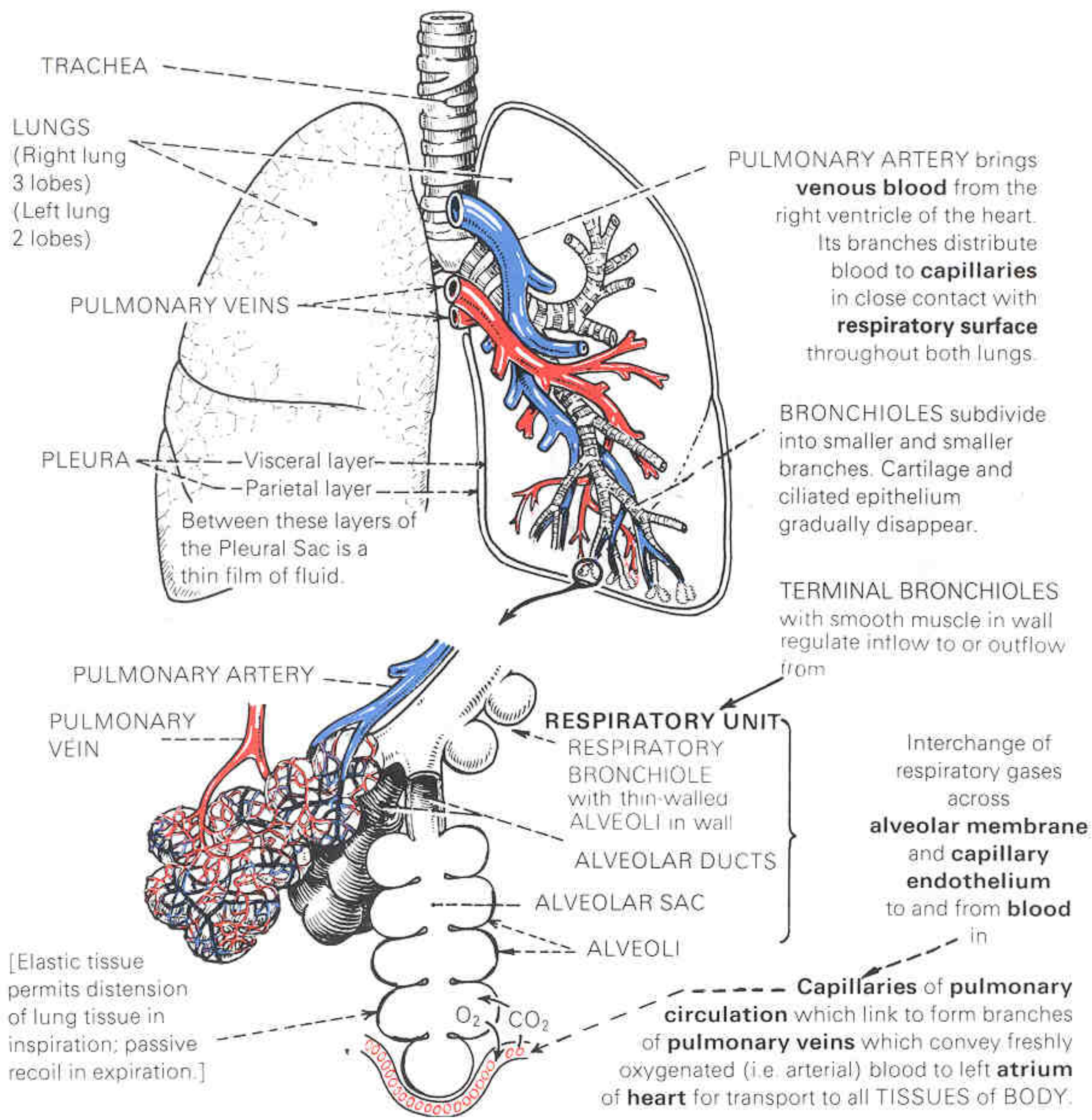
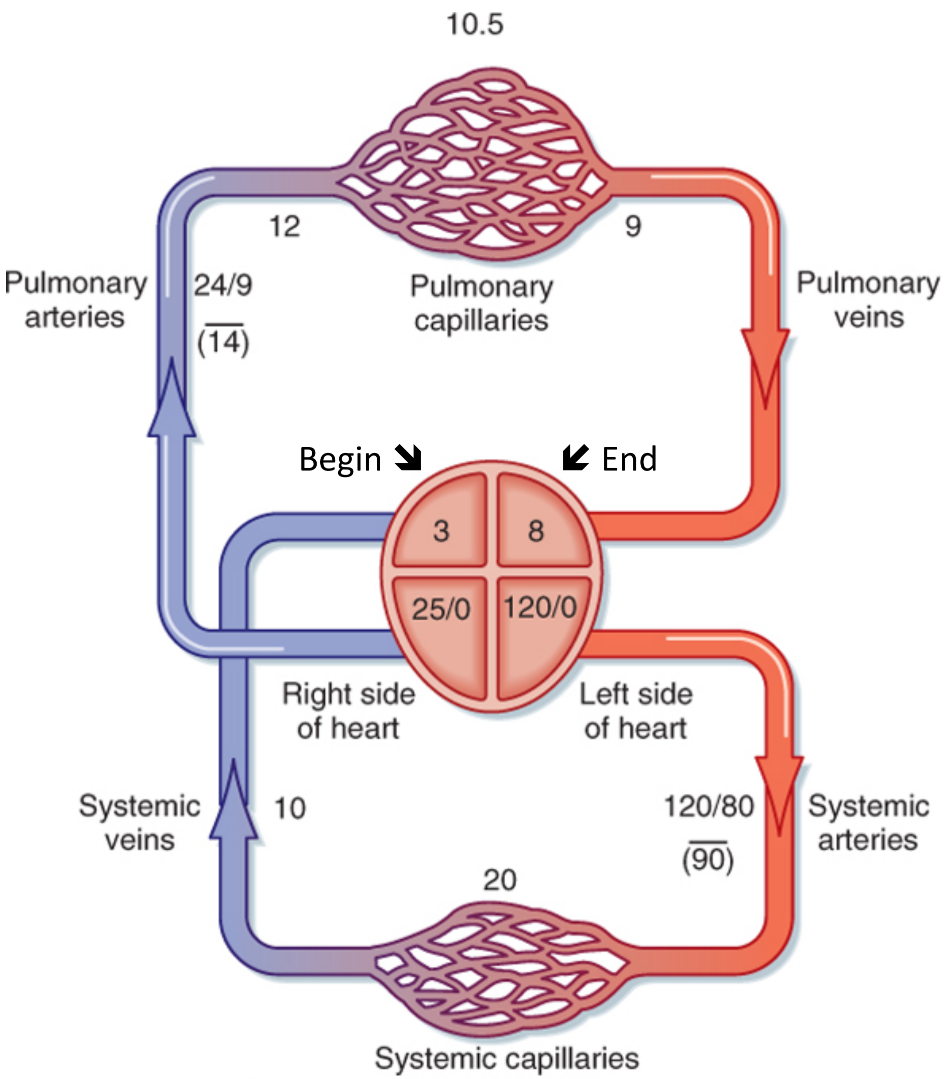
The trachea and the bronchial 'tree' conduct air down to the **respiratory surfaces**.

