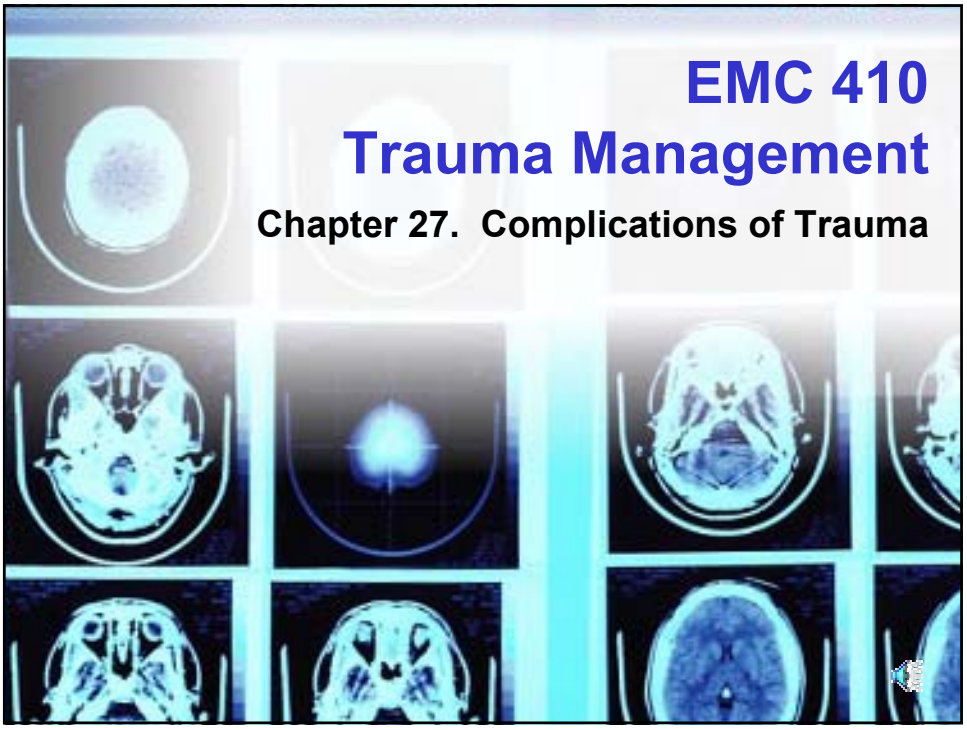


EMC 410
Trauma Management
Chapter 27. Complications of Trauma

Unit Objectives

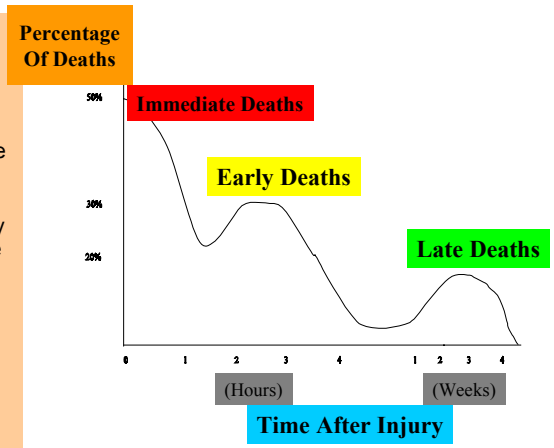
- **Upon completion of this chapter, you should be able to:**
  - List the most important complications occurring in the trauma patient.
  - Describe the pathophysiology of these complications.
  - Recognize the clinical signs that are helpful in diagnosing these complications.
  - List the diagnostic tests used to evaluate these complications.
  - Identify those patients who are most susceptible to complicating factors.

Unit Objectives continued

- Explain the treatment modalities that may be used in caring for the victim of trauma complications.
- List the most common causes of traumatic cardiac arrest.
- Compare and contrast the underlying pathophysiological differences between traumatic versus nontraumatic cardiac arrest.
- Discuss the conclusions generated by current research related to expected outcomes following traumatic cardiac arrest.
- Based on your understanding of the current societal climate, expand upon the theme of ethical considerations in relation to use of resources, organ donation, and financial cost.

