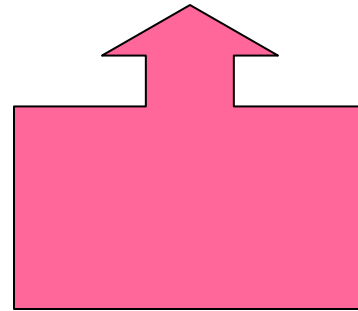


# Restrictive Pulmonary Diseases

Causes:

- Acute alveolo-capillary dysfunction
- Interstitial disease
- Pleural disorders
- Chest wall disorders
- Neuromuscular disease



# Pathophysiology

- Reduced compliance
- Leading to an increase in WOB
- Increased oxygen utilization causes hypoxemia
- Causes stimulation of peripheral chemoreceptors, causing hyperventilation
- Abnormality promotes ventilation/perfusion mismatch (primary cause of hypoxemia)
- Reduced lung volumes, leading to hypercapnea

# Clinical Manifestations

- Decreased lung compliance
- Dyspnea
- Tachypnea

# Diagnostic Tests

- PFT
- Decreased TLC
- Decreased VC
- Decreased FEV<sub>1</sub>
- Normal FEV<sub>1%</sub>
- Normal FEF<sub>25-75%</sub>
- Normal RV/TLC

# Diagnostic Tests

- ABG's
- Decreased PaO<sub>2</sub>, secondary to V/Q mismatch
- Decreased PaCO<sub>2</sub> due to hyperventilation
- Persistent hypocapnea
- Compensated respiratory alkalosis
- Hypoxemia is observed in chronic cases
- Chronic-hypercapnea, compensated respiratory acidosis with hypoxemia

# Diagnostic Tests

- Chest x-ray
- Pulmonary edema
- Pneumonia
- Pleural effusion
- Frail chest
- Physical examination
- Kyphosis
- Scoliosis
- Chest Wall Injury
- Pneumothorax

# Pulmonary Fibrosis

- Tissue necrosis
- Aspiration
- Pneumonitis
- Pulmonary infection
- Noxious gases

# Pulmonary Fibrosis

- Pathophysiology
- Caused by repeated insult to the lung
- Inflammatory process releases polymorphonuclear leukocytes into the alveolar walls
- Certain mediators are released, increasing the number of fibroblasts

# Pulmonary Fibrosis

- Pathophysiology
- Fibrosis ensues with decreased compliance
- Increased work of breathing
- V/Q mismatch precipitates hypoxemia and hypocapnea

# Pulmonary Fibrosis

- Reduced lung volumes (TLC, FRC, RV)
  - FEV<sub>1</sub>
  - FEV/FVC% may be higher than normal
  - FEF<sub>25-75%</sub> normal or high
  - no scooped out shape on flow volume curve
  - downslope of the curve above normal
  - elastic recoil pressure higher than normal
  - airway resistance normal

# Pulmonary Fibrosis

- Clinical manifestations
- Dyspnea on exertion
- Bilateral basal rales
- Tracheal shift to the fibrotic side
- Affects adults in late middle age
- Finger clubbing is common
- Shallow, rapid breathing
  - increases ventilation of the anatomical VD

# Pulmonary Fibrosis

- Diagnosis
- Decreased TLC, VC, normal  $FEV_{1\%}$
- Decreased PaO<sub>2</sub>, PaCO<sub>2</sub>
- Increased pH, P(A-a)O<sub>2</sub>
- CXR-mediastinal shift toward the fibrotic side, irregularly elevated diaphragm
  - patchy shadows near the diaphragm (basal collapse)
  - late-honeycomb appearance (cysts)

# Pulmonary Fibrosis

- Treatment
- No effective therapy
- Mostly supportive and symptomatic
- Oxygen therapy for hypoxemia
- Avoidance of respiratory irritants
- Higher pressures will be needed to distend the lung

# Cardiogenic Pulmonary Edema

- Cardiogenic Pulmonary Edema
- Hypervolemia
- Left ventricular failure (CHF)
- Mitral valve disease
- Myocardial infarction
- Increased capillary hydrostatic pressure

