ATLS Course. However it has to be considered an introduction to ATLS Course



Chapter
4

NINTH EDITION

Committee on Trauma Presents

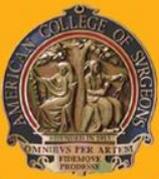


Thoracic Trauma



Chapter Statement

Thoracic injury is common in the poly-trauma patient and can pose life-threatening problems if not promptly identified during the primary survey.



Case Scenario

- **27-year-old male was unrestrained driver in high-speed, frontal-impact collision**
- **Blood pressure: 90/70; heart rate: 110; respiratory rate: 36**
- **Initial assessment: GCS score 15, patent airway**

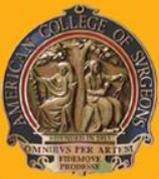
What leads you to suspect thoracic injury in this patient?

How would you evaluate this patient for potential thoracic injuries?



Objectives

- 1. Identify and initiate treatment during the primary survey of injuries that affect the airway.**
 - Airway obstruction
 - Tension or open pneumothorax
 - Flail chest and pulmonary contusion
 - Massive hemothorax
 - Cardiac tamponade
- 2. Identify and initiate treatment during the secondary survey of the eight potentially life-threatening injuries.**
- 3. Describe the significance and treatment of subcutaneous emphysema, thoracic crush injuries, and sternal, rib, and clavicular fractures.**



Thoracic Trauma

- **Significant cause of mortality**
- **Blunt:** < 10% require operation
- **Penetrating:** 15-30% require operation
- **Majority:** Require simple procedures
- **Most life-threatening injuries are identified during the primary survey**



Thoracic Trauma

What are the immediately life-threatening chest injuries?



Thoracic Trauma

What are the immediately life-threatening chest injuries?

- **Laryngeotracheal injury / Airway obstruction**
- **Tension pneumothorax**
- **Open pneumothorax**
- **Flail chest and pulmonary contusion**
- **Massive hemothorax**
- **Cardiac tamponade**



Thoracic Trauma

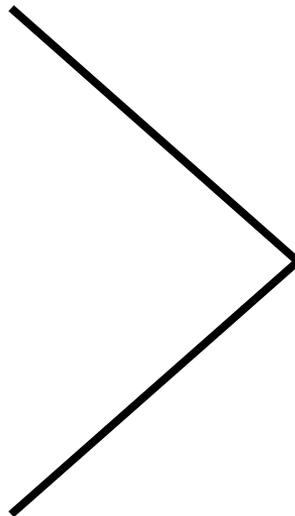
What are the pathophysiologic consequences of these chest injuries?



Thoracic Trauma

What are the pathophysiologic consequences of these chest injuries?

- **Hypoxia**
- **Hypoventilation**
- **Acidosis**
 - Respiratory
 - Metabolic
- **Inadequate tissue perfusion**



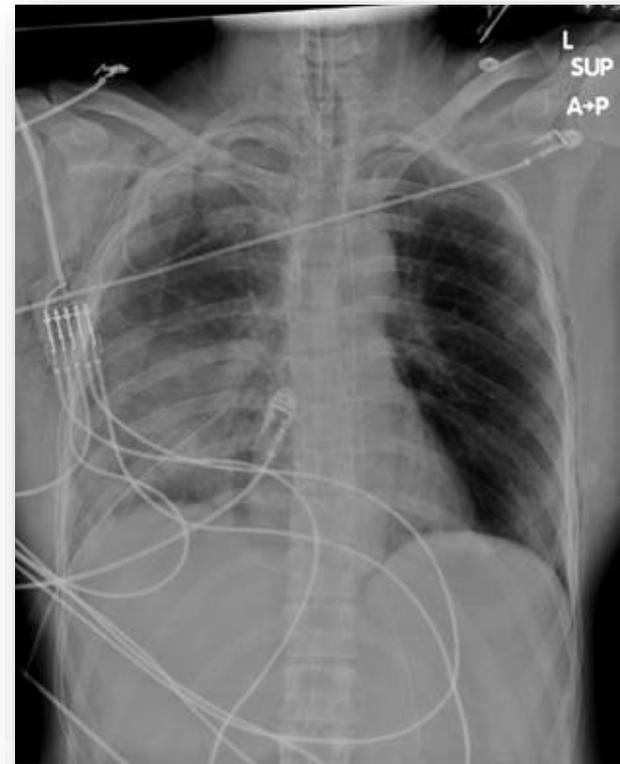
Manage in the primary survey as they are identified



