

## Pulmonary Vascular Disease

## Pulmonary Circulation

- Dual supply
  - Pulmonary arteries
  - Bronchial arteries
- Low pressure system
- Pulmonary artery receives entire cardiac output (a filter)

## Low pressure system....

- Thin walled vessels
- Low incidence of atherosclerosis

At normal pressures

## Pulmonary Oedema

- Accumulation of fluid in the lung
  - Interstitium
  - Alveolar spaces
- Causes a restrictive pattern of disease

## Pulmonary Oedema (causes)

1. Haemodynamic ( ↑ hydrostatic pressure)
2. Due to cellular injury
  - i. Alveolar lining cells
  - ii. Alveolar endotheliumLocalised – pneumonia  
Generalised – adult respiratory distress syndrome (ARDS)

## Increased pulmonary venous pressure

- Left ventricular failure
  - Mitral stenosis
  - Mitral incompetence
- Pressure increase forces fluid into interstitial space. Initially compensated by lymphatic drainage

## Development of pulmonary oedema

- Fluid builds up first in interstitial space "stiff lung"
- Eventually gets into alveolar space

## Pulmonary Embolus

- Common
- Often subclinical
- An important cause of sudden death and pulmonary hypertension

95% + of emboli are thromboemboli

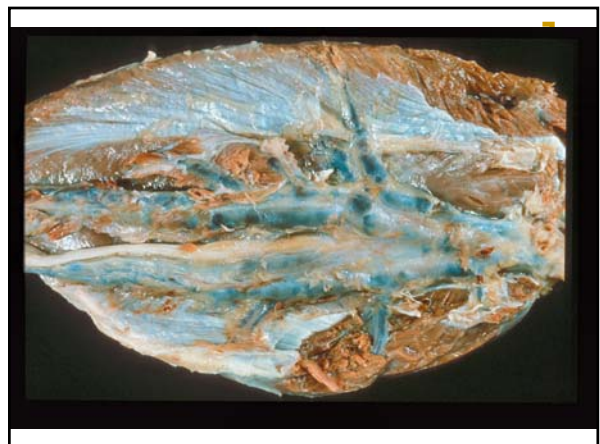


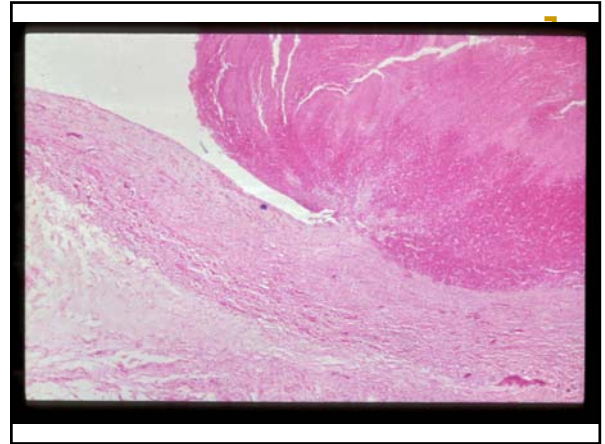
## Embolus

- A detached intravascular mass carried by the blood to a site in the body distant from its point of origin
- Most emboli are thrombi – others include gas, fat, foreign bodies and tumour clumps

## Source of most pulmonary emboli.....

- Deep venous thrombosis (DVT) of lower limbs





**[ Risk factors for PE are those for DVT... ]**

1. Factors in vessel wall (eg endothelial hypoxia)
2. Abnormal blood flow (venous stasis)
3. Hypercoaguable blood (cancer patients, post-MI etc)