IP[5] p132

There is no exchange of gases in these tubes.





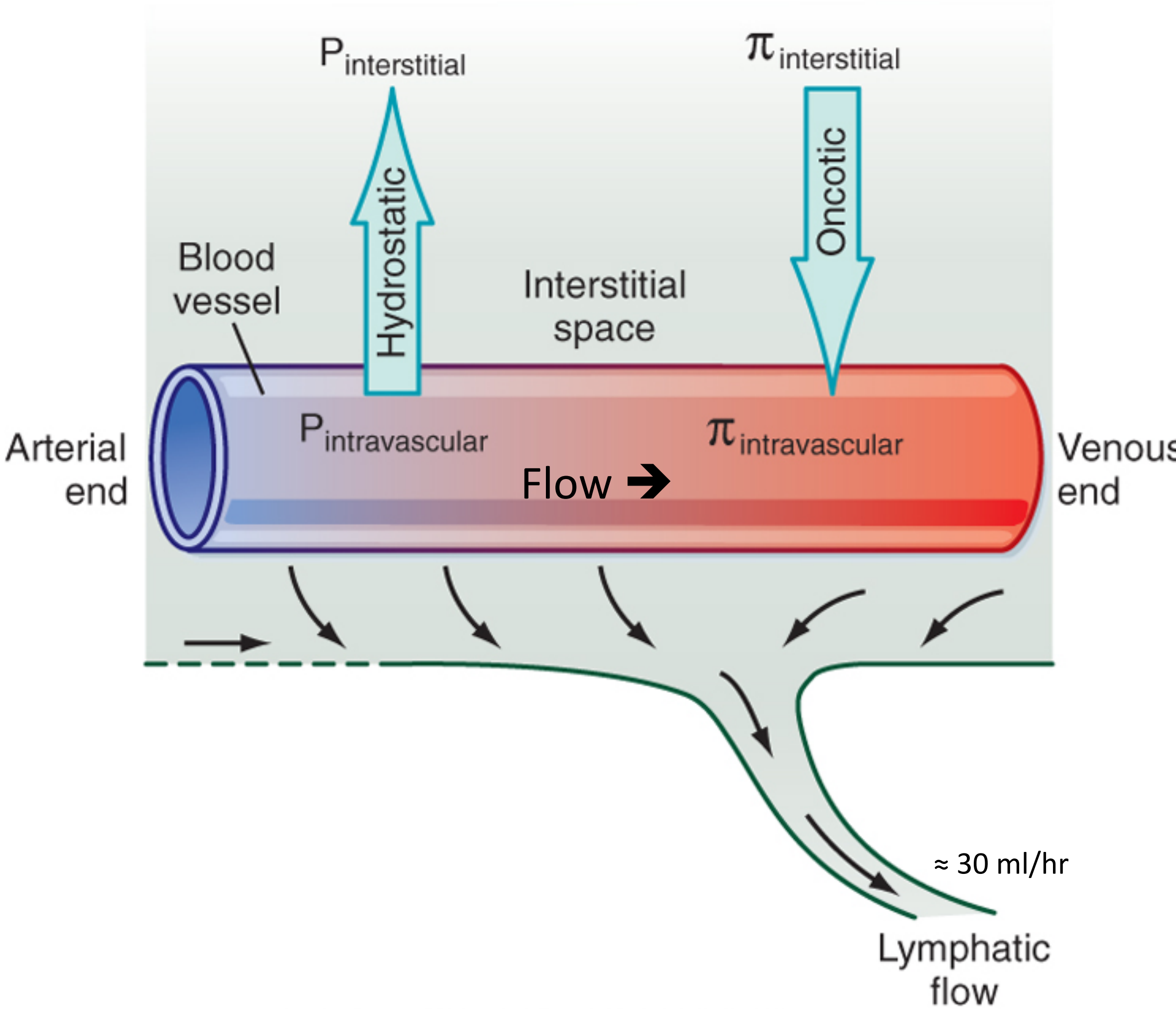
Koeppen & Stanton: Berne and Levy Physiology, 6th Edition.

Figure 22-6 Schematic representation of the phasic and mean pressures within the systemic and pulmonary circulations in a normal, resting human adult lying supine. The numbers are millimeters of mercury (mm Hg) for easy comparison. The driving pressure in the systemic circuit is $P_{ao} - P_{ra} = 90 - 3 = 87$ mm Hg, whereas the driving pressure in the pulmonary circuit is $P_{pa} - P_{la} = 14 - 8 = 6$ mm Hg. Cardiac output must be the same in both circuits in the steady state because they are in series. The resistance to flow through the lungs is less than 10% that of the rest of the body. Note that the pressure in the left heart chambers is higher than that in the right side of the heart. Any congenital openings between the right and left sides of the heart favor left-to-right flow.

Vessel Types in Pulmonary Circulation

- Three types (by function)
  - Extraalveolar
    - Arteries, arterioles, veins, venules
      - Not influenced by alveolar pressure changes
      - Affected by intraplural and interstitial pressure changes
  - Alveolar capillaries
    - Run in alveolar septa (see Module 11, Video 2, Slide 8)
      - Sensitive to alveolar pressure changes
      - Not sensitive to pleural or interstitial pressure changes
  - Pulmonary microcirculation
    - Fluid balance

PULMONARY CAPILLARY FLUID BALANCE



Koeppen & Stanton: Berne and Levy Physiology, 6th Edition.

See B&L[6+], page 450

Figure 22-7 Factors influencing lung fluid balance. Starling's equation summarizes the balance of forces favoring fluid flux into or out of the pulmonary vessels. Normally there is a net flux of fluid out of the vessels into the interstitium, which is drained from the interstitial space by the lymphatic system.