Primary Survey

Identification of Thoracic Injury

- Tachypnea
- Respiratory distress
- Hypoxia
- Tracheal deviation
- Abnormal breath sounds
- Percussion abnormalities
- Chest wall deformity





Laryngeotracheal Injury

Airway Obstruction

- Rare
- Hoarseness
- Subcutaneous emphysema
- Manage in the primary survey as soon as possible
 - Intubate cautiously
 - Tracheostomy

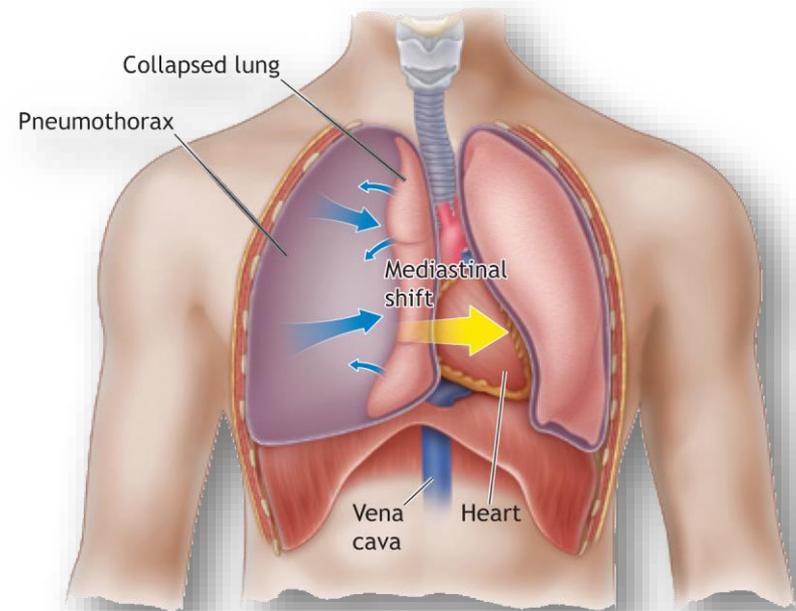




Tension Pneumothorax

- Respiratory distress
- Shock
- Distended neck veins
- Absent breath sounds
- Hyperresonance
- Elevated hemithorax
- Cyanosis (late sign)
- Immediate decompression
 - Needle
 - Chest tube

Clinical diagnosis



NO x-ray



Open Pneumothorax

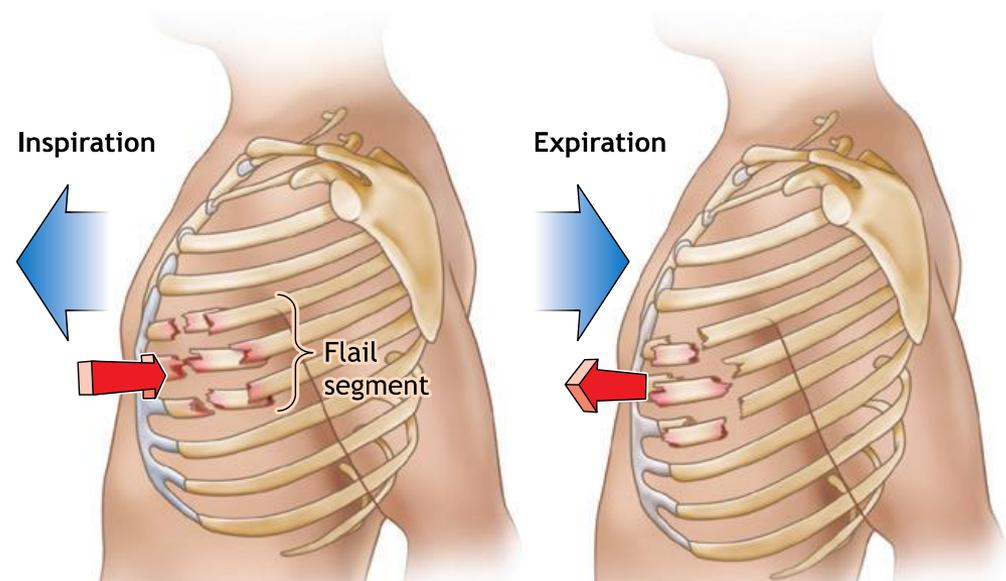
- **Ineffective ventilation**
- **3-sided cover over defect**
- **Chest tube**
- **Definitive operation**





