

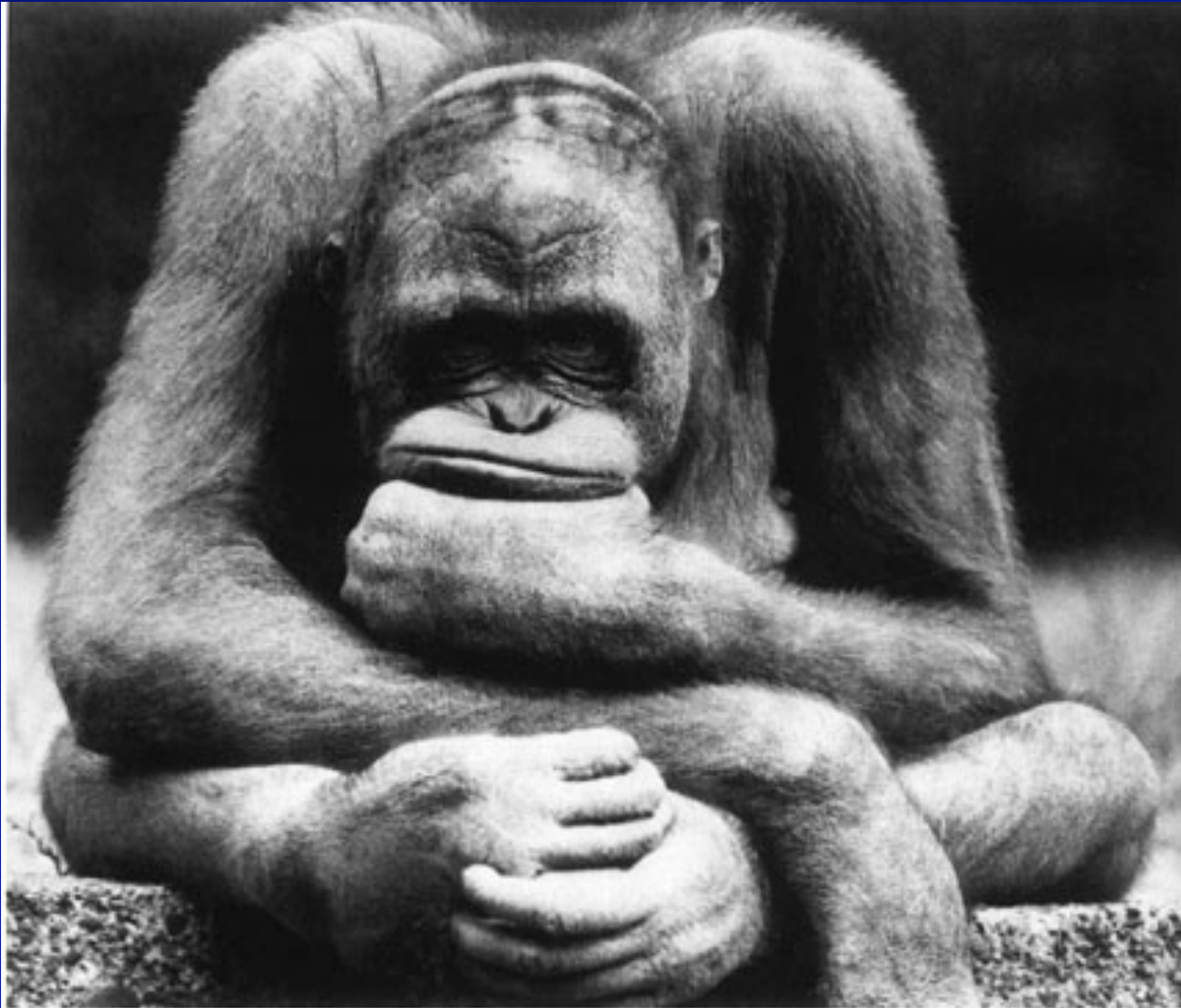
# Ischaemia & infarction

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- A 60 year old man presented with vague fatigue
- Chest discomfort and
- Malaise
- Relieved with rest

- A substernal tightening chest pain
- Radiating to the left arm and shoulder
- Not relieved with rest
- Associated with nausea and vomiting

