ISCHEMIC HEART DISEASE - 2

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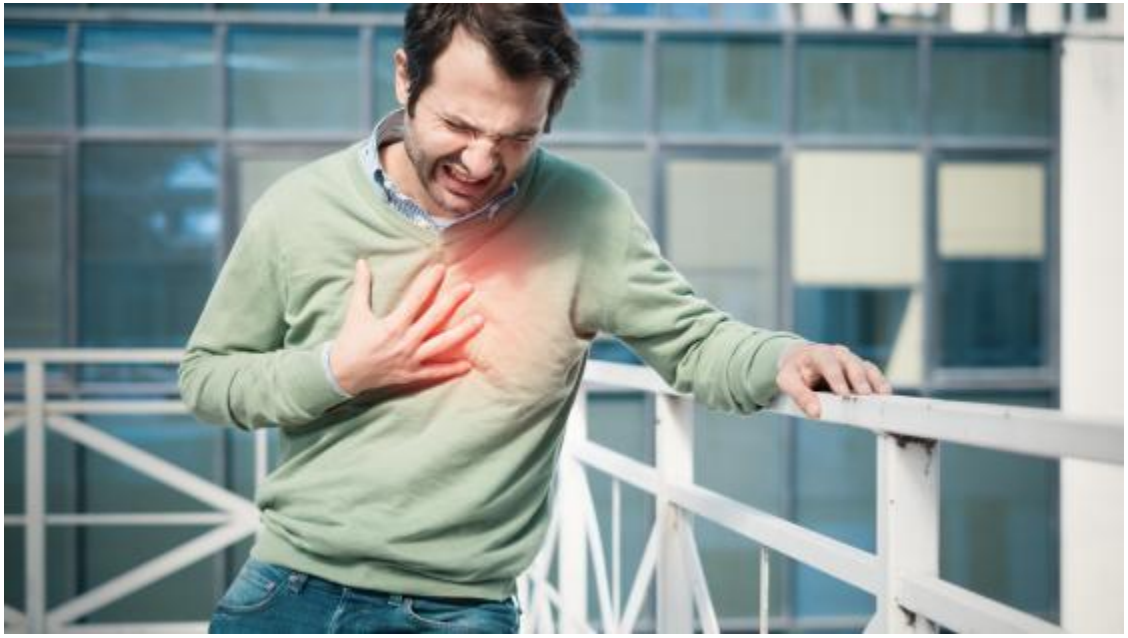
Clinical Features of acute MI



Clinical Features of MI

- Severe, crushing substernal chest pain
- radiates to neck, jaw, epigastrium, or left arm
- rapid and weak pulse
- nausea (posterior MI)
- cardiogenic shock (>40% of lt ventricle)
- dyspnea (pulmonary congestion & edema)

- **silent infarcts: (**10% - 15% of MIs)

- **Silent infarcts:**
- 10% -15% are asymptomatic
- particularly in:

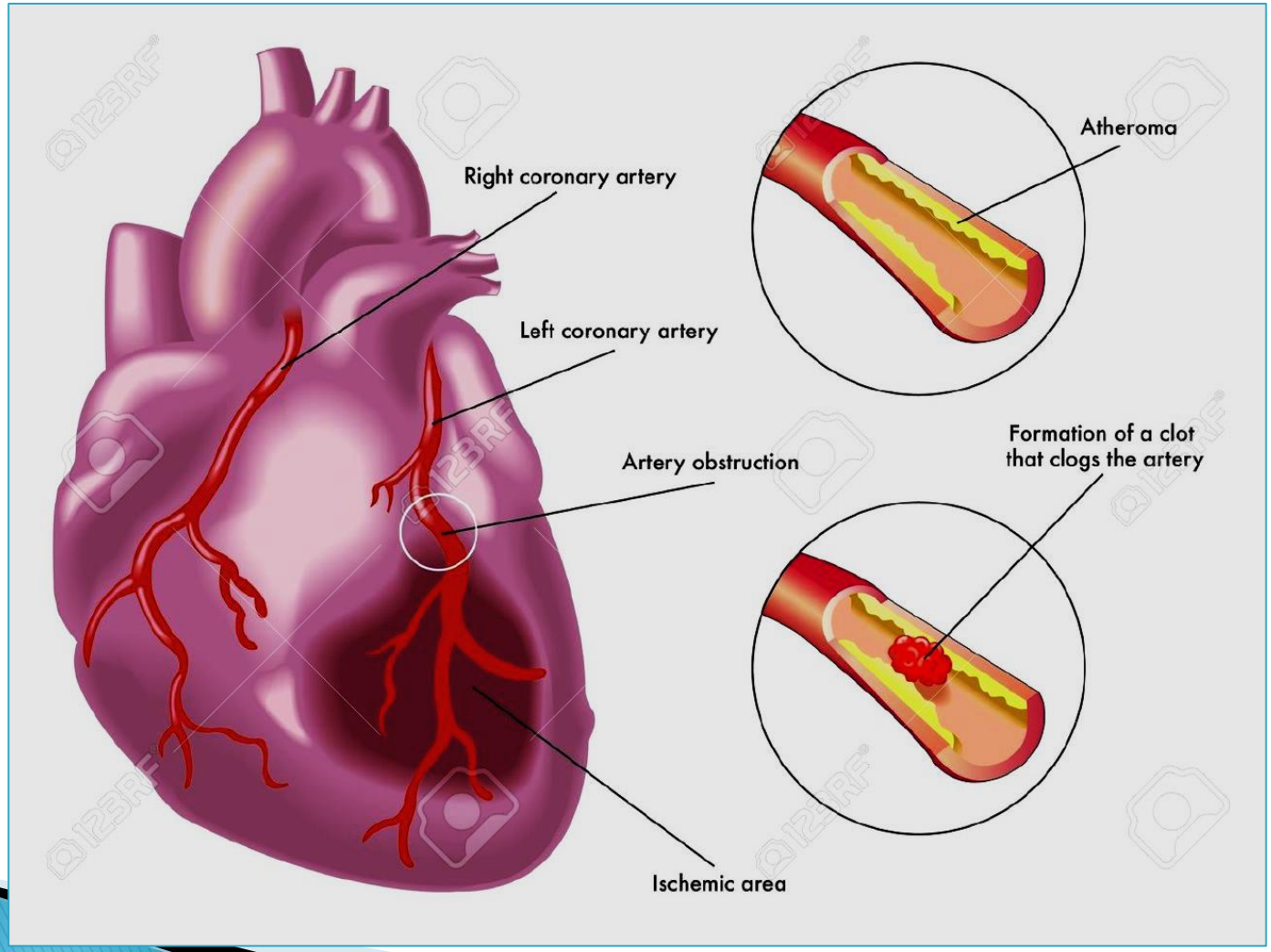
  1- DM (peripheral neuropathies)