Flail Chest and Pulmonary Contusion

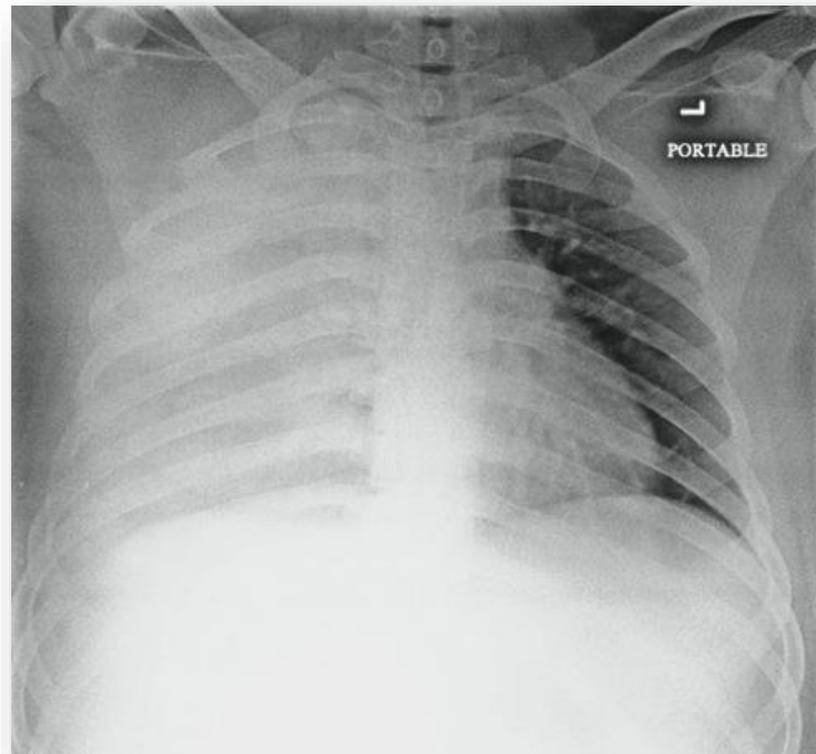
- **Intubate as indicated**
- **Oxygen**
- **Re-expand lung**
- **Judicious fluids**
- **Analgesia**

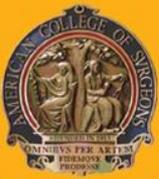




Massive Hemothorax

- **No breath sounds and percussion dullness**
- **Chest decompression**
- **Flat neck veins**
- **Shock**
- **≥ 1500 mL blood loss**
- **Volume restoration**
- **Autotransfusion**
- **Operative intervention**





Cardiac Tamponade

- Shock
- Distended neck veins
- Muffled heart sounds
- Pulseless electrical activity
- FAST
- Operation





Resuscitative Thoracotomy

When to Consider Resuscitative Thoracotomy

- Patients with *penetrating* thoracic injury arriving with PEA
- When a surgeon with appropriate skills is present
- Resuscitative thoracotomy is *not* indicated in blunt trauma with PEA



Thoracic Trauma

Secondary Survey: Potentially Life-threatening Chest Injuries

- Tracheobronchial tree injury
- **Simple pneumothorax**
- **Pulmonary contusion**
- Hemothorax
- Blunt cardiac injury
- Traumatic aortic disruption
- Blunt esophageal rupture
- Traumatic diaphragmatic injury



Thoracic Trauma

What adjunctive tests are used during the secondary survey to allow complete evaluation for potentially life-threatening thoracic injuries?



Thoracic Trauma

What adjunctive tests are used during the secondary survey to allow complete evaluation for potentially life-threatening thoracic injuries?

