



# EMBOLISM

Dr. Deepak K. Gupta

# Introduction

- process of partial or complete obstruction of some part of the cardiovascular system by any mass carried in the circulation;
- transported intravascular mass detached from its site of origin is called an ***embolus***
- emboli (90%) are thromboemboli



# Classification

- **Depending upon the matter in the emboli**
  - **Solid:** detached thrombi (thromboemboli), atheromatous material, tumour cell clumps, tissue fragments, parasites, bacterial clumps, foreign bodies.
  - **Liquid:** fat globules, amniotic fluid, bone marrow.
  - **Gaseous:** air or other gases.
- **Depending upon whether infected or not: Sterile or Septic**
- **Depending upon the source of the emboli:**
  - **Cardiac emboli:** left atrium and atrial appendages, infarct in the left ventricle, vegetations of endocarditis.
  - **Arterial emboli :** systemic arteries in the brain, spleen, kidney, intestine
  - **Venous emboli:** pulmonary arteries.
  - Lymphatic emboli can also occur.



# Thromboembolism

- A detached thrombus or part of thrombus constitutes the most common type of embolism.
- It may be either **Arterial (systemic)** or **Venous**

Arterial thromboembolism	Venous thromboembolism
<b>HEART (most common)</b> Mural thrombi (left atrium, left ventricle) Vegetative mural endocarditis Valvular endocarditis Prosthetic heart valve Cardiomyopathy	<b>SYSTEMIC</b> Deep vein thrombosis (most common) Pelvic veins Cavemous sinus
<b>LUNGS</b> Pulmonary veins	<b>HEART</b> Right side of heart
<b>SYSTEMIC</b> Aortic atherosclerosis Carotid atherosclerosis Aortic aneurysm	<b>LUNGS</b> Pulmonary artery

# Systemic Thromboembolism

- refers to emboli in the arterial circulation
- Most (80%) arise from intracardiac mural thrombi,
  - two-thirds of which are associated with **left ventricular wall infarcts**
  - Another quarter with dilated left atria
- The remainder originate from **aortic aneurysms, thrombi on ulcerated atherosclerotic plaques, or fragmentation of valvular vegetations**
- A very small fraction of systemic emboli appear to arise in veins but end up in the arterial circulation, through interventricular defects - ***paradoxical emboli***

# Systemic Thromboembolism

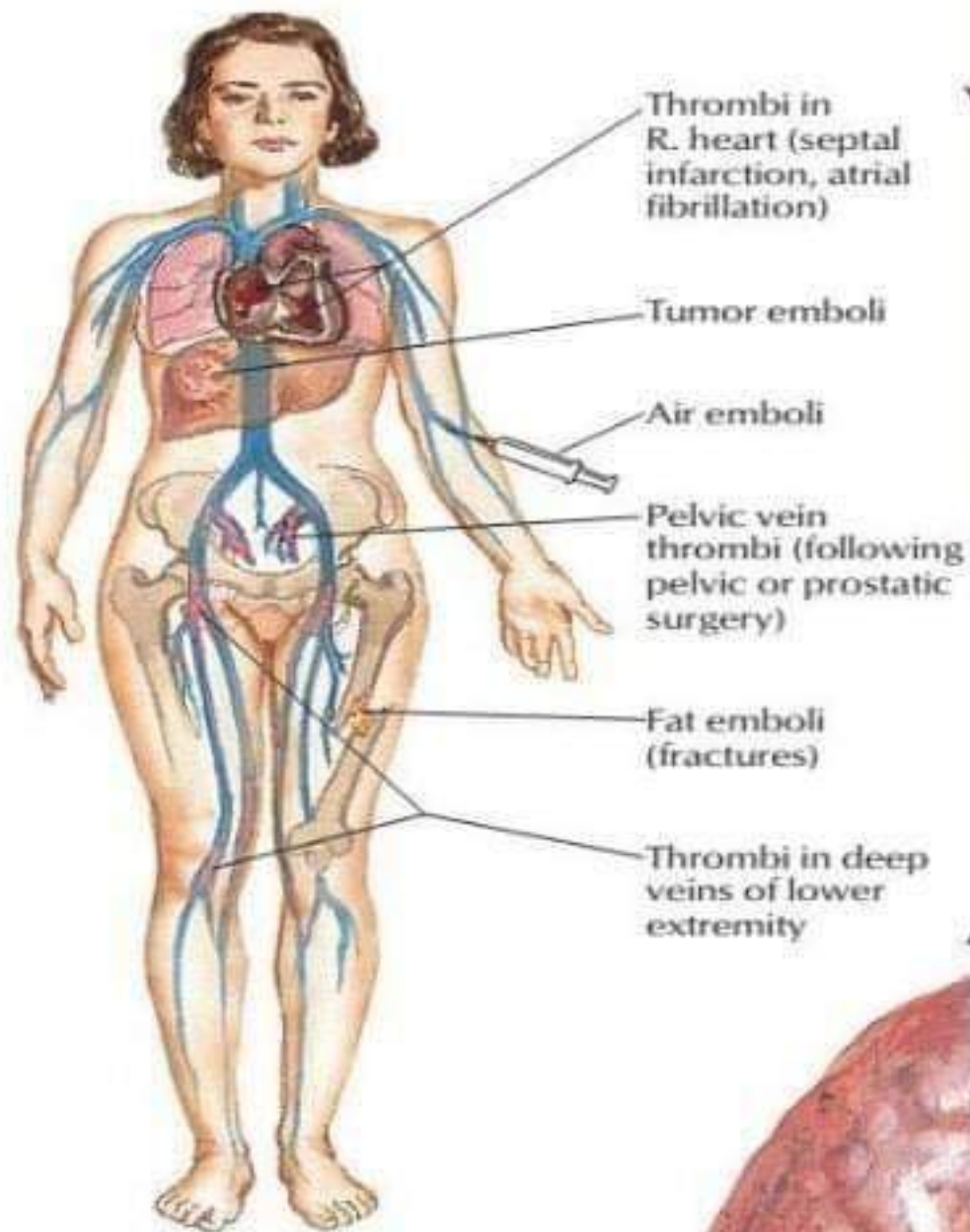
- Can travel to a wide variety of sites as compared to **venous emboli**
- Site of arrest depends on the **point of origin** of the thromboembolus and the **relative blood flow** through the downstream tissues
  - lower extremities (75%)
  - brain (10%),
  - Rest: intestines, kidneys, and spleen affected to a lesser extent
- The consequences of embolization in a tissue depend on
  - vulnerability to ischemia,
  - caliber of the occluded vessel,
  - collateral blood supply
- In general, it causes infarction

