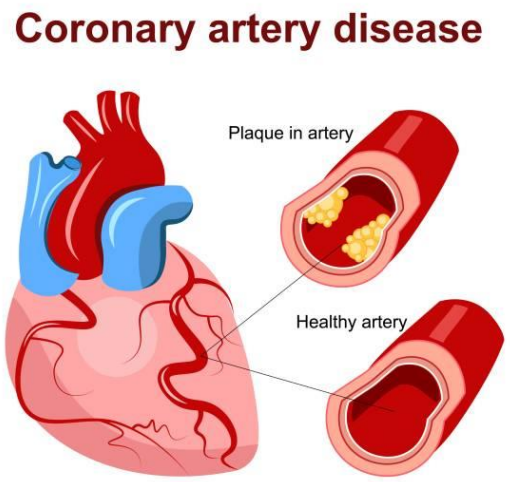
Ashur University
College of Medicine

Grade 1

Cardiovascular Module
Cardiovascular Medicine
Lecture 3

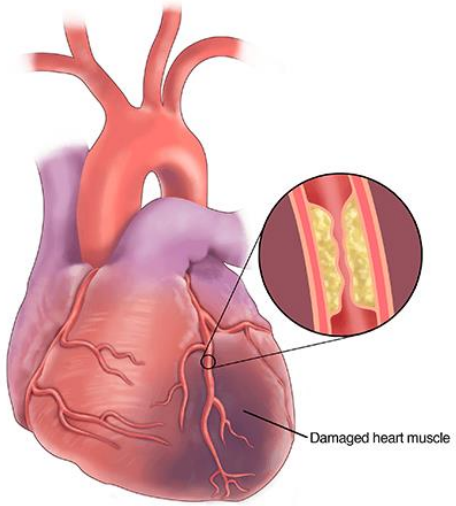
ISCHEMIC HEART DISEASES



Ass. Professor Internal Medicine

Dr Qasim Razzaq Radhi

20/5/2025



Objectives

1. To enumerate the clinical manifestations of coronary heart disease.

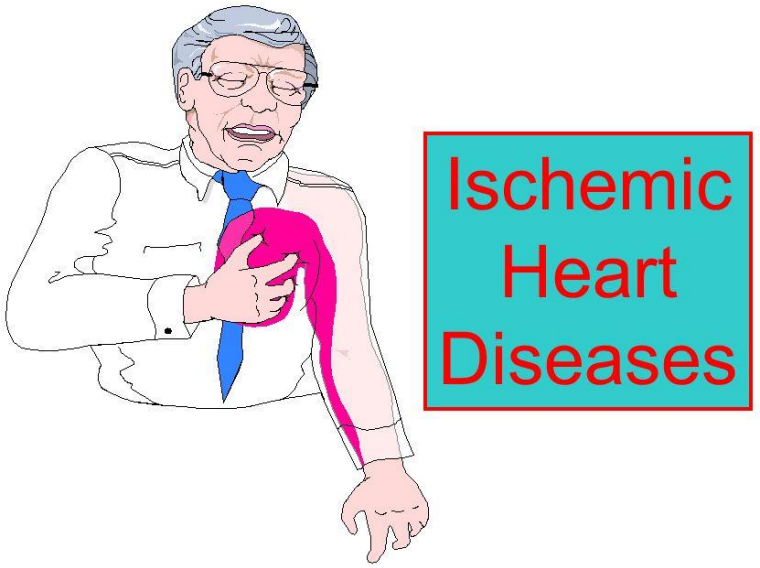
2. To define chronic stable angina and the precipitating factors , investigation and management .
3. To define unstable angina and non ST-elevation myocardial infarction, investigation and management .