# What is Ischaemia & Infarction ? ?



# Ischaemia

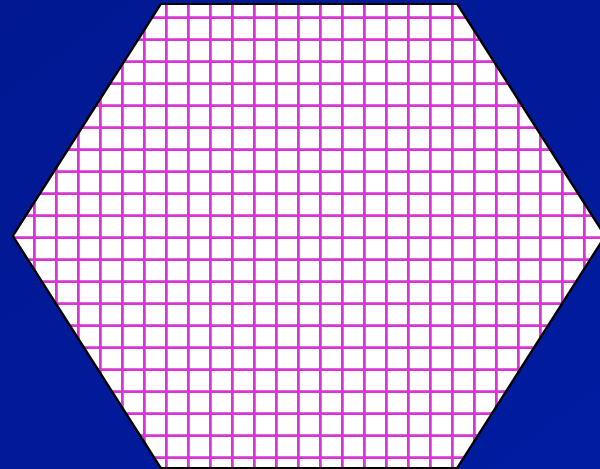
- Deficient blood supply
- Complete / partial
- Arterial obstruction is more important than venous obstruction.

# Ischaemia

- ***Causes*** - Thrombosis  
Embolism  
Atheroma  
Proliferation of the intima  
Arterial spasms

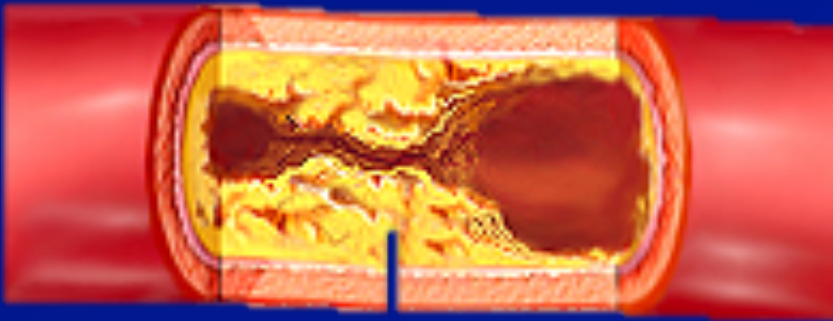
# Ischaemia

- Progressive narrowing → ischaemic fibrosis



# Infarction

- Cessation of blood flow necrosis (infarction)





# Susceptibility of tissues – blood supply

- Anatomy and physiology of the blood vessels
- Organs with a dual blood supply
- Liver – portal circulation
- Lung – pulmonary circulation

# Collateral circulation

- Neck arteries supplying circle of Willis
- Femoral artery with collaterals in the legs
- Mesenteric vessels form overlapping arcades

If the narrowing is gradual collaterals may develop in some organs e.g.heart

# End arteries

- Kidney
- Spleen
- Arteries beyond the circle of Willis

When arteries are narrowed a sudden drop in blood pressure causes reduction in perfusion which may lead to infarction.

# Tissue metabolism & Ischaemia

- Parenchymal cells are more susceptible than supporting tissue.
- Tissue – depending on exogenous fuel
  - - with a high metabolic rate
  - - depending on aerobic metabolism
- are susceptible to ischaemia