- Virchow's triad

**[ Effects of PE ]**

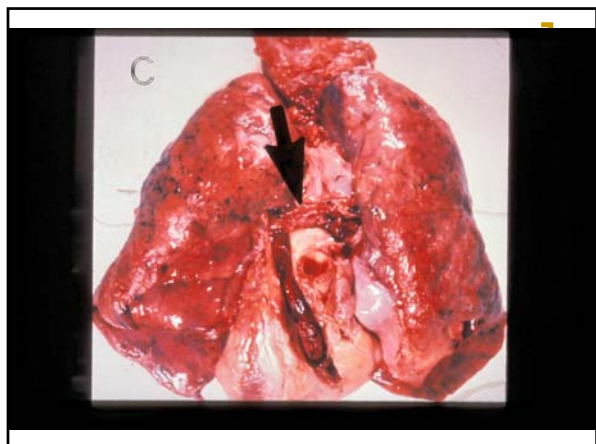
- Sudden death
- Severe chest pain/dyspnoea/haemoptysis
- Pulmonary infarction
- Pulmonary hypertension

**[ Effects of PE depend on... ]**

- Size of embolus
- Cardiac function
- Respiratory function

**[ Effect of embolus size... ]**

<ul style="list-style-type: none"> <li>■ Large emboli           <ul style="list-style-type: none"> <li>○ Death</li> <li>○ Infarction</li> <li>○ Severe symptoms</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>■ Small emboli           <ul style="list-style-type: none"> <li>○ Clinically silent</li> <li>○ Recurrent → pulmonary hypertension</li> </ul> </li> </ul>
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### Pulmonary Infarct (ischaemic necrosis)

- Embolus necessary but not sufficient
- Bronchial artery supply compromised (eg in cardiac failure)

### Pulmonary Embolus



### Pulmonary infarct – *tumour* embolus



### Pulmonary Hypertension

- Primary (rare, young women)
- Secondary

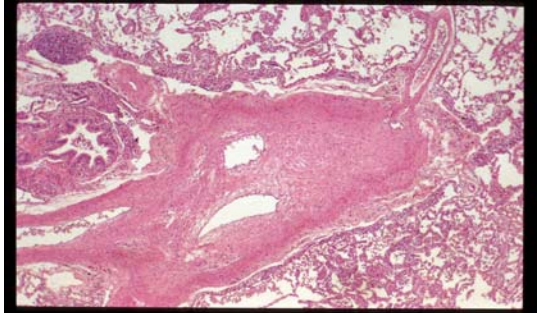
### Pulmonary Hypertension (mechanisms)

- Hypoxia (vascular constriction)
- Increased flow through pulmonary circulation (congenital heart disease)
- Blockage (PE) or loss (emphysema) of pulmonary vascular bed
- Back pressure from left sided heart failure

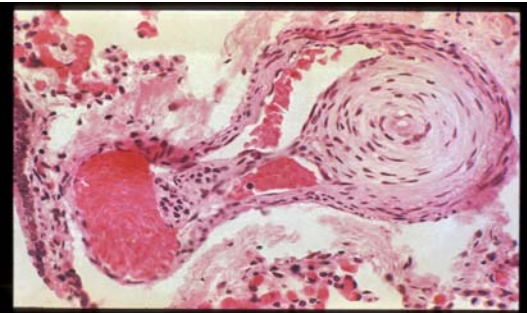
### Morphology of pulmonary hypertension

- Medial hypertrophy of arteries
- Intimal thickening (fibrosis)
- Atheroma
- Right ventricular hypertrophy
- Extreme cases (congenital heart disease, primary pulmonary hypertension) – plexogenic change/necrosis

### Pulmonary artery – intimal fibrosis



### Plexiform lesion – primary pulmonary hypertension



### “Cor Pulmonale”

- Pulmonary hypertension complicating lung disease
- Right ventricular hypertrophy
- Right ventricular dilatation
- Right heart failure (swollen legs, congested liver etc)

### Right ventricular hypertrophy and dilatation



### Pulmonary vasculitis

- Arteritis with ischaemia and focal necrosis – Wegeners granulomatosis, polyarteritis nodosa
- Anti basement membrane antibodies (Goodpasture’s disease)

[ Wegeners granulomatosis ]