# Pulmonary Thromboembolism

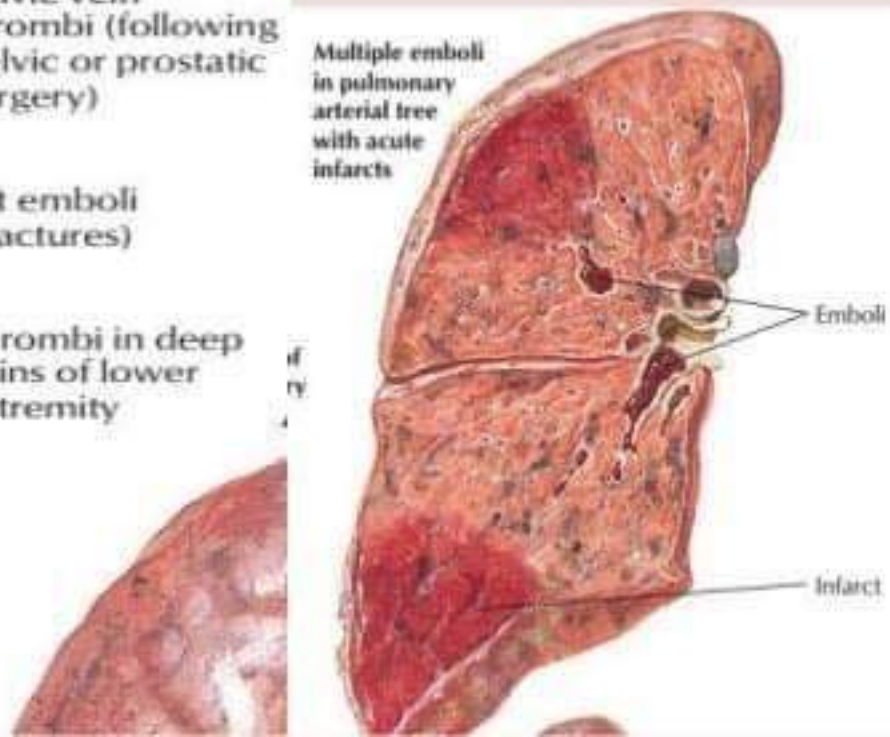
- Most common and fatal form of venous thromboembolism in which there is occlusion of **pulmonary arterial tree**
- **ETIOLOGY**
  - more common in hospitalised or bed-ridden patients,
  - though they can occur in ambulatory patients as well
    - originating from large veins of lower legs
    - Less common varicosities of superficial veins of the legs, and pelvic veins