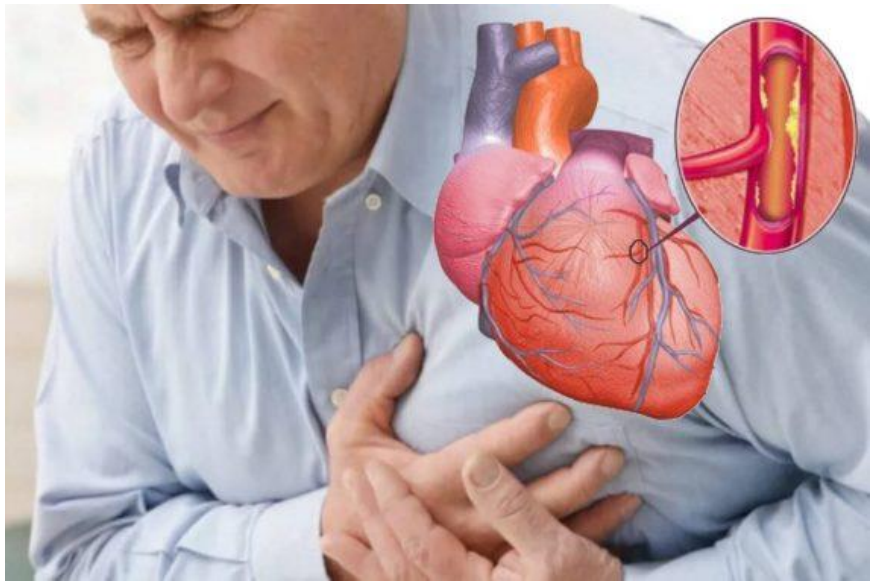
4. To outline the ECG changes of acute myocardial infarction(MI), plasma cardiac markers and management.

Introduction

Coronary heart disease (CHD) is the most common form of heart disease and the single most **important cause of premature death** in certain parts of world.

Disease of the coronary arteries is **almost always due to atheroma** and its complications, particularly thrombosis.





Clinical manifestations of coronary heart disease

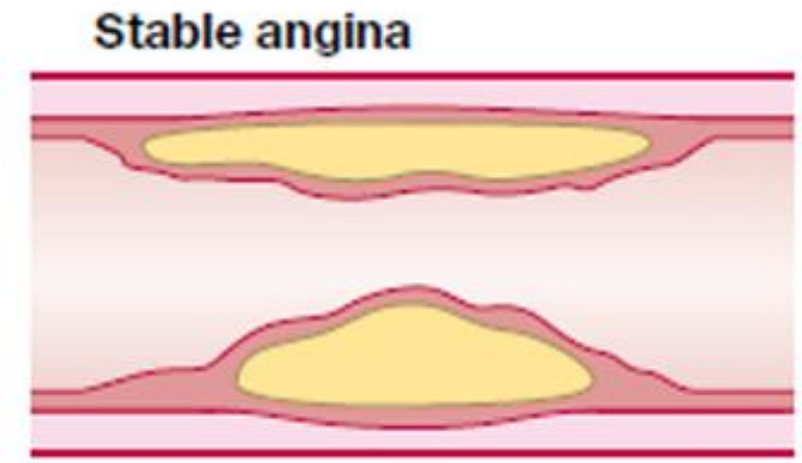
Coronary heart disease may manifest in one or more of the following ways:

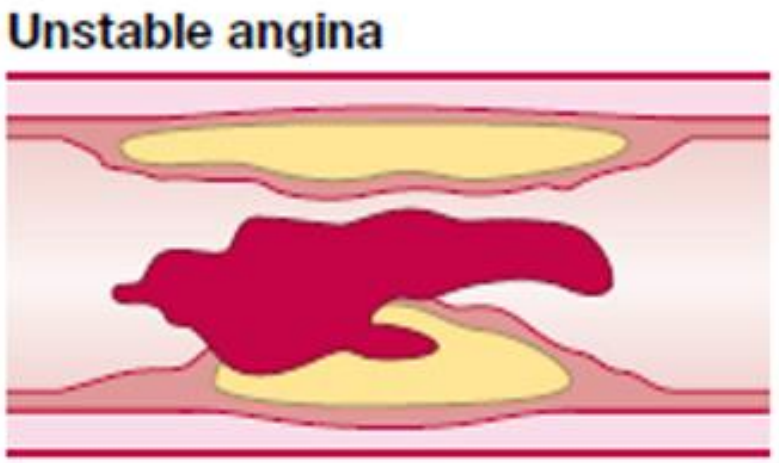
1. **Stable angina**
2. **Unstable angina**
3. **Myocardial infarction**
4. **Heart failure**
5. **Arrhythmia**
6. **Sudden death**