# Effects of ischaemia on cell metabolism

Reduced O<sub>2</sub>

Anaerobic respiration

Reduced ATP generation

ATPase cation pump affected

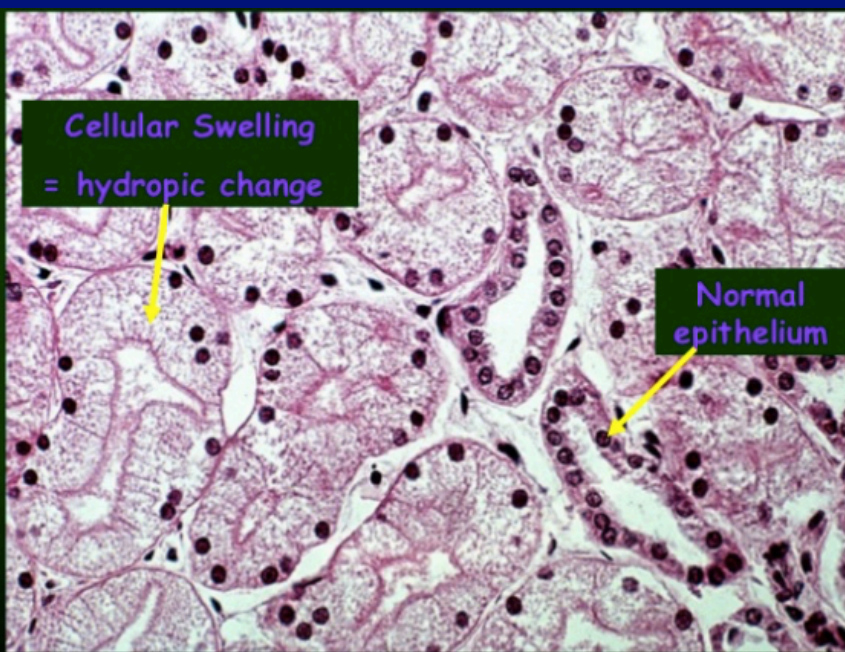
Cell swelling

Enzyme activity increases

Free radical injury

Necrosis

Membrane injury



# Reperfusion injury

- Restoration of blood supply may cause a paradoxical increase in cell injury due to free radicals.
- However restoration of blood supply reduce the mortality rate

# Infarction

- Tissue necrosis due to reduction / loss of blood supply.
- Usually due to obstruction of arteries by thrombosis or embolism.
- Occasionally due to obstruction of a draining vein. (venous infarct)

# Factors that influence the development of an infarct

1. Nature of the vascular supply
2. Rate of the development of the occlusion
3. Vulnerability of a given tissue to hypoxia
4. O<sub>2</sub> content of the blood

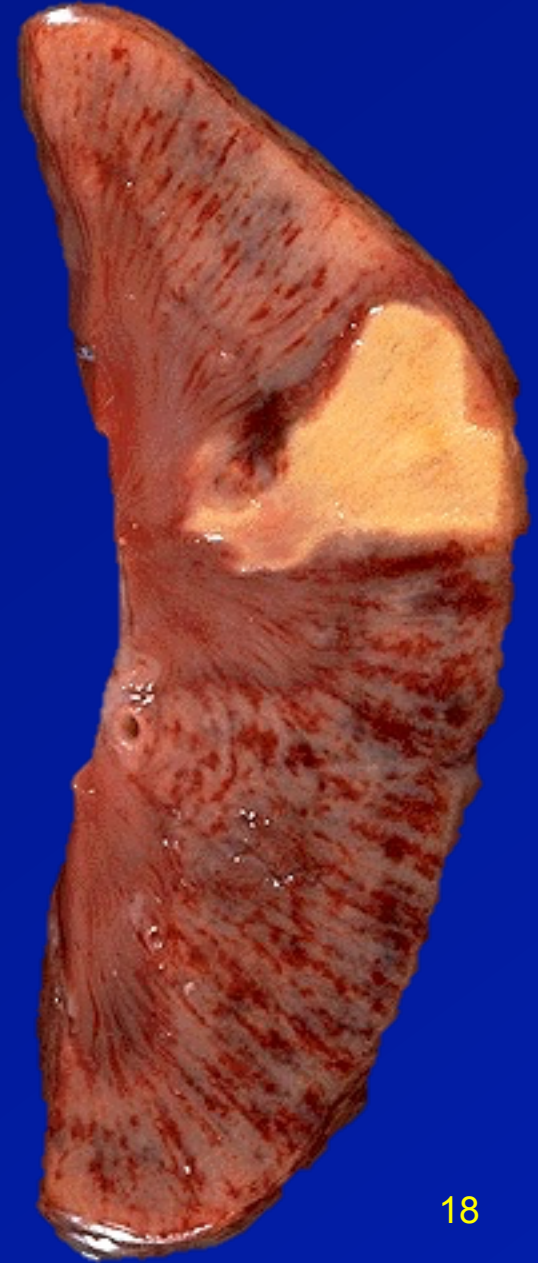


# General features

- Pale / red
- sterile / septic
- Undergo coagulative / colliquative necrosis.
- Size depends on -
- Amount of tissue affected
- Severity and
- Duration
- Susceptibility of the cells to hypoxic injury