# Sources of Pulmonary Embolism



Multiple emboli in pulmonary arterial tree with acute infarcts



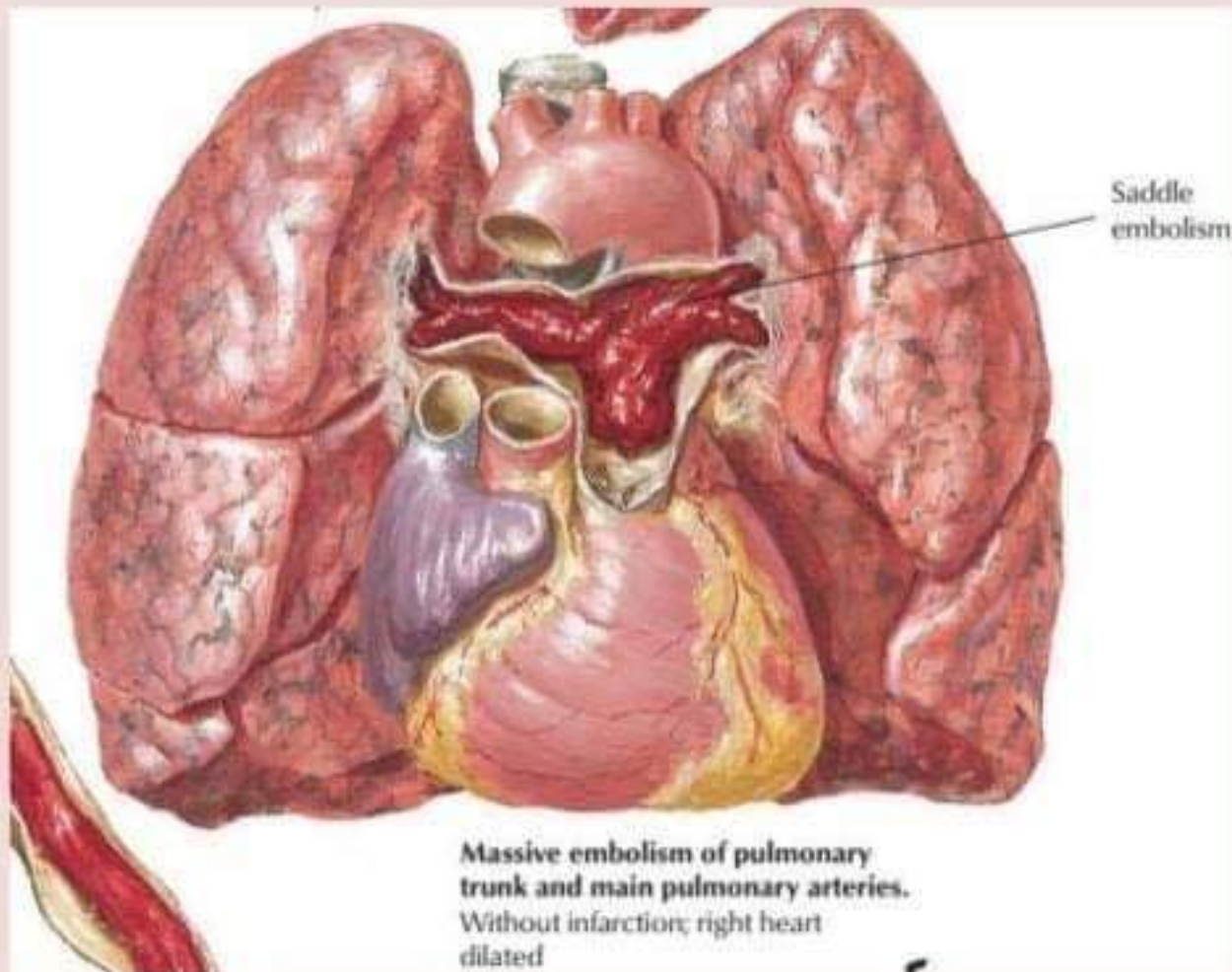


# Pulmonary Thromboembolism:

## Consequences

- **Resolution:** Vast majority of small pulmonary emboli (60-80%) are resolved by fibrinolytic activity
- **Acute cor pulmonale**
  - Numerous small emboli may obstruct most of the pulmonary circulation resulting in **acute right heart failure**.
  - Release of vasoconstrictor substances from platelets
  - Reflex vasoconstriction of pulmonary vessels