Clinical manifestations …cont.

1.Stable angina Ischaemia due to fixed atheromatous stenosis of one or more coronary arteries .

2.Unstable angina Ischaemia caused by dynamic obstruction of a coronary artery due to plaque rupture with superimposed thrombosis and spasm





3.Myocardial infarction

Myocardial necrosis caused by acute occlusion of a coronary artery due to plaque rupture and thrombosis

4.Heart failure

Myocardial dysfunction due to infarction or ischaemia.

5.Arrhythmia

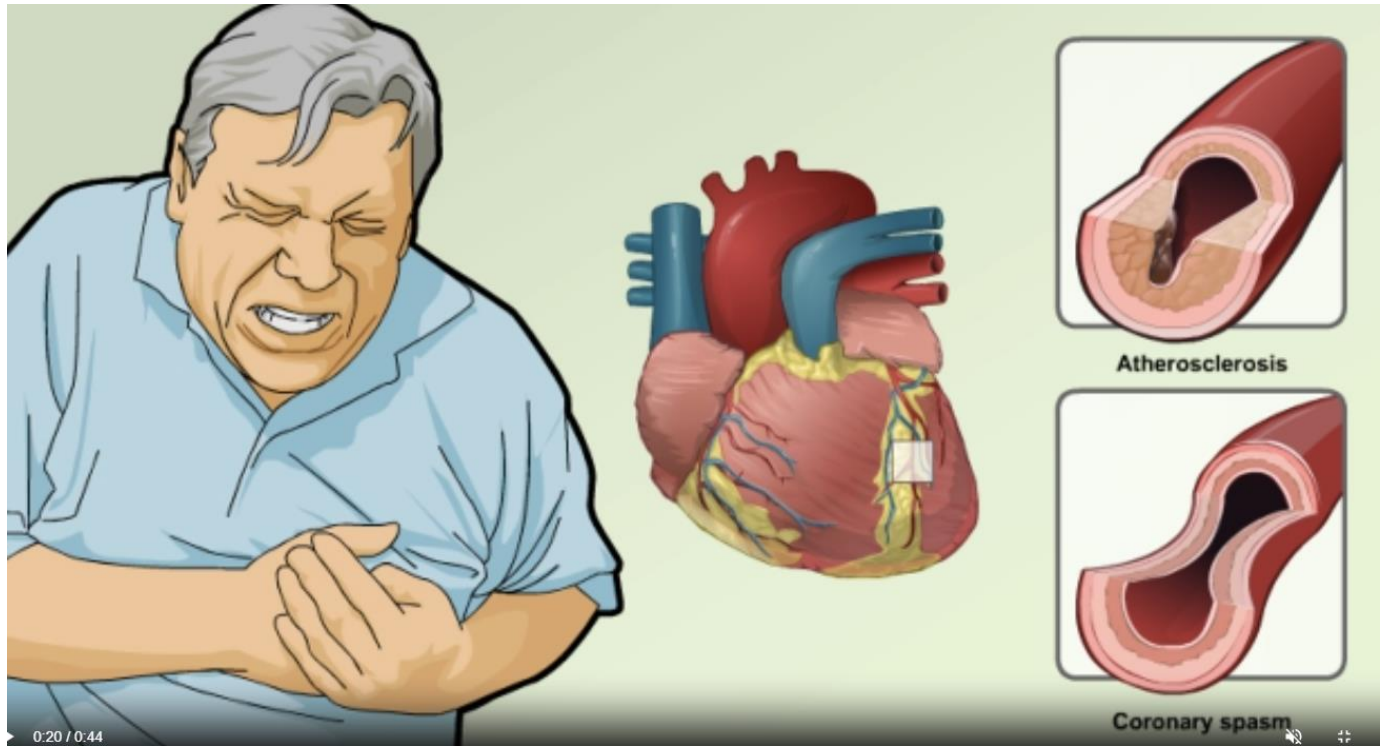
Altered conduction due to ischaemia or infarction

