At the conclusion of this lecture, the participant should be able to:
1. Use arterial blood gas analysis to diagnose lung disease.
2. Understand how the lung regulates blood flow and gas exchange.
3. Understand how to manipulate pulmonary hemodynamics with drug therapy.

I. Introduction and overview

II. Gas exchange

A. Oxygenation

   Hypoxemia

   Evaluation: cyanosis, pulse oximetry, arterial blood gases

   Oxygen delivery

   Oxyhemoglobin dissociation curve

   Physiological causes of hypoxemia (West)

   Low FiO2

   Diffusion barrier

   Hypoventilation

   Ventilation/Perfusion (V/Q) mismatch

   Shunt

   Not remedied with 100% oxygen

   Iso-shunt diagram (Nunn)

   Common causes of shunt

   Hypoxic pulmonary vasoconstriction (HPV)

   Local homeostatic mechanism to maintain V/Q matching and preserve oxygenation

   Failure of HPV

   Inflammation, infection, sepsis, drugs

   Hyperoxia
B. Ventilation

Defined by removal of CO2

PaCO2 determined by equilibrium between CO2 delivery to lung (VCO2) and CO2 removal (ventilation)

Dead space

Interpreting blood gases and end-tidal PCO2

Physiologic effects of a pulmonary embolism

II. Lung mechanics

Why important - relationship between driving pressure and gas flow in lung

Resistance, Compliance, and regional time constants

Distribution of ventilation

Dynamics vs static mechanics

Peak and plateau pressures

Intrapeural pressure

Pressure control vs. volume control ventilation

Expiratory flow limitation and gas trapping

III. Pulmonary hemodynamics

Pulmonary vasoactive drugs

Inhaled nitric oxide and gas exchange

References