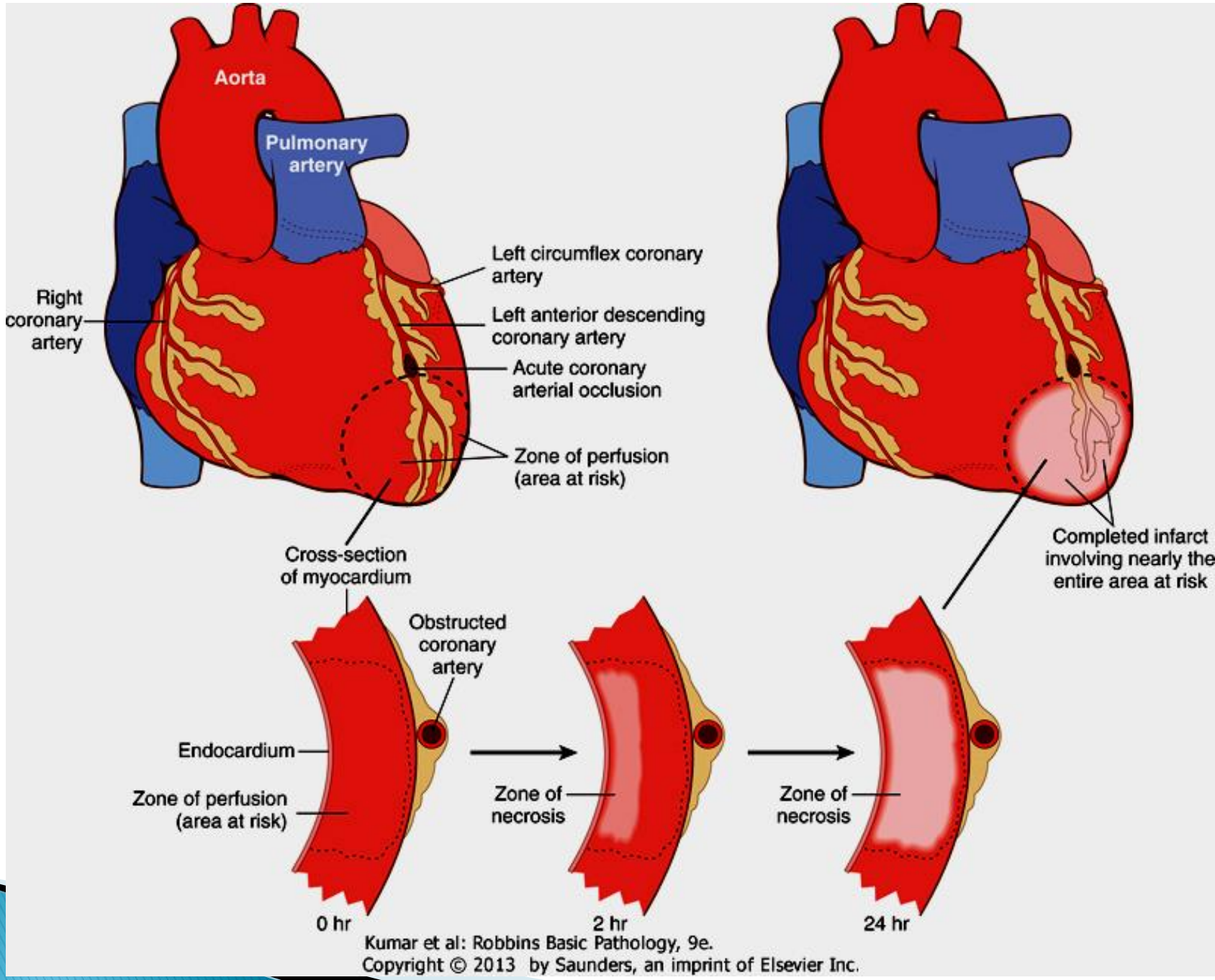
  2- the elderly

Myocardial Infarction

- MI = *heart attack*
- *necrosis of heart muscle due to ischemia*
- significant cause of death worldwide
- < 50% die before hospitalization➔ lethal arrhythmia ➔ Sudden Cardiac Death
- **Arrhythmias are caused by electrical abnormalities of the ischemic myocardium and conduction system**

Acute occlusion of left anterior descending (LAD) artery is the cause of *50% of all MI*




Aorta
Pulmonary artery
Left circumflex coronary artery
Right coronary artery
Left anterior descending coronary artery
Acute coronary arterial occlusion
Zone of perfusion (area at risk)
Completed infarct involving nearly the entire area at risk
Cross-section of myocardium
Obstructed coronary artery
Endocardium
Zone of perfusion (area at risk)
Zone of necrosis
Zone of necrosis
0 hr
2 hr
24 hr
Kumar et al: Robbins Basic Pathology, 9e.
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Evaluation of MI

- *Clinical signs and symptoms*
- *Electrocardiographic(ECG) abnormalities*
- ***Laboratory evaluation:***

  blood levels of certain cardiac intracellular macromolecules that leak out of injured myocardial cells through damaged cell membranes.

Cardiac enzymes in MI

1- Cardiac Troponins T and I (TnT, TnI): the **best** markers for acute MI

2- Creatine kinase (CK, and more specifically the myocardial-specific isoform, CK-MB): the **second best**