6.Sudden death

Ventricular arrhythmia, asystole or massive myocardial infarction

Chronic stable angina

- Angina pectoris has a complex symptoms.
- It may occur whenever there is an imbalance between myocardial oxygen supply and oxygen demand.
- It occurs when coronary perfusion is impaired by fixed or stable atheroma of the coronary arteries.



Factors influencing myocardial oxygen supply and demand

Increased Oxygen Demand (cardiac work)

1. ↑Heart rate
2. ↑ Blood pressure
3. ↑ Myocardial contractility
4. Left ventricular hypertrophy
5. Valve disease, e.g. aortic stenosis

Chronic stable angina …cont.

Decreased Oxygen Supply (Coronary Blood Flow)

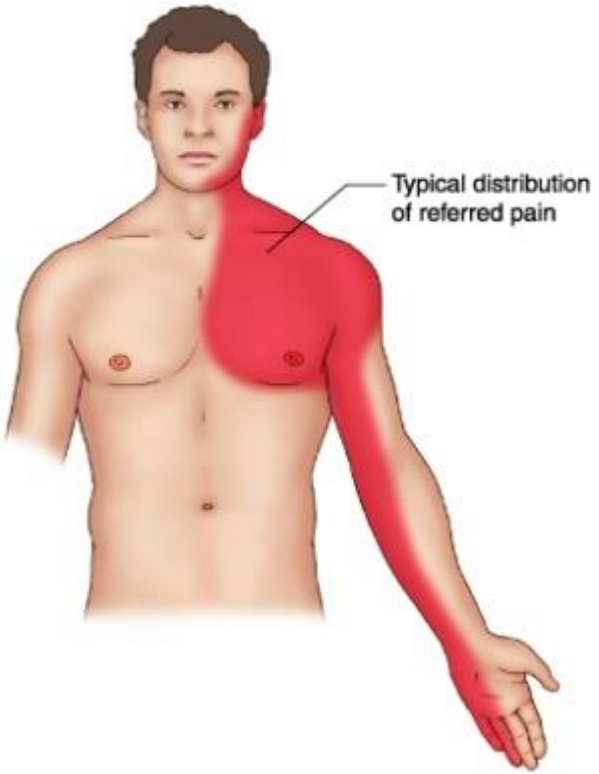
1. ↓Duration of diastole
2. ↓ Coronary perfusion pressure (aortic diastolic minus coronary sinus or right atrial diastolic pressure)
3. ↑ Coronary vasomotor tone
4. ↓ Oxygenation
   - ↓Haemoglobin
   - ↓Oxygen saturation

Chronic stable angina …cont.

Clinical features

Stable angina is characterized by central chest pain, discomfort or breathlessness that is precipitated by exertion or other forms of stress, and is relieved by rest.