Introduction

- Overview of pathologies that present hours to days to weeks following the initial injury.
- These represent common causes of “Late Deaths.”
- Understanding of complications necessary to that measures can be taken to prevent complications, and if already present, to manage them.
- Focus will be on respiratory conditions, coagulation disorders, shock, MSOF, and cardiac arrest.

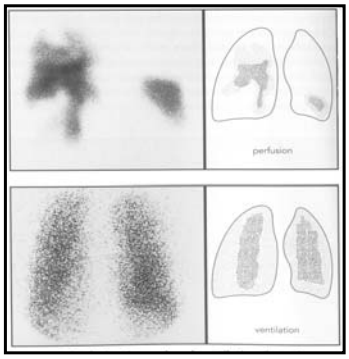


Respiratory Complications

- **Failure of lungs and muscles of inspiration to provide efficient gas exchange to oxygenate tissue.**
- **Causes**
  - Structural (thoracic cage)
  - Spinal cord injury
  - Aspiration
  - Airway obstruction
- **Signs and symptoms**
  - Nasal flaring
  - Accessory muscles
  - Tachypnea
  - Pallor
  - Mental status changes
- **Treatment**
  - Airway control
  - ETI
  - Mechanical ventilation
  - NG tube
  - Antibiotics

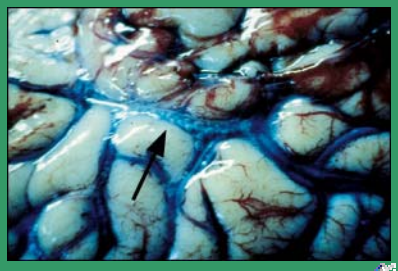
Respiratory Complications continued

- **Pulmonary embolus**
  - Causes
    - Saddle emboli
    - DVT (66%)
  - Risk factors
    - Lower extremity trauma
    - Immobilization
    - Cancer
    - Elderly
    - Oral contraceptives
    - Surgery
  - Signs and symptoms
    - Tachypnea
    - Chest pain
    - Hypoxemia
    - V/Q scan
    - D-dimer
    - Leg pain/hot/swelling
  - Treatment
    - Oxygen
    - Heparin
    - Lovenox
    - Thrombolytics
    - Compression devices for prevention



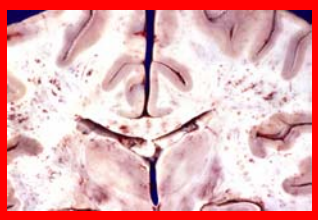
Respiratory Complications continued

- **Air embolism**
  - Causes
    - Air entrainment into vein
    - Lacerations to neck
    - EJ/IJ lines
  - Signs and Symptoms
    - Acute respiratory distress
    - Hypoxemia
  - Treatment
    - Prevention during EJ/IJ cannulation
    - Oxygen
    - ETI as needed
    - Mechanical ventilation as needed
    - LLR position



Respiratory Complications continued

- **Fat Embolism**
  - Causes
    - Long-bone pelvic fractures
    - Circulating chylomicrons (fat carried by protein)
  - Signs and Symptoms
    - Thrombocytopenia
    - Respiratory distress
    - Skin and conjunctival petechia
    - Mental status changes
    - Hypoxia
  - Treatment
    - Prevention by immobilization of fractures
    - Airway and ventilatory support
    - Circulatory support



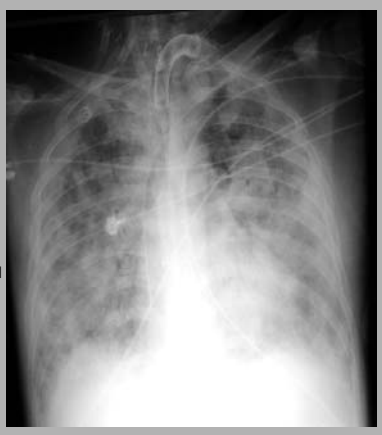
Petechial hemorrhage from fat embolism.