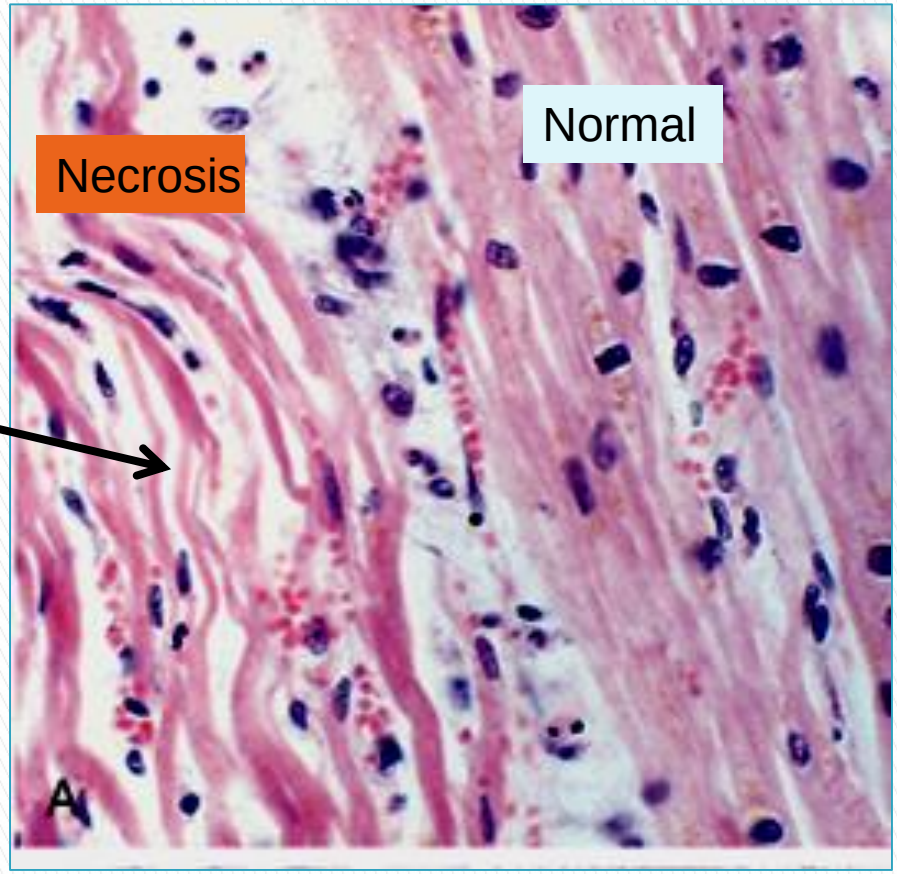
3- Lactate dehydrogenase

4- Myoglobin

Microscopic changes of MI & its repair

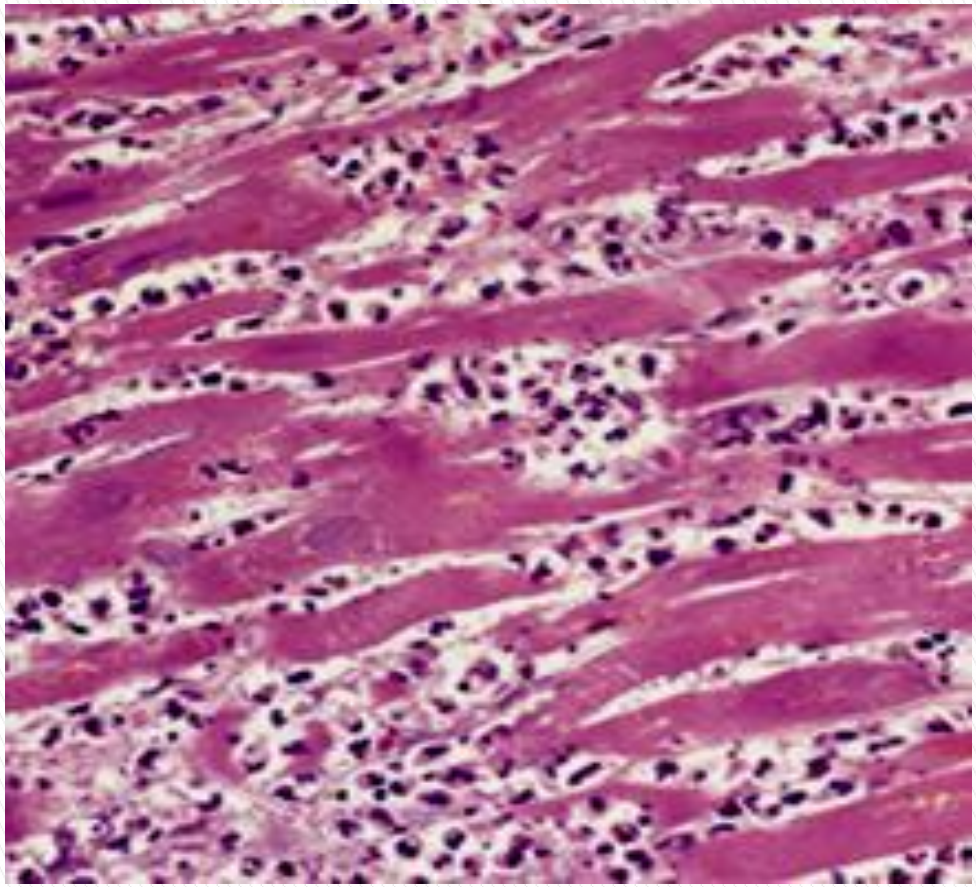
- **(<24 hr)➔** coagulative **necrosis** and **wavy fibers**
- **(2- to 3-day) old - infarct➔ neutrophil** infiltrate
- **(7 to 10 days)➔** phagocytic **macrophages** remove necrotic tissue
- **up to 14 days➔ Granulation tissue** (loose connective tissue and abundant capillaries)
- **several weeks➔** Healed MI (collagenous **scar)**

