COPD: Findings on Investigations

**Chronic Obstructive Pulmonary Disease (COPD)**

- **Airflow obstruction**
  - ↓ ventilation of alveoli
  - Blood perfusing ill-ventilated alveoli does not receive normal amounts of oxygen
  - **Hypoxemia:** PaO2 < 70mmHg (on ABGs)
  - Ventilation-perfusion mismatch
  - **High A-a gradient** (calculated from ABGs)

- **Lung tissue damage**
  - During expiration, positive pleural pressure squeezes on airways → ↑ obstruction
  - No elastic recoil to push air out of lungs
  - Total expiration time takes longer than normal
  - Lungs don’t fully empty
  - Loss of lung parenchyma and vasculature ↓ surface area for gas exchange
  - ↓ diffusion capacity (on spirometry)
  - More CO2 remains and diffuses into the blood
  - **Hypercapnia:** PaCO2 > 45 (on ABGs)

**Investigations for COPD:**
- Spirometry (Pulmonary function test)
- Arterial Blood Gasses (ABGs)
- Chest X-Ray (CXR): frontal and lateral

**Abbreviations:**
- FEV1: Forced expiratory volume in 1 second
- FVC: Forced vital capacity
- TLC: Total lung capacity
- VC: Vital Capacity
- PaO2: partial pressure of O2 in arterial blood
- PaCO2: partial pressure of CO2 in arterial blood

**Pathophysiology:**
- In the setting of fever and productive cough, especially if lung field opacifications are seen on CXR: consider sputum gram stain and culture to rule out pneumonia.

**Mechanism:**
- Air does not block X-ray beams, will appear black on X-ray film
- ↑ retrosternal air space (on lateral CXR)
- Hyperlucent (darker) lung fields, ↓ lung markings (on frontal CXR)

**Sign/Symptom/Lab Finding:**
- Low, flat diaphragm, >10 posterior ribs (on frontal CXR)
- High TLC and VC (on spirometry)

**Complications:**
- Chronic hypercapnia makes breathing centers less sensitive to the high PaCO2 stimulus for breathing, & more reliant on the low PaO2 stimulus (“CO2 retention”)
- Give O2 carefully to these patients (high PaO2 may suppress patients’ hypoxic respiratory drive, ↓ their breathing, & ↑↑↑ PaCO2)