Pulmonary Vascular Resistance

- PVR = (P_{pa}-LAP)/CO
  - Ex (slide 2): PVR = (14-8)/6 = 1 mmHg/L/min
    - ≈ 0.1 SVR
  - PVR of alveolar capillaries ↑ at end inspiration
    - Expanded alveoli compress capillaries in septa
  - PVR of extraalveolar vessels ↓ at end inspiration
    - Lung parenchyma "pulls away", expands vessels

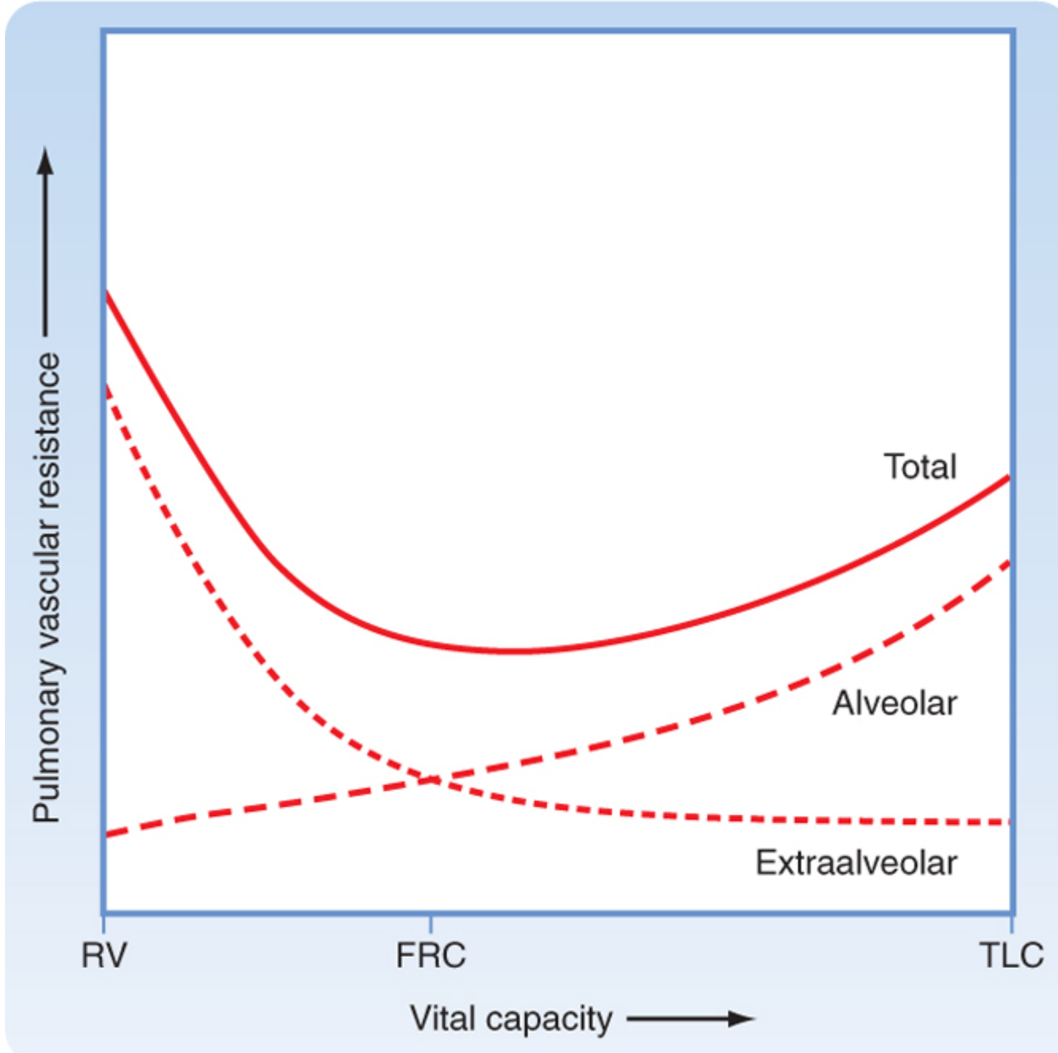


Figure 22-8 Schematic representation of the effects of changes in vital capacity on total pulmonary vascular resistance and the contributions to the total afforded by alveolar and extraalveolar vessels. During inflation from residual volume (RV) to total lung capacity (TLC), resistance to blood flow through alveolar vessels increases, whereas resistance through extraalveolar vessels decreases. Thus, changes in total pulmonary vascular resistance form a U-shaped curve during lung inflation, with the nadir at FRC.