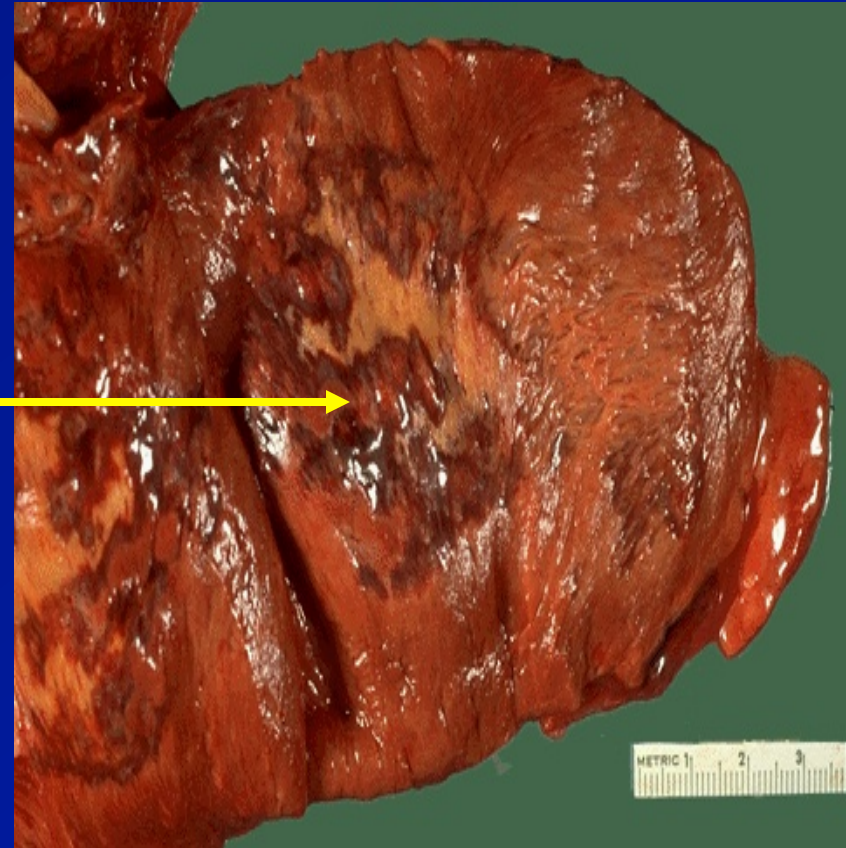
# Macroscopy

- No histological changes during the first few hours
- Wedge shaped in many organs  
Base in the periphery



# Macroscopy

- Overlying fibrinous exudate.
- Initially – poorly defined
- Slightly haemorrhagic
- Narrow rim of hyperaemia at the margin
- Pale / red
- Later – fibrous scar