Activities precipitate angina

Physical exertion

Cold exposure

Heavy meals

Intense emotion

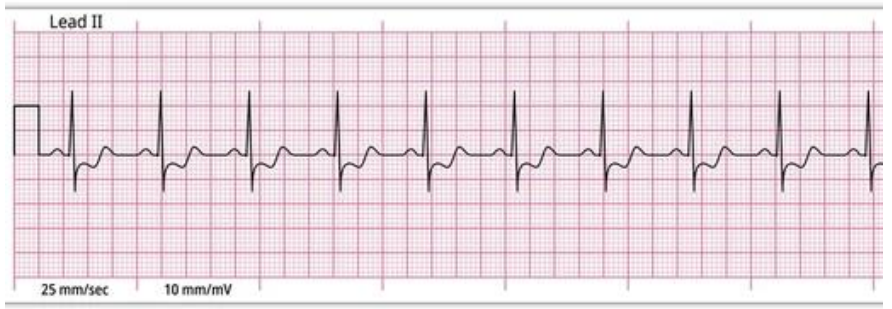




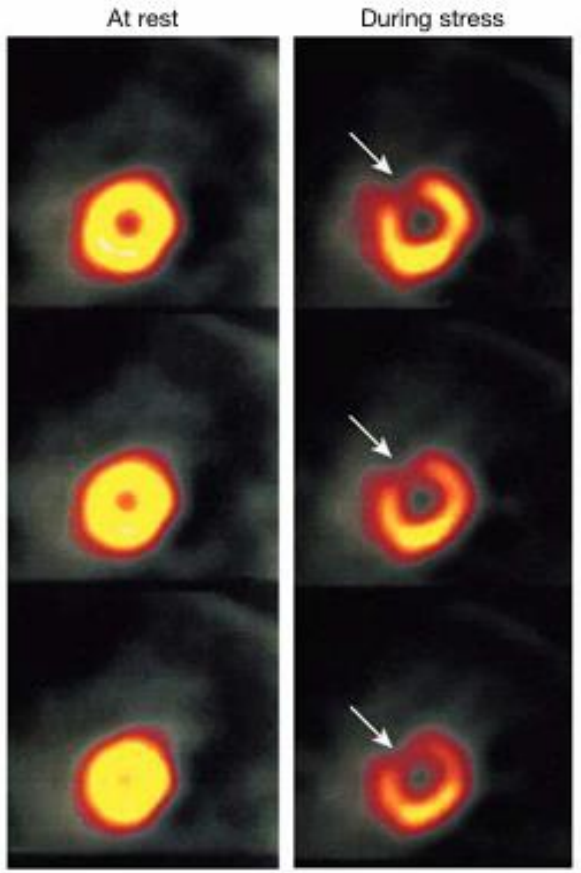
Chronic stable angina …cont.

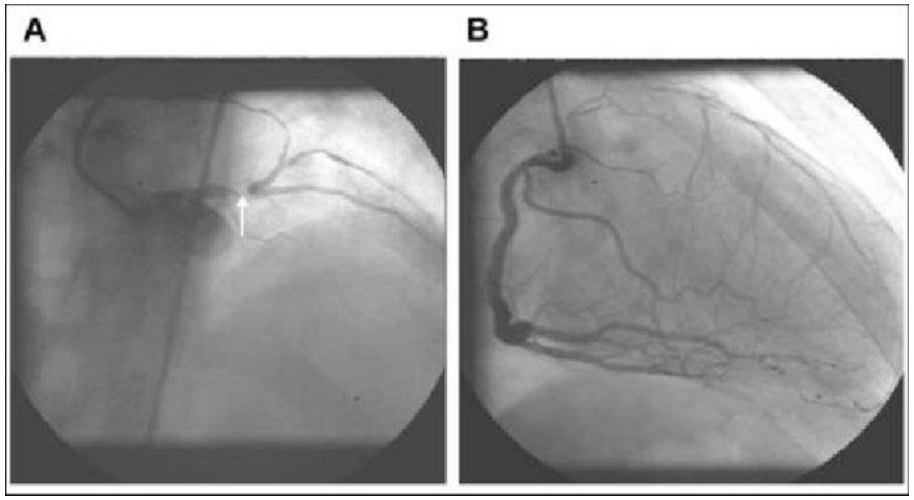
Investigations

1. Resting ECG
2. Exercise ECG
3. Myocardial perfusion scanning
4. Stress echocardiography
5. Coronary arteriography









Chronic stable angina …cont.