Distribution of Blood Flow

- Influenced by gravity (upright posture)
  - Increases from apex (top) to base (bottom)
    - Blood from PA travels “up” to apex
      - Pressure loss, reduced drive
    - Blood from PA travels “down” to base
      - Increased pressure, increased drive
    - Pulmonary alveolar pressure affects capillary resistance

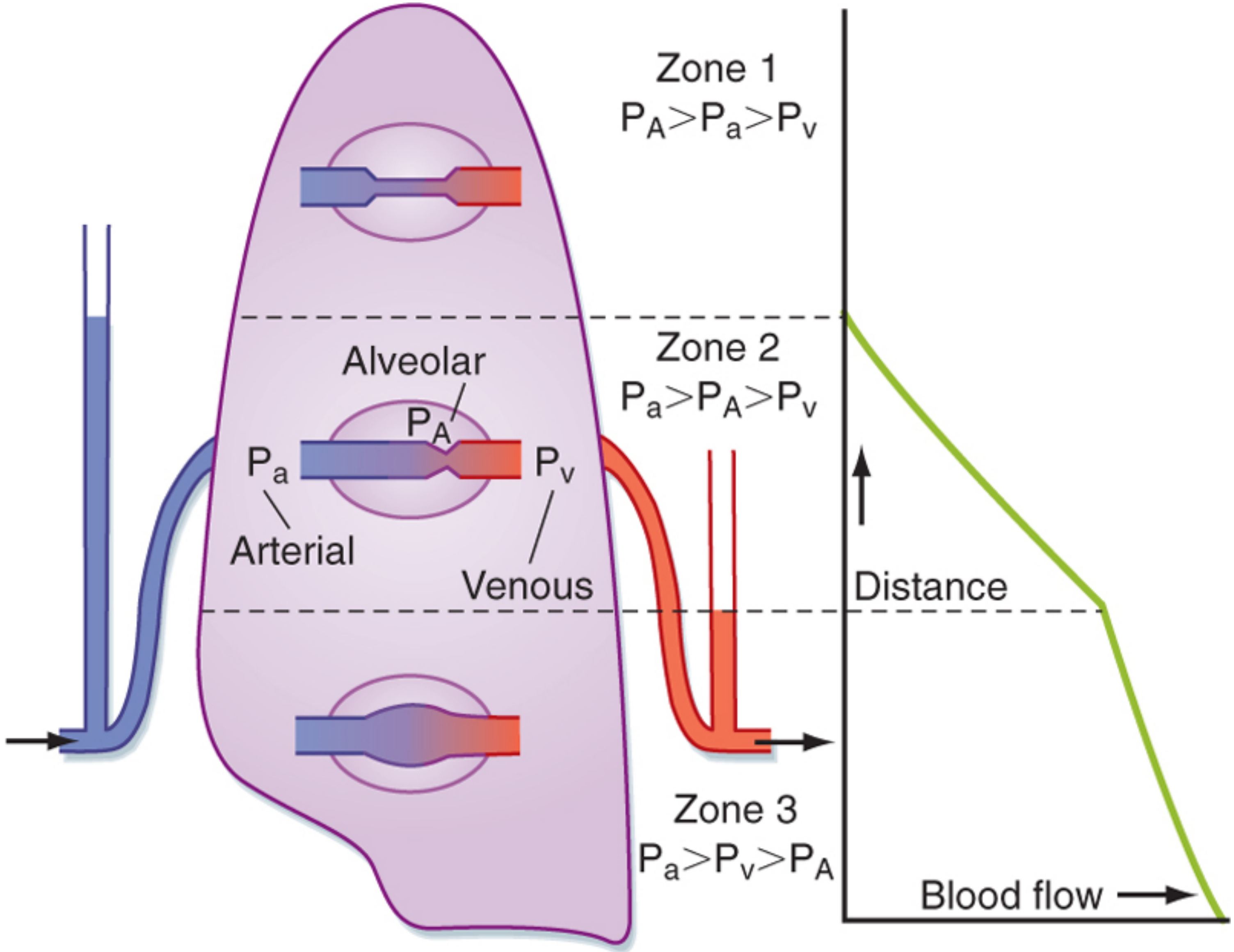


Figure 22-9 Model to explain the uneven distribution of blood flow in the lung based on the pressures affecting the capillaries. (From West JB et al: J Appl Physiol 19:713, 1964.)

END

Video 2, Module 12