(<24 hr): coagulative **necrosis** and **wavy fibers**

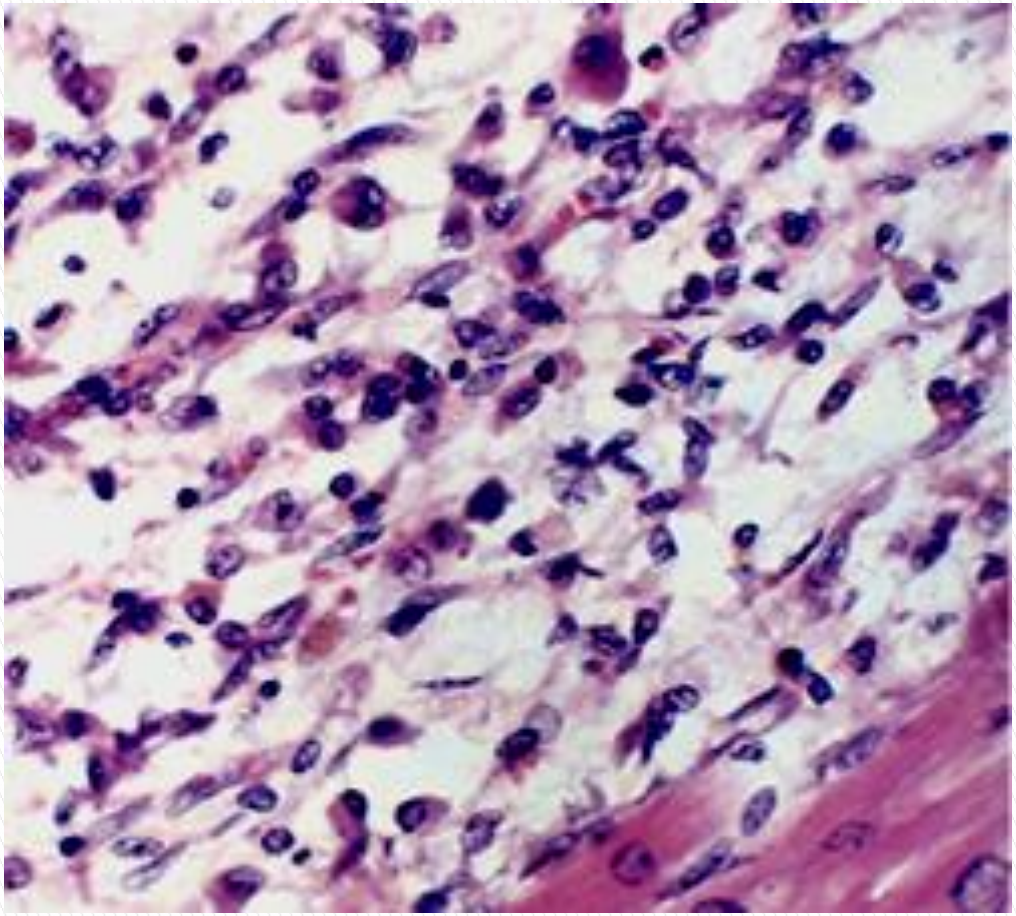


2- 3 day old – infarct:

