Pathophysiology of Thoracic Trauma

Flail Chest

- Three or more adjacent ribs fracture in two or more places
- Serious chest wall injury with underlying pulmonary injury
  - Reduces volume of ventilation
- Paradoxical movement

Paradoxical Movement

Management of the Chest Injury Patient

- **Flail Chest**
  - Dress with bulky bandage against flail segment
    - Stabilizes fracture site
  - High flow O2
    - Consider ET
Pathophysiology of Thoracic Trauma

Open Pneumothorax

- Free passage of air between atmosphere and pleural space
- Air replaces space for lung tissue
- Air will be drawn through wound if wound is 2/3 diameter of the trachea or larger

Signs & Symptoms
- Penetrating chest trauma
- Sucking chest wound
- Frothy blood at wound site
- Severe Dyspnea
- Hypovolemia

Sucking Chest Wound

Management of the Chest Injury Patient

- **Open Pneumothorax**
  - High flow O2
  - Cover site with sterile occlusive dressing taped on three sides
  - Progressive airway management if indicated

Sealing a Wound
Sealing a Wound

Pathophysiology of Thoracic Trauma
Tension Pneumothorax

- Closed chest
- Progression from Simple or Open pneumothorax
- Excessive pressure reduces effectiveness of v/q

Pulmonary Injuries
Tension Pneumothorax: Signs & Symptoms

- Dyspnea
- Hypoxia/cyanosis
- JVD
- Hyperinflation of injured side of chest
- Hyperresonance of injured side of chest

Pathophysiology of Thoracic Trauma

- Apprehension
- Agitation
- Increasing cyanosis, air hunger (ventilation severely impaired)
- Distended neck veins
- Possible subcutaneous emphysema
- Shock, skin cold, clammy
- Tracheal displacement toward uninjured side
- Hyperresonance (resonance note; breath sounds or absent)
- Increasing intrapleural pressure
- Superior vena cava
- Medial shift
- Inferior vena cava

Radiograph of chest trauma.
Management of the Chest Injury Patient

**Tension Pneumothorax**
- Confirmation

- Pleural Decompression
  - 2nd intercostal space in mid-clavicular line
  - Consider multiple decompression sites if patient remains symptomatic
    - Large over-the-needle catheter

Pathophysiology of Thoracic Trauma

**Hemothorax**
- Accumulation of blood in the pleural space

- Serious hemorrhage may accumulate 1,500 mL of blood
  - Mortality rate of 75%
  - Ventilation/Perfusion mismatch
  - Shock

- Typically accompanies a pneumothorax

Management of the Chest Injury Patient

**Hemothorax**
- High flow O₂
- Shock Management
  - Positioning, warmth

- 2 large bore I.V.’s
  - Evaluate breath sounds for fluid overload
Pathophysiology of Thoracic Trauma

**Pulmonary Contusion**
- 30–75% of patients with significant blunt chest trauma
- Typical MOI
  - Rib fx
  - Deceleration
    - Chest impact on steering wheel
- Micro-hemorrhage may account for 1-1 ½ L of blood loss in alveolar tissue

**Myocardial Contusion**
- Right Atrium and Ventricle is commonly injured
- Electrical disturbances due to irritability of damaged myocardial cells
- Progressive problems
  - Hematoma
  - Myocardial necrosis
  - Dysrhythmias
  - CHF &/or Cardiogenic shock

Thoracic Trauma **Cardiovascular Injuries**

**Myocardial Contusion Signs & Symptoms**
- Bruising of chest wall
- Tachycardia and/or irregular rhythm
- Associated injuries
  - Rib/Sternal fractures
- Chest pain unrelieved by oxygen

Management of the Chest Injury Patient

**Myocardial Contusion**
- Monitor ECG
- Alert for dysrhythmias
- ALS / BLS
Pathophysiology of Thoracic Trauma
Pericardial Tamponade

- Restriction to cardiac filling caused by blood or other fluid within the pericardium

- Occurs in <2% of all serious chest trauma
  - Very high mortality
  - 200 ml of blood

Thoracic Trauma Cardiovascular Injuries
Pericardial Tamponade Signs & Symptoms

- Dyspnea
  - Normal breath sounds
- Pale/ cyanotic
- Beck’s Triad
  - JVD
  - Muffled heart tones
  - Hypotension

Management of the Chest Injury Patient

- Pericardial Tamponade
  - High flow O₂
  - I.V. access
  - “Diesel Therapy”

Pathophysiology of Thoracic Trauma
Myocardial Aneurysm/Rupture

- Occurs almost exclusively with extreme blunt thoracic trauma

- Secondary due to necrosis resulting from AMI

- Signs & Symptoms
  - Severe rib or sternal fracture
  - Possible signs and symptoms of cardiac tamponade
  - Absence of vital signs
Myocardial Rupture

- Aorta most commonly injured in severe blunt or penetrating trauma
  - 85-95% mortality
- Injury may be confined to areas of aorta attachment
- Signs & Symptoms
  - Rapid and deterioration of vitals
  - Pulse deficit between right and left upper or lower extremities

Aortic Rupture

- Herniation of abdominal organs into thorax
- MOI
  - High pressure blunt chest trauma
  - Penetrating trauma
- Signs & Symptoms
  - Restriction of ipsilateral lung
  - Displacement of mediastinum
  - Bowel sounds may be noted in thorax

Management of the Chest Injury Patient

- Aortic Aneurysm/Rupture
  - AVOID rough handling
  - Initiate I.V. therapy en-route
  - Mild hypotension may be protective
  - Keep patient calm

Pathophysiology of Thoracic Trauma

- Traumatic Rupture of the Diaphragm
  - Herniation of abdominal organs into thorax
  - MOI
    - High pressure blunt chest trauma
    - Penetrating trauma
  - Signs & Symptoms
    - Restriction of ipsilateral lung
    - Displacement of mediastinum
    - Bowel sounds may be noted in thorax
Management of the Chest Injury Patient

- **Diaphragmatic rupture**
  - Oxygen administration
  - Positive pressure ventilation will worsen the injury
  - Rapid transport
  - NG tube placement (MC, protocol)

**Pathophysiology of Thoracic Trauma**

**Traumatic Esophageal Rupture**

- 30% mortality
- Contents in esophagus/stomach may move into mediastinum
- Subcutaneous emphysema
- Pain, hoarseness, dysphagia, respiratory distress, shock

**Management of the Chest Injury Patient**

- **Esophageal injury**
  - Fluid replacement for shock
  - Rapid Transport
  - Watch airway

**Pathophysiology of Thoracic Trauma**

**Tracheobronchial Injury**

- 50% of patients with injury die within 1 hr of injury
- Signs & Symptoms
  - Tachypnea, tachycardia
  - Cyanosis
  - Hemoptysis
  - Massive subcutaneous emphysema
  - Suspect/Evaluate for other closed chest trauma
Pathophysiology of Thoracic Trauma

Traumatic Asphyxia

- Results from severe compressive forces applied to the thorax

- Signs & Symptoms
  - Head & Neck become engorged with blood
  - Face and tongue swollen
  - Bulging eyes with conjunctival hemorrhage
  - JVD
  - Hypotension, Hypoxemia

QUESTIONS?

FOR MORE INFORMATION....

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