

JULY 2008
QUESTION 24

Describe the gravity dependent processes which affect pulmonary blood flow (70% of marks). Describe the changes that result from an acute increase in pressure in the pulmonary vessels (30% of marks).

Pulmonary blood flow

Equal to cardiac output 5000ml/min

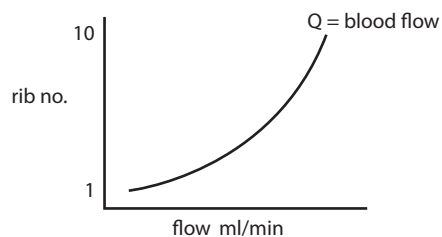
Is a low resistance, low pressure system

May act as a reservoir, via distension and recruitment

No autoregulation, some local metabolic control (HPV), some extrinsic neural and hormonal control

Gravity is the main factor which determines pulmonary blood flow

increases from the apex to the base



described using West's Zones of the Lung

- | | |
|--------|---|
| Zone 1 | arterial pressure < alveolar pressure > venous pressure
no flow to alveoli (dead space) |
| Zone 2 | arterial pressure > alveolar pressure > venous pressure
blood flows downstream (normal situation) |
| Zone 3 | arterial pressure > alveolar pressure < venous pressure
blood flows downstream but alveolar compressed (shunt) |
| Zone 4 | extra alveolar pressure exceeds arterial pressure and flow ceases
at the very base of the lung (no ventilation or perfusion) |

During an acute increase in pulmonary artery pressure

There is recruitment and distension of the vasculature

blood volume is increased

Subsequently the flow will increase according to the equation $\text{flow} = \frac{\Delta \text{pressure}}{\text{resistance}}$

Respiratory changes

Increased V/Q mismatch due to most of the changes happening at the base (Zone 3)

Cardiac changes

Right heart pressure increases and the right ventricle behaves more like the left

coronary flow increases in diastole and decreases in systole

Transient increase in preload, followed by reduction secondary to reduced venous return

Venous congestion noted in liver, peripherally