- **Chest x-ray**
- **FAST**
- **ABG**
- **ECG**
- **Pulse oximetry**



Simple Pneumothorax

- **Penetrating or blunt trauma**
- **Ventilation / perfusion defect**
- **Hyperresonance**
- **Decreased breath sounds**
- **Tube thoracostomy**





Tracheobronchial Tree Injury

- **Often missed**
- **Penetrating or blunt trauma**
- **Persistent pneumothorax or persistent air leak**
- **Bronchoscopy**
- **Treatment**
 - **Airway and ventilation**
 - **Tube thoracostomy**
 - **Operation**



Pulmonary Contusion

- **Common**
- **Oxygenate and ventilate**
- **Selective intubation**
- **Delayed x-ray changes**
- **Judicious fluid administration**





Hemothorax

- **Chest wall injury**
- **Lung / vessel laceration**
- **Tube thoracostomy**





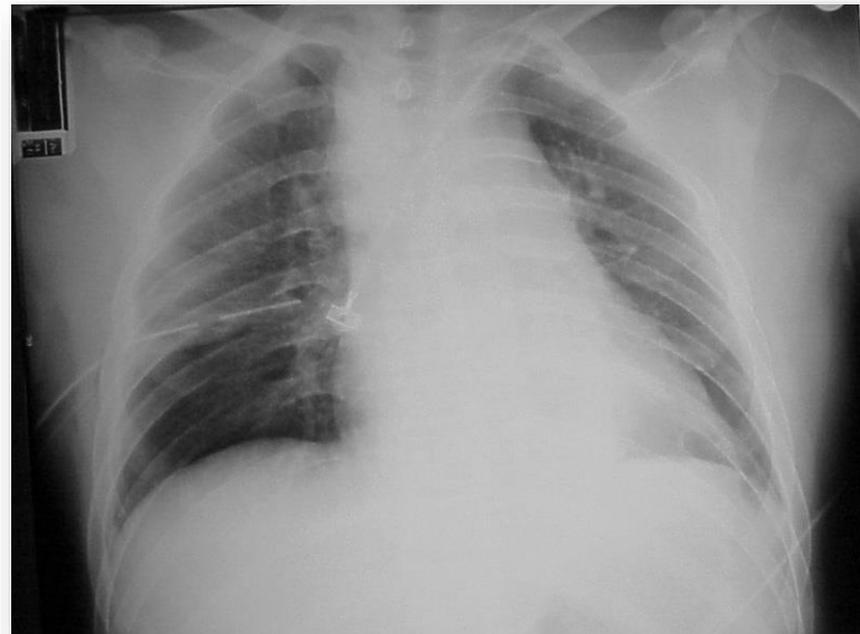
Blunt Cardiac Injury

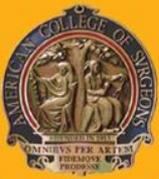
- **Spectrum of injury** (asymptomatic dysrhythmias to cardiogenic shock)
- **Abnormal ECG / monitor changes (within 24h)**
- **Echocardiography if hemodynamic consequences**
- **Treat**
 - **Dysrhythmias**
 - **Perfusion**
 - **Complications**



Traumatic Aortic Disruption

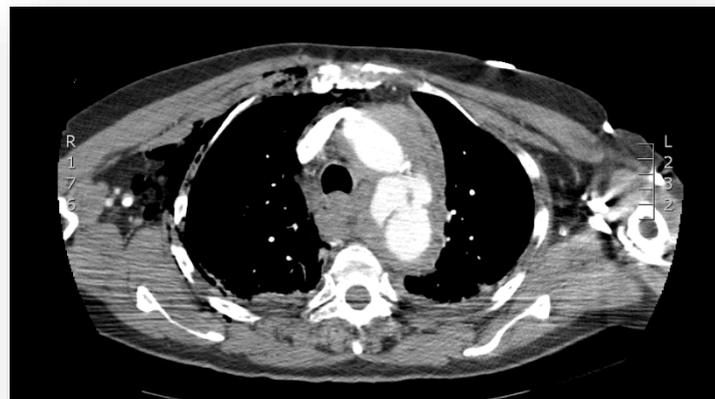
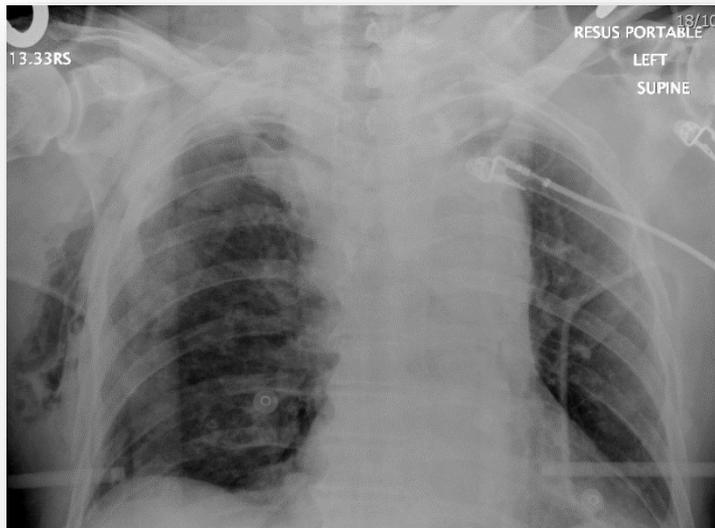
- **Rapid acceleration / deceleration**
- **X-ray signs**
- **High index of suspicion**
- **Surgical consult**