Respiratory Complications continued

- **Tension Pneumothorax**
  - May occur immediately or days following injury
  - Causes
    - Thoracic trauma
    - Barotrauma
  - Signs and Symptoms
    - Respiratory distress
    - Hypotension
    - Tachycardia
    - Diminished/absent lung sounds
    - Hyperesonance
    - Tracheal deviation
    - JVD
    - Narrow pulse pressure
  - Treatment
    - Rapid decompression

Respiratory Complications continued

- **ARDS**
  - Diagnosis
    - Acute onset within 24-48 hours of injury
    - Poor oxygenation and ventilation
    - Bilateral diffuse infiltrates
    - Systemic manifestations (tachycrdia, tachypnea, hypoxia)
    - CHF ruled out by Swanz
    - Poor prognosis
  - Causes
    - Numerous (trauma, infection, snakebite, tick bite, fractures, shock)
  - Pathophysiology
    - Alveolar edema
    - Pulmonary capillaries clogged with fibrin and cellular debris
    - V/Q mismatch
    - Loss of surfactant
    - Inflammatory response in lungs
    - Diffuse white-out
  - Treatment
    - Supportive
    - Mechanical ventilation with PEEP



Disseminated Intravascular Coagulation

- **Mismatch between coagulation and fibrinolysis**
- **85% mortality**
- **Causes**
  - Trauma
  - Infection
  - Tissue damage
  - Shock
  - Sepsis
  - Mismatched blood transfusions
- **Pathophysiology**
  - Release of clotting mechanisms
  - Microclots reduce blood flow to organs
  - Organ failure
  - Platelets consumed leading to bleeding
- **Signs and Symptoms**
  - Petechiae
  - Ecchymosis
  - Infarction of organs
  - MSOF
- **Treatment**
  - Replacement of clotting factors
  - Prevention of new clots with Heparin

Septic Shock

- **Result of infection**
- **50% mortality**
- **Causes**
  - Native host bacteria
  - Environmental bacteria
- **Pathophysiology**
  - Introduction of bacteria
  - Activation of immune response
  - Release of TNF
  - Release of Cytokines
  - Release of endotoxins

- **Signs and Symptoms**
  - –Decreased C.O.
  - –Hypotension
  - –Warm, flushed skin
  - –Hypoxemia, lactic acidosis
  - –Fever
  - –Renal failure and/or MSOF
- **Treatment**
  - –Circulatory support
  - –Antibiotics
  - –Remove source of infection
  - –oxygenation

Multiple Organ Failure

- **Follows prolonged shock**
- **Accounts for 50% of late deaths**
- **Causes**
  - Hypotension
  - Inflammatory response
- **Affects all organs**
- **Treatment**
  - Supportive

Neurogenic Shock

- **Spinal cord injury disrupts sympathetic nervous control**
  - **Pathophysiology**
    - Loss of sympathetic stimulation from ganglia chain
    - No catecholamine response
    - Unopposed parasympathetic activity
    - Vasodilation
    - Bradycardia
    - Hypotension
  - **Signs and Symptoms**
    - Wide pulse pressure
    - Hypotension
    - Warm, dry, flushed skin
  - **Treatment**
    - Treatment of initial spinal insult
    - Solu Medrol
    - Fluid
    - Vasopressors
    - Atropine

Traumatic Cardiac Arrest

- **Outcome predictors**
  - CPR > 30 minutes
  - Multiple arrests
  - Different etiology than medical arrests with poorer outcomes
  - Must correct underlying cause
- **Causes**
  - Exsansguination
  - Hypovolemia
  - Pericardial tamponade
  - Myocardial contusion and arrhythmia
  - Tension pneumothorax
  - Great vessel injury
- **Treatment**
  - 10 minute window of opportunity
  - Identify underlying cause
  - CPR may not be appropriate
  - Fluid resuscitation
  - Pericardiocentesis
  - Pleural decompression
  - Chest tube
- **Ethical Considerations**