# Acute cor pulmonale

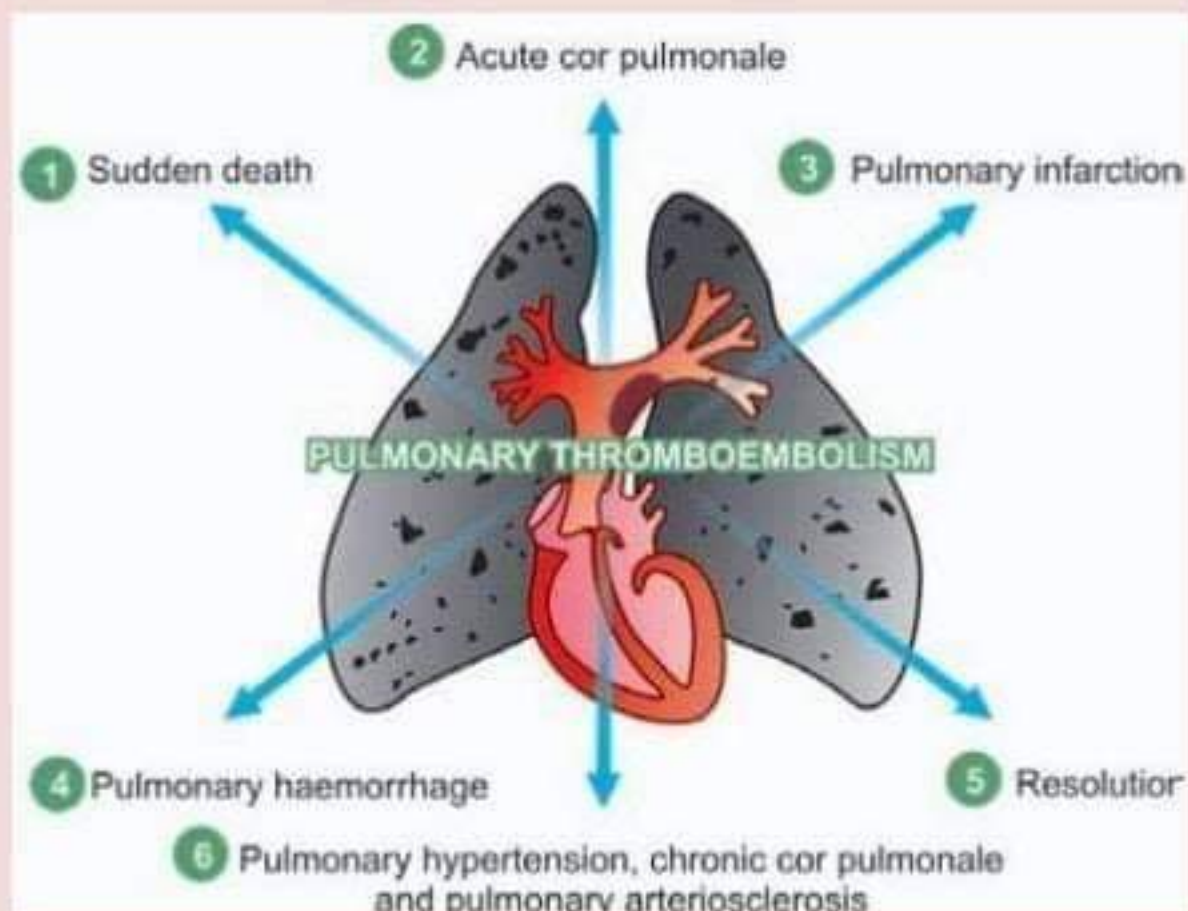


# **Pulmonary Thromboembolism: Consequences**

- **Pulmonary infarction:** Obstruction of relatively small sized pulmonary arterial branches may result in pulmonary infarction
- **Pulmonary haemorrhage**
- **Pulmonary hypertension, chronic cor pulmonale and pulmonary arteriosclerosis.**
- **Sudden death**



# Pulmonary Thromboembolism: Consequences



# Air Embolism

- Air embolism occurs when air is introduced into venous or arterial circulation.
- **VENOUS AIR EMBOLISM**
  - Operations on head and neck, and trauma
  - Obstetrical operations and trauma
  - Intravenous infusion of blood and fluid
  - Angiography.
- **ARTERIAL AIR EMBOLISM**
  - Cardiothoracic surgery and trauma
  - Paradoxical air embolism
  - Arteriography