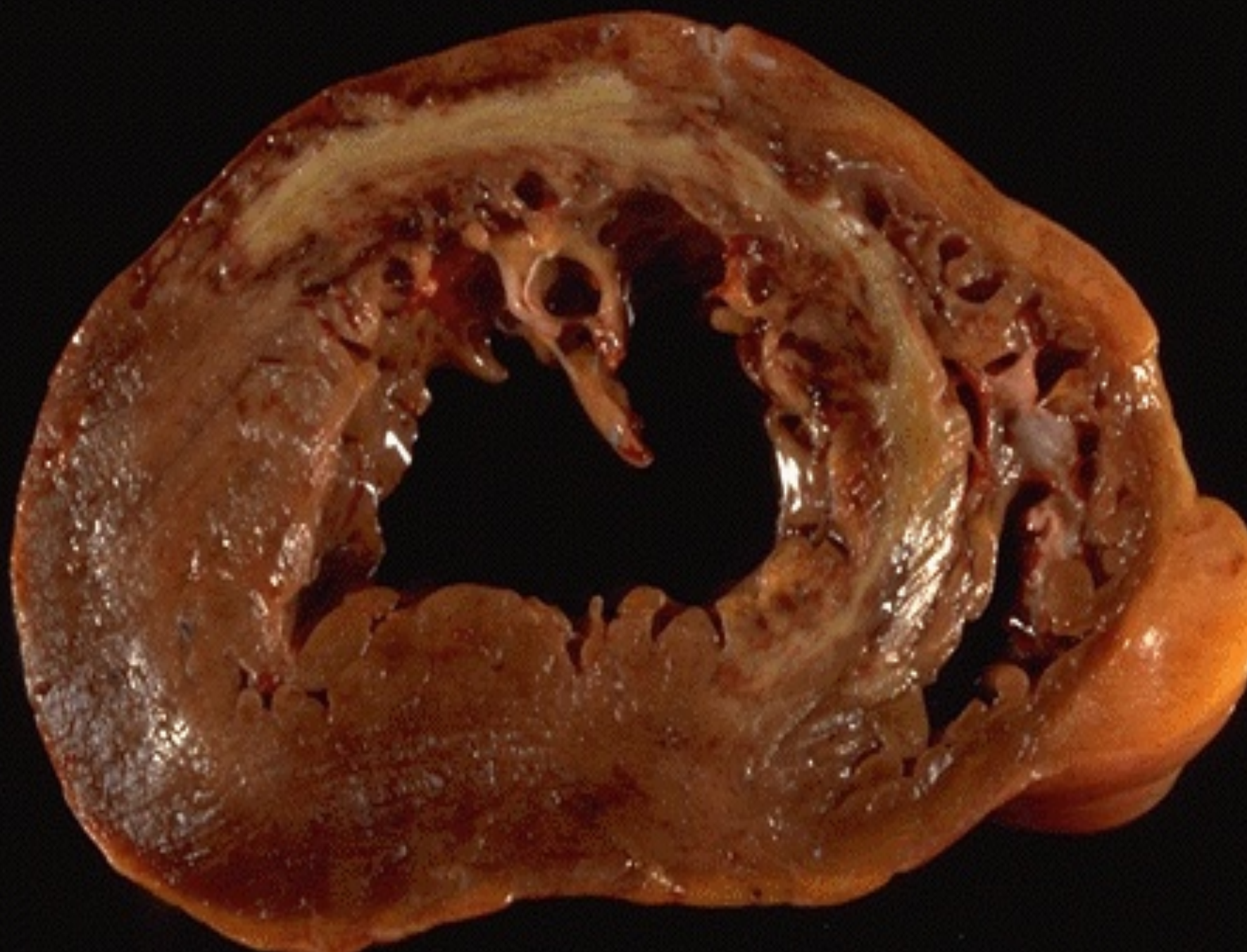
# Microscopy

- initially cells are swollen
- margin – acute inflammatory reaction
  - vascular congestion
  - oedema
- Polymorphs and macrophages enter the dead tissue
- granulation tissue grows in
- later – fibrous scar forms

# Pale infarct

- In solid organs (Heart , spleen , kidney)
- Tissue limits the amount of haemorrhage that can seep in.





# Myocardial infarction

- Usually from occlusive thrombosis of an existing atheromatous narrowing
- Coagulative necrosis replaced by scar tissue
- Less commonly - subendocardial infarction

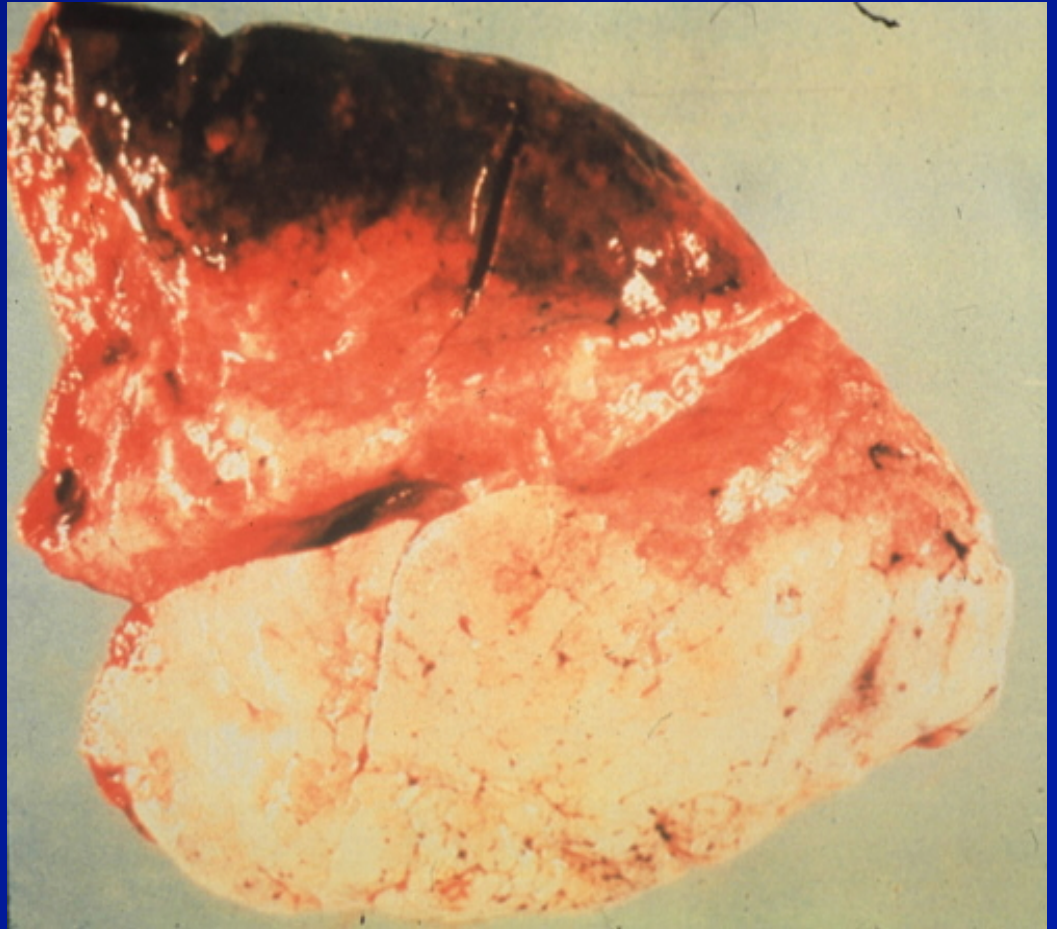
# Red infarct

- a)venous infarct
- b) loose tissue ( lung )
- c)tissue with dual circulation (lung , SI)
- d)congested tissue
- e)when blood flow is re established following arterial occlusion



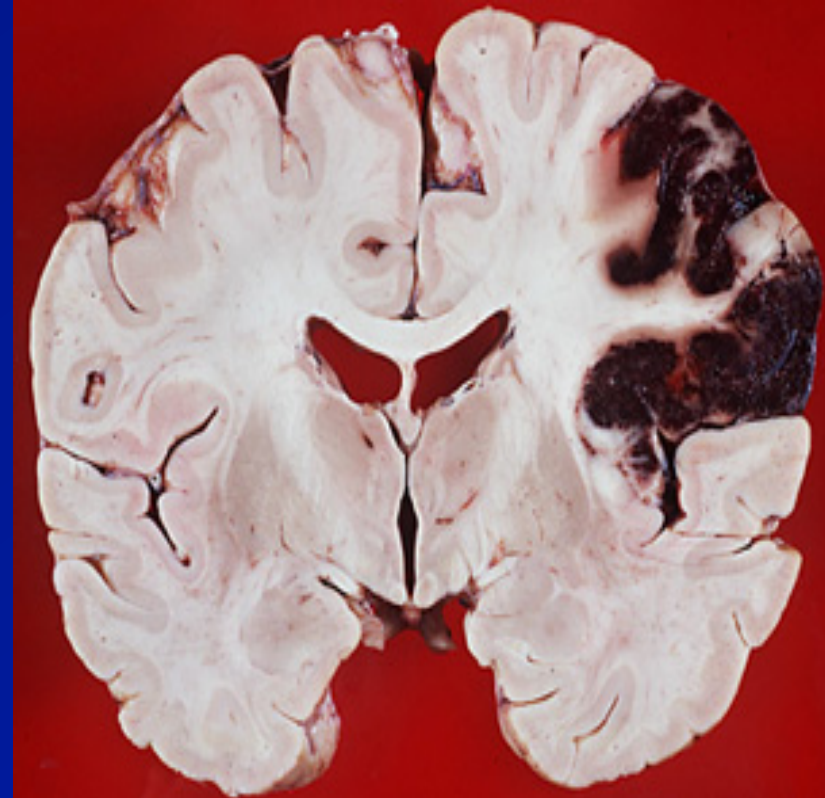
# Lung infarction

- red infarction
- conical shape



# Cerebral infarction

- Pale / haemorrhagic
- colliquative necrosis
- debris removed by macrophages
- residual cavity remains



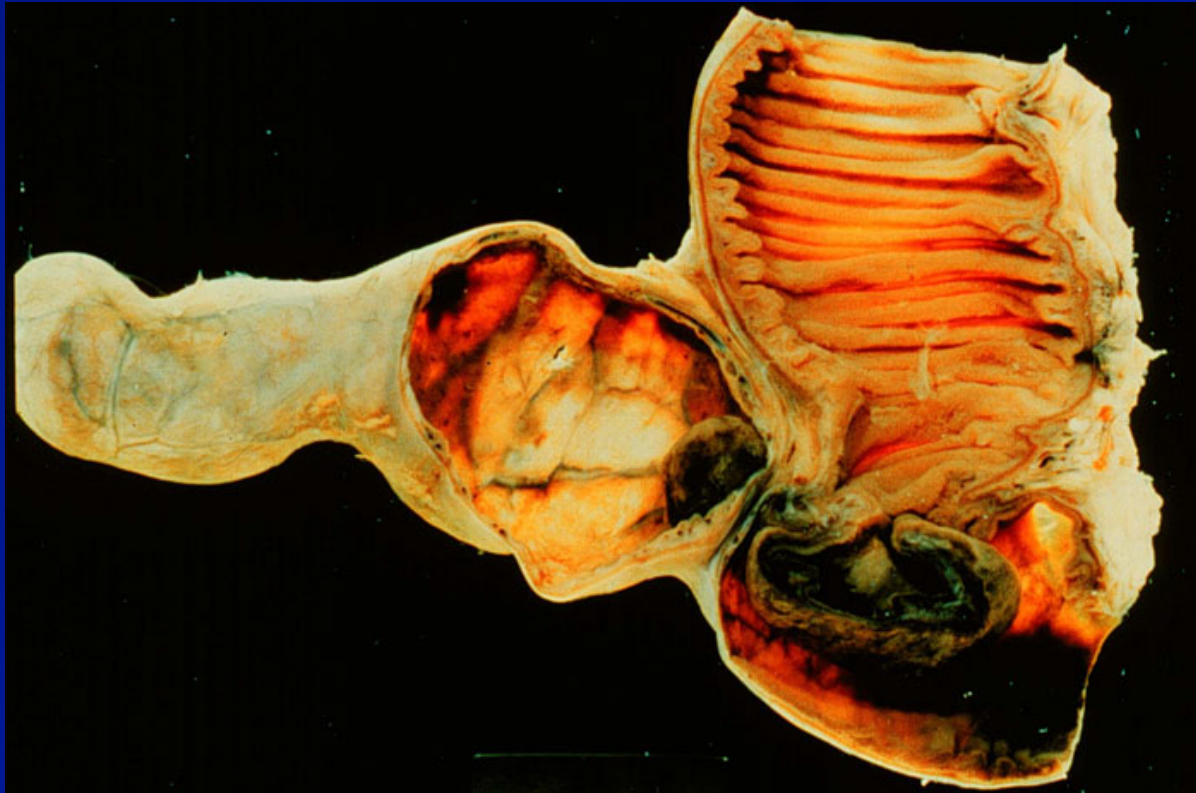
# Splenic / kidney infarct

- pale infarct
- conical shape



# Intestinal infarction

- occlusion of a major artery
- occlusion of mesenteric vein



# Venous infarction

## Ovary and testes

- Acute renal vein thrombosis – kidney infarct
- Marantic thrombosis of the superior longitudinal sinus in severely debilitated children
- Venous infarction of the gut



# Septic infarction

- Infarct caused by septic emboli