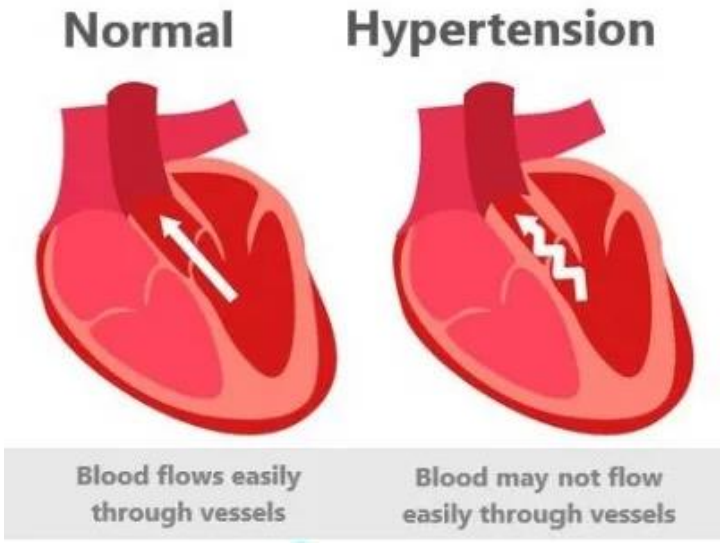
Management :

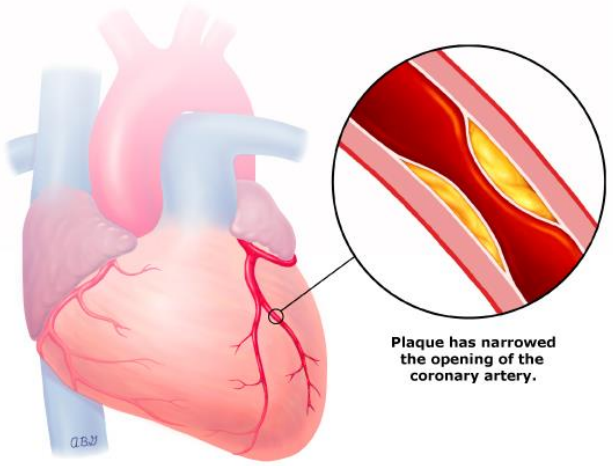
The management of angina pectoris involves:

- Assessment of the extent and severity of arterial disease.
- Control of significant risk factors

  (e.g. smoking, hypertension, hyperlipidaemia).
- Measures to control symptoms.
- The identification of high-risk patients and given treatments to improve life expectancy.







Chronic stable angina …cont.

Advices to patients with stable angina

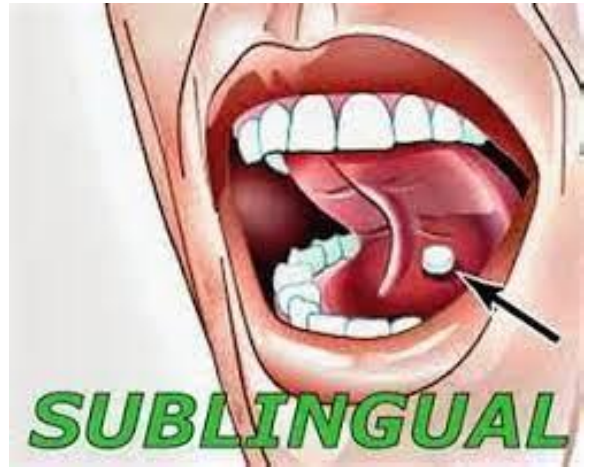
- Stop smoking
- Keep ideal body weight
- Regular exercise (exercise up to, but not beyond, the point of

chest discomfort is beneficial and may promote collateral vessels)

- Avoid severe exertion, and strong exercise after a heavy meal or in very cold weather
- Take sublingual nitrate tablet before doing exertion that may cause angina