Traumatic Aortic Disruption

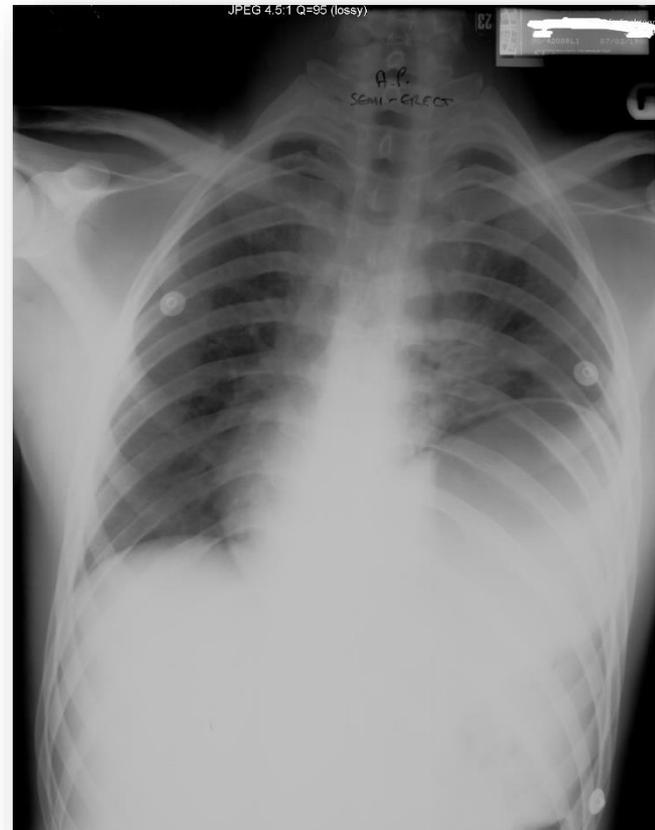
Diagnosis by Helical CT or Aortography





Diaphragmatic Injury

- **Most often left-sided**
- **Blunt:** Large tears
- **Penetrating:** Small perforations
- **Frequently misinterpreted x-ray**
- **Operation**





Fractures and Associated Injuries

Sternum, Scapular, and Rib Fractures

Ribs 1-3

- Severe force, high mortality risk with associated injuries

Ribs 4-9

- Pulmonary contusion and pneumothorax

Ribs 10-12

- Suspect intra-abdominal injury

Pain Control is Key!



Traumatic Asphyxia

- **Signs**
 - Petechiae
 - Swelling
 - Plethora
 - Cerebral Edema
- **Treatment**
 - Airway control
 - Oxygen





Esophageal Injury

- **Uncommon and difficult to diagnose**
 - Mechanism is severe epigastric blow
 - Unexplained pain
 - Unexplained shock
 - Radiographs demonstrate mediastinal air
- **Signs and symptoms**
 - Mediastinal air
 - Unexplained shock
 - Unexplained left hemothorax / effusion
- **Investigations**
 - Contrast
 - Endoscopy



Subcutaneous Emphysema

- **Airway injury**
- **Pneumothorax**
- **Blast injury**

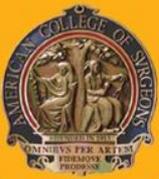




Pitfalls

Pitfalls

- Simple pneumothorax converts to tension pneumothorax
- Retained hemothorax
- Diaphragmatic injury
- Inadequate pain control
- Extremes of age
- Over-resuscitation
- Misplaced chest tube



Case Scenario

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Questions?





Summary

- **Chest injuries are common in the multiply injured patient.**
- **The ABCDE approach is used to identify life-threatening and potentially life-threatening injuries.**
- **Initial stabilization requires simple maneuvers, e.g., endotracheal intubation and tube thoracostomy.**
- **The goal of treating patients with chest injuries is to establish normal gas exchange and normal hemodynamics.**