# Cardiogenic Pulmonary Edema

- Noncardiogenic pulmonary edema
  - ARDS
  
- Near Drowning

# Cardiogenic Pulmonary Edema

- Clinical manifestations
- Dyspnea
- Cough and expectoration of thin, frothy sputum
- Tachycardia
- Tachypnea
- Rales
- Cyanosis

# Cardiogenic Pulmonary Edema

- Diagnosis
- Rales
- ABG's-hypoxemia, hypocapnea and mild alkalosis
- CXR-possible cardiomegaly, increased opacity and prominent vascular markings
- Increased capillary wedge pressure

# Cardiogenic Pulmonary Edema

- Treatment
- IPPB with antifoaming agent
- Diuretics
- Digitalis
- MS
- High oxygen concentration
- Mechanical ventilation with PEEP

# Pneumonia

- Bacterial (gm+)
  - Pneumococcal
  - Staphylococcal
  - Streptococcal
- (gm-)
  - Klebsiella
  - Legionella
  - Pseudomonas
- Viral
  - influenza
  - adeno virus
- Aspiration

# Pneumonia

- Pathophysiology
- Clinical Manifestations
- Bacterial
  - increased body temp
  - productive cough
  - thick sputum
  - hypoxemia, SOB
  - Increased opacity
  - Increased WBC's

# Pneumonia

- Viral
  - low grade fever
  - normal WBC's
  - frequently undiagnosed
- Diagnosis
  - body temperature
  - WBC
  - Sputum culture
  - CXR

# Pneumonia

- Treatment
  - Bronchial hygiene
    - IPPB or IS
    - Aerosol therapy
    - CPT
  - Oxygen therapy
  - ATB
  - Fluid therapy

# Pleural Effusion

- Transudates
  - plasma filtering from blood vessels
  - severe heart failure
    - Right heart failure
- Exudates
  - inflammatory effusion-containing protein
  - typically with malignancies and infections
    - Pulmonary thrombosis
    - Pneumonias leading to empyema

# Pleural Effusion

- Clinical
  - Dyspnea
  - Chest pain
  - Fever
  - Hemoptysis
  - dry, NPC
  - Mediastinal shift to the unaffected area
  - Reduced BS

# Pleural Effusion

- Diagnosis
  - Thoracentesis
  - CXR
- Treatment
  - Chest tube drainage
  - ATB
  - Pulmonary hygiene

# Chest Trauma

- Frail Chest
  - paradoxical respiration
  - pain
- Treatment
  - oxygen
  - pain meds
  - close monitoring of respiratory failure
  - mechanical ventilatory support

# Chest Trauma

- Pneumothorax
  - spontaneous
    - most common
    - caused by a rupture of a small bleb on the surface of the lung near the apex
    - tall young males
    - related to high mechanical stresses

# Chest Trauma

## Spontaneous Pneumothorax

- Sudden pain on one side
- dyspnea
- reduced BS on affected side
- must confirm with CXR

# Chest Trauma

- Tension Pneumothorax
  - small number of cases
    - check value between the lung and the pleural space
  - medical emergency
  - increased respiratory distress
  - tachycardia
  - signs of mediastinal shift
    - tracheal deviation
  - needs a chest tube with an underwater seal

# Chest Trauma

- Pneumothorax
  - Reduced FEV<sub>1</sub> and FVC
  - CXR more helpful than a PFT

# ARDS

- Also known as Acute Respiratory Failure
  - trauma to the lung or rest of the body
  - aspiration
  - sepsis
  
  - stiff lungs
  - decreased lung compliance
  - decreased FRC

# Neuromuscular Diseases

- Poliomyelitis
- Guillian-Barre syndrome
- Myasthenia gravis
- Botulism
- Tetanus

# Neuromuscular Diseases

- All could lead to dyspnea or respiratory failure
  - reduced FVC, TLC, IC and FEV<sub>1</sub>
  - process of the disease must be monitored by FVC and ABG's