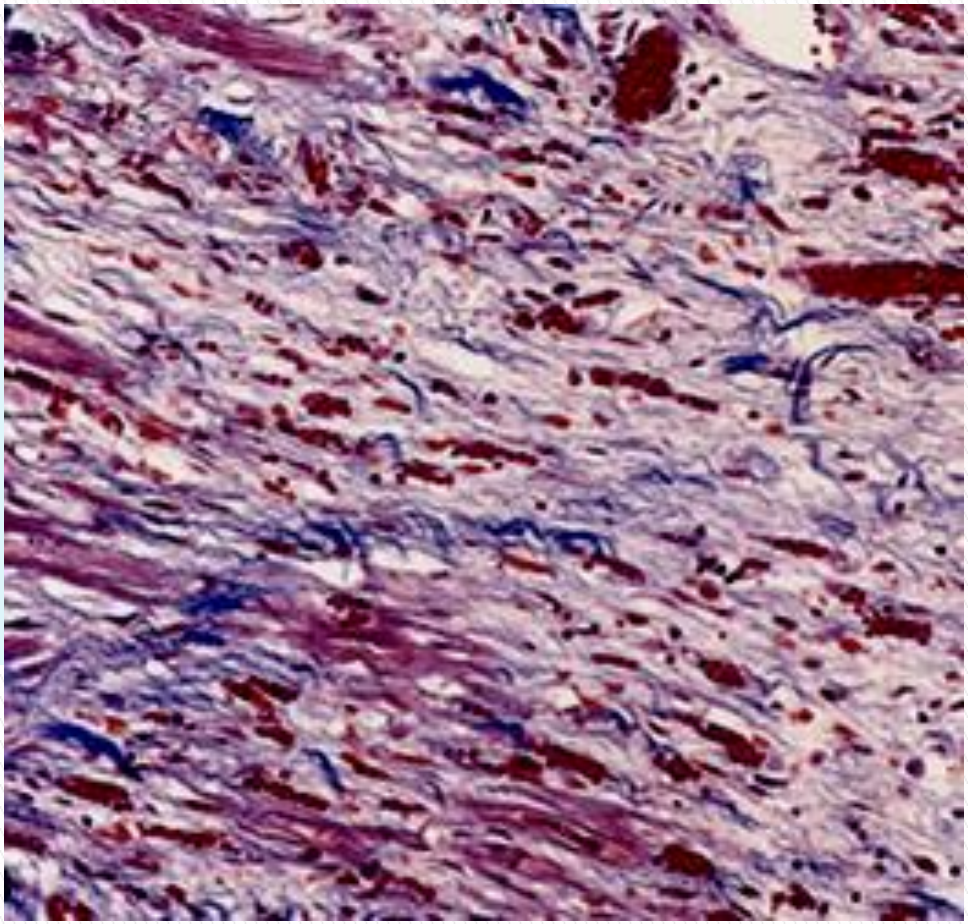
Dense **neutrophil** infiltrate



7 to 10 days: complete removal of necrotic tissue by **macrophages**

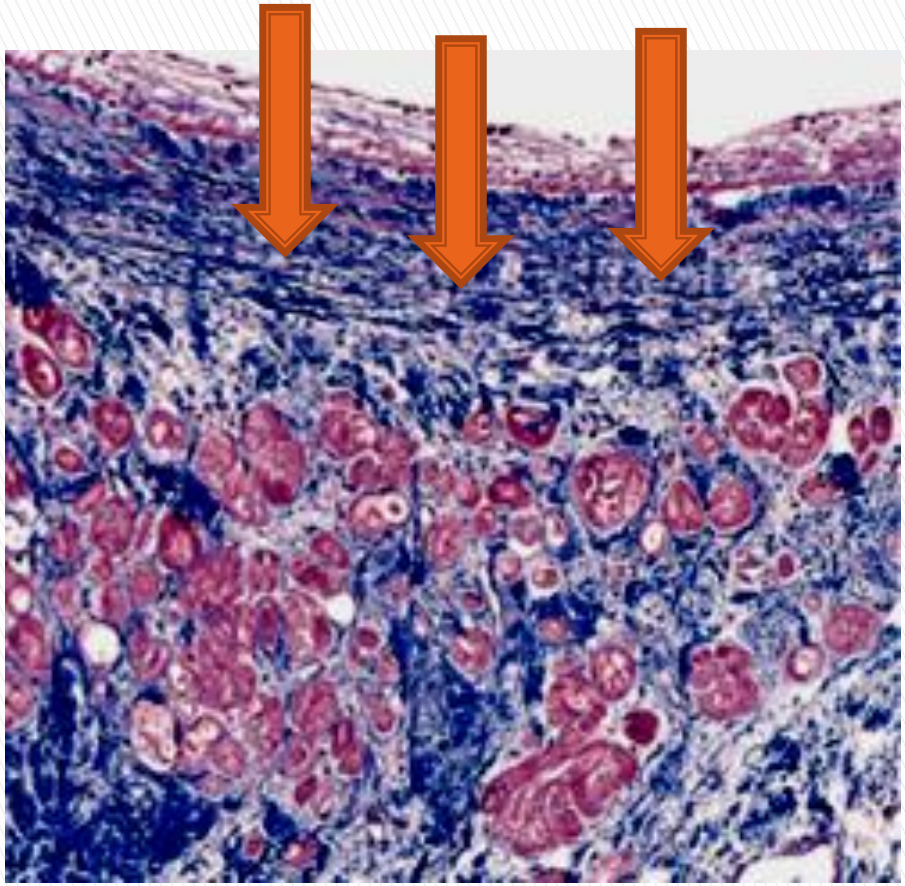


up to 14 days: **Granulation tissue** =loose connective tissue (blue) and abundant capillaries (red)



several weeks:

Healed infarct with a dense collagenous **scar (blue)**



Consequences and Complications of MI

- **1- Death**:

- **50%:** before reaching hospital (<1 hour of symptom onset; due to arrhythmias)
- (*in-hospital) death rate* has declined (30% to 10%) thanks to extraordinary progress in medical care