Drug therapy

1. Antiplatelet therapy

   Low-dose aspirin or clopidogrel

2. Lipid-lowering therapy

   Statins

3. Anti-anginal drug treatment

Four groups are used to relieve or prevent the symptoms of angina:

1. Nitrates
2. β-blockers
3. Calcium antagonists and
4. Potassium channel activators













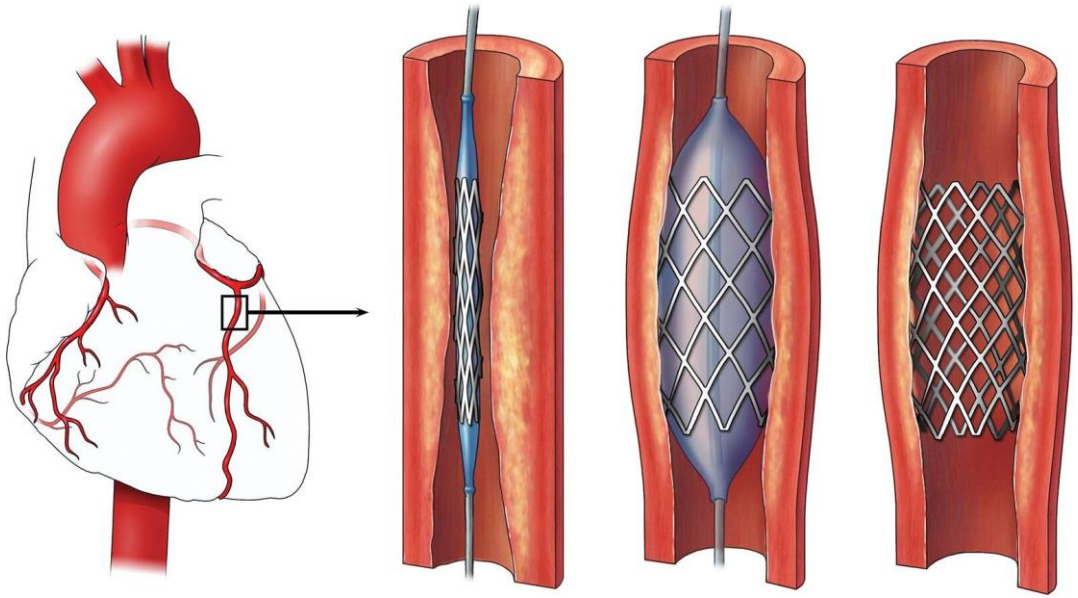
Chronic stable angina …cont.

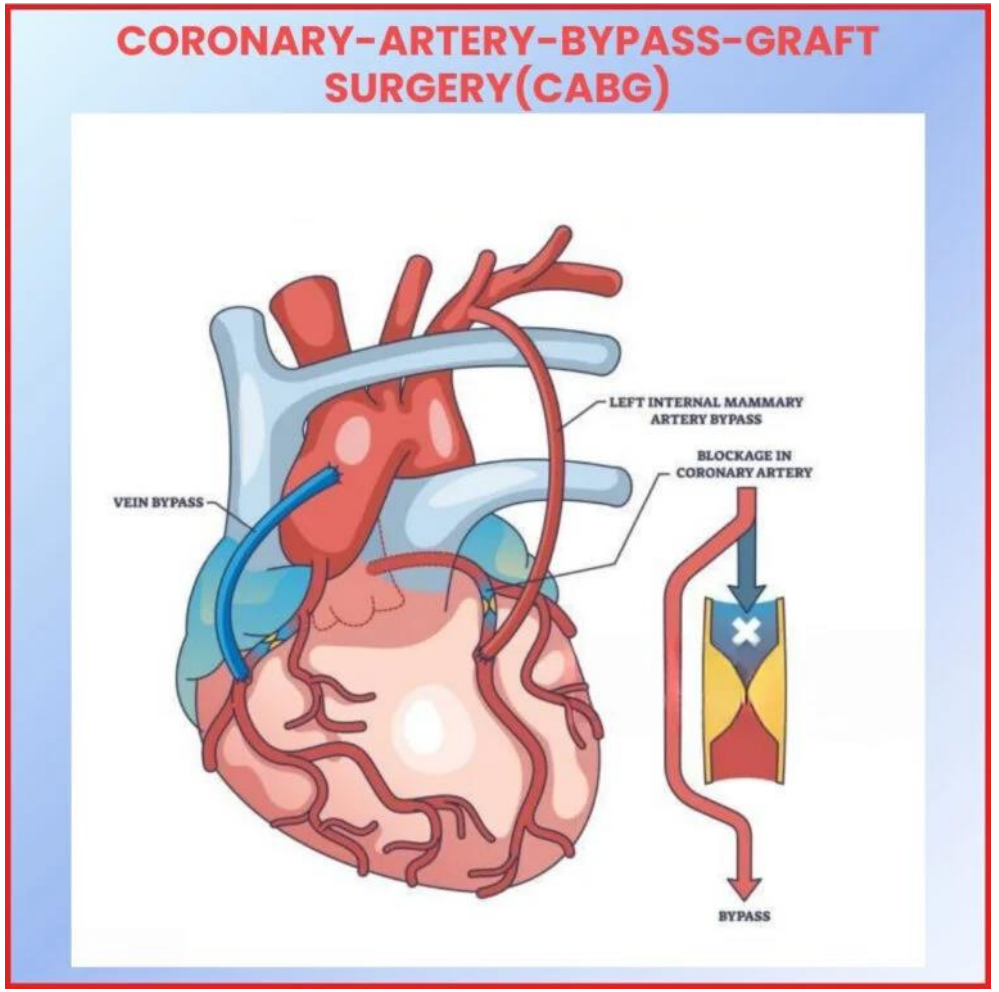
Invasive treatment

Invasive treatment for IHD include:

1. Percutaneous coronary intervention (PCI)

2. Coronary artery bypass graft (CABG) surgery





Unstable angina / Non ST- elevation myocardial infarction

Unstable angina is a clinical syndrome that is characterized by:

-New-onset of severe angina

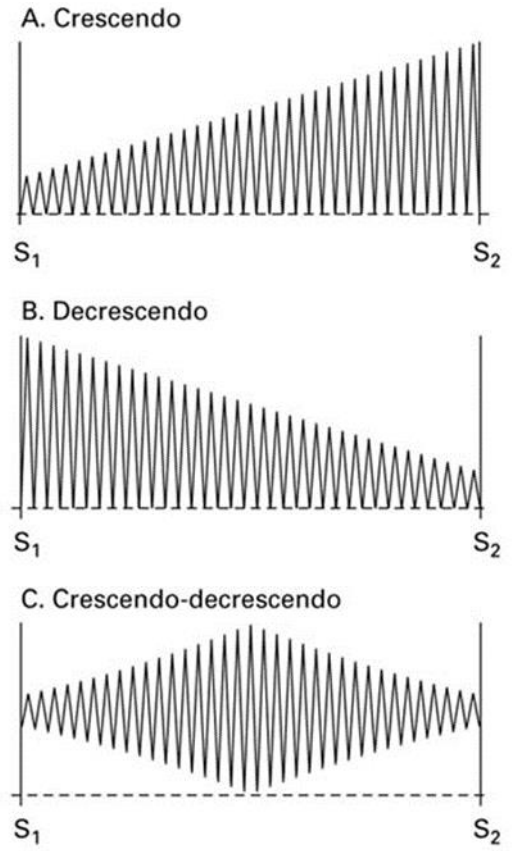
-Rapidly worsening angina (crescendo angina) → →

-Angina on minimal exertion, or

-Angina at rest.

Non ST-elevation myocardial infarction differs from unstable angina by the presence of elevated markers of myocardial