Pneumothorax

• Defined as air in the pleural space which can occur through a number of mechanisms

Traumatic pneumothorax
• Penetrating chest trauma
  – Common secondary to bullet or knife penetration
  – Chest tube is usually adequate to treat.
  – May require surgery if bleeding is severe

• Blunt trauma
  – Broken ribs puncture lung with air escape into pleura.
  – Chest tube is all that is generally required.
Pneumothorax (cont.)

• Blunt trauma (cont.)
  – Tracheal fracture and esophageal rupture
    • These are two special causes of pneumothorax that require surgical repair.

• Iatrogenic
  – Most common cause of traumatic pneumothorax
  – Common iatrogenic causes are
    • Needle aspiration lung biopsy
    • Thoracentesis
    • Central venous catheter placement
Pneumothorax (cont.)

Neonatal

• Spontaneous pneumothorax occurs in 1–2% of infants

• Likely caused by high transpulmonary pressures and transient bronchial blockage (i.e. meconium)

• Recognition is difficult
  – Contralateral heart sounds may be a clue.
  – Transillumination of thorax may be useful.

• Most neonates with this condition require chest tubes.
Pneumothorax (cont.)

Spontaneous

• Pneumothorax with no obvious cause

• Primary spontaneous pneumothorax
  – Occurs with no underlying lung disease
  – Most (80%) have small subpleural blebs
  – Typically happens in tall, thin, young adults
  – >90% have had short-term smoking history
    • Smoking cessation recommended
Pneumothorax (cont.)

- Secondary spontaneous pneumothorax
  - Occurs with underlying lung disease
    - Most common associated disease is COPD
    - Also seen during exacerbations of asthma and CF
    - Interstitial lung diseases with normal lung volumes
      - Sarcoidosis, BOOP
  - Depending on extent of disease, pneumothorax can be devastating
    - 43% 5-year mortality
  - Evacuation, not observation, should be the standard of care with these patients.
Pneumothorax (cont.)

Complications

• Tension pneumothorax
  – Pleural air pressure exceeds atmospheric pressure
  – Radiographic appearance
    • Mediastinal shift, diaphragmatic depression, flattened ribs
  – Clinical presentation
    • Venous return and cardiac output decrease with hypotension and tachycardia
    • Hypoxemia due to alveolar collapse
  – Treatment: emergency needle decompression
Pneumothorax (cont.)

Complications

• Reexpansion pulmonary edema
  – Occurs following rapid lung reexpansion particularly:
    • From low lung volumes
    • Long duration pneumothorax
    • High pressure gradient across lung
  – May be related to reperfusion injury
  – Lung reexpansion should be slow
    • First, just waterseal, no suction
    • If lung fails to reexpand, then apply suction
Pneumothorax (cont.)

Diagnosis

• Chest radiography
  – Requires good quality film
  – In ICU, 30% of pneumothoraces are missed due to:
    • Low-quality film
    • Supine position of patient on AP film
    • Air hidden behind thoracic or mediastinal structures

• CT may be used to confirm size and presence of pneumothorax.
Pneumothorax (cont.)

Therapy

• Oxygen
  – Should be administered to all patients
  – Supplemental O₂ speeds absorption of air from pleural space

• Observation of stable patients
  – Primary: observe 4 hours, if no enlargement: home
  – Secondary and iatrogenic: hospitalize and observe carefully,
    • If there is any deterioration (SpO₂, RR, etc) - drain
Pneumothorax (cont.)

Therapy

• Simple aspiration
  – Small catheter placed in pleural space
  – Connect to three-way stopcock
  – Slowly evacuate until no more air can be removed
  – This works as many leaks heal between time of leak and its drainage.

  – If 4 L air is removed without resistance, chest tube placement is required
Pneumothorax (cont.)

Therapy

• Chest tubes buy time
  – Resolution is mostly determined by lung healing
  – Small bore: placed via small incision in second intercostal space (ICS), midclavicular line or laterally, fifth–seventh ICS
    • Connected to underwater seal or Heimlich valve
  – Large bore: placed via blunt dissection, usually connected to “three-bottle” chest drainage system
  – Chest tubes are sutured in place

• Pleurodesis: consider with recurrent pneumothoraces
Bronchopleural fistula
• Usually used to refer to large, persistent air leaks

• Most are on MV
  – PPV perpetuates the leak

• May require more than one chest tube
  – Aids restoring lung proximity to chest wall and promotes healing

• Avoid auto-PEEP, consider bronchoscopic closure or thoracoscopic surgery