Consequences and Complications of MI

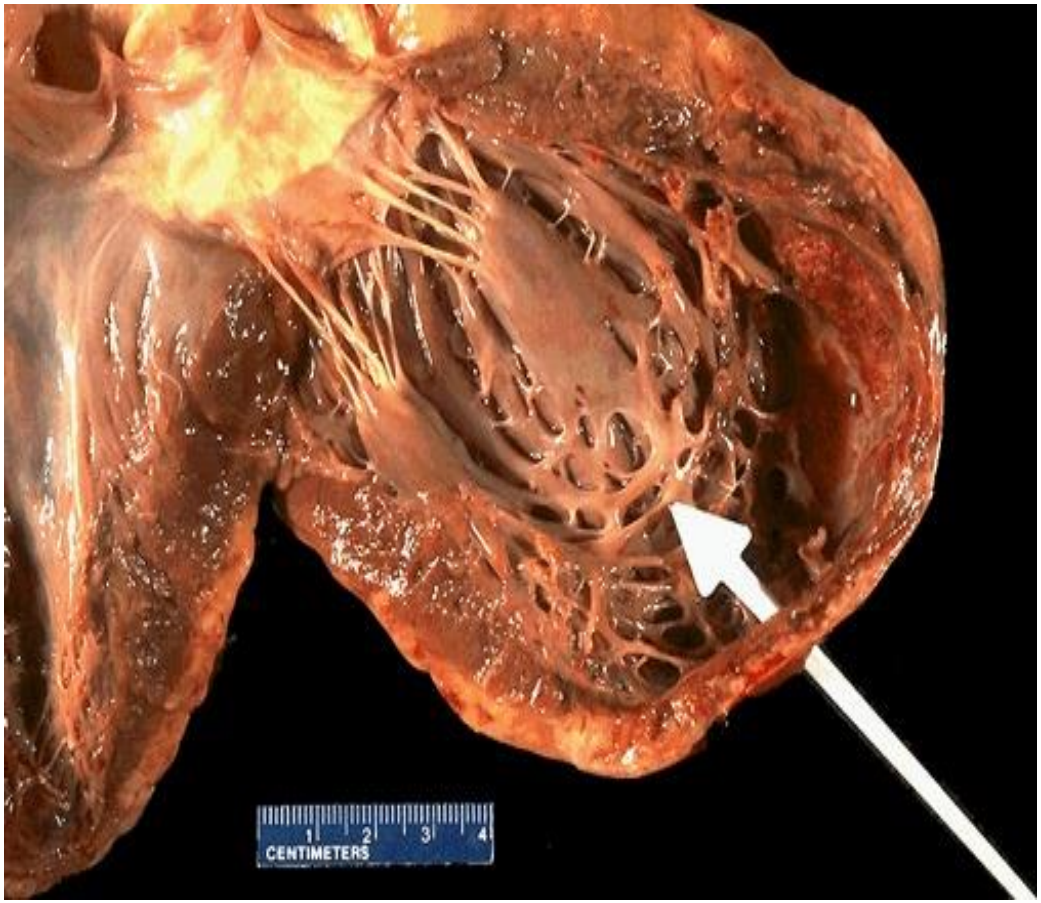
- ***Cardiogenic shock***
  - (10% to 15%)
  - In large infarcts (>40% of Left ventricle)
  - Mortality 70%; 2/3 of in-hospital deaths
- ***Myocardial rupture***
- ***Papillary Muscle Rupture***
- ***Pericarditis***
- ***Infarct expansion***
- ***Mural thrombus***
- ***Ventricular aneurysm***
- ***Progressive late heart failure***

Myocardial Rupture

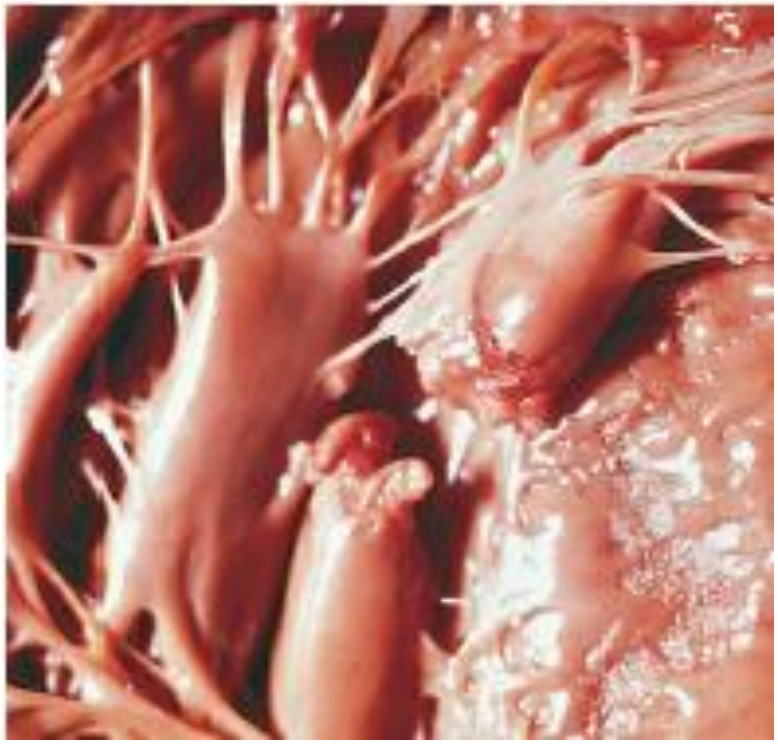
(1) Rupture of ventricular free wall: hemopericardium and cardiac tamponade (usually fatal)

(2) Rupture of ventricular septum:

VSD and left-to-right shunt

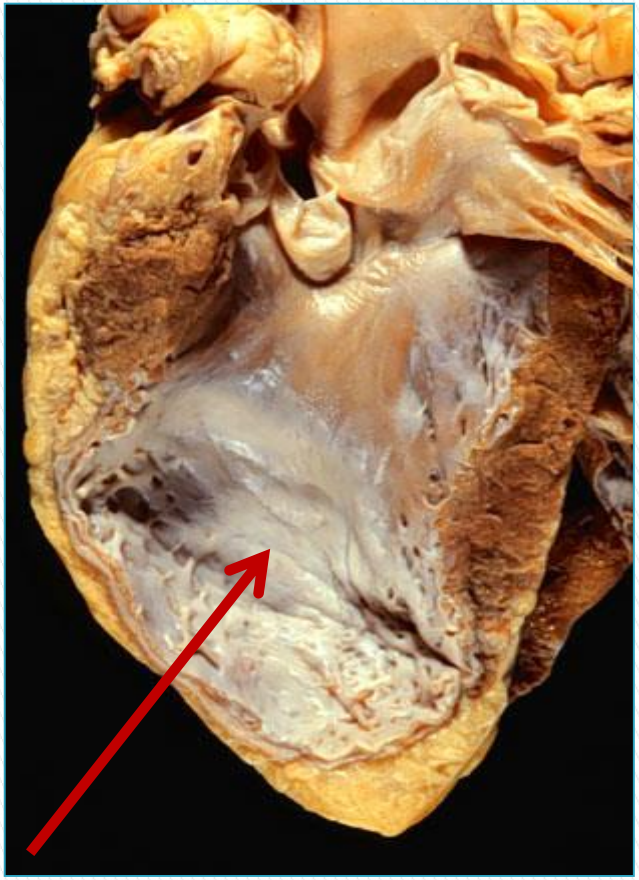


Papillary Muscle Rupture



Leads to post-infarct mitral regurgitation

Ventricular aneurysm



Ventricular aneurysm

- A late complication
- result from a large transmural infarct with formation of thin scar tissue

Complications of ventricular aneurysms include:

1-mural thrombus

2-arrhythmias

3-heart failure

Long-term prognosis after MI

- depends on many factors:
- e.g. LV function; severity of atherosclerosis in remaining viable myocardium; ……
- Mortality rate 1st year 30%
- annual mortality rate 3%

Chronic Ischemic Heart Disease

- **post-infarction** cardiac decompensation that follows exhaustion of hypertrophic viable myocardium
- **progressive heart failure**; sometimes punctuated by episodes of angina or MI
- Arrhythmias are common

Sudden Cardiac Death (SCD)

- **unexpected death from cardiac causes without symptoms or < 24 hours of symptom onset**
- **CAD (atherosclerosis) is the most common underlying cause**
- **Lethal arrythmias (v. fibrillation) is the most common direct mechanism of death**
- With **younger** victims, other **non-atherosclerotic** causes are more common:

Non-atherosclerotic causes of SCD

- Congenital coronary arterial abnormalities
- Aortic valve stenosis
- Mitral valve prolapse
- Myocarditis
- Dilated or hypertrophic cardiomyopathy
- Pulmonary hypertension
- Hereditary or acquired abnormalities of the cardiac conduction system
- Isolated myocardial hypertrophy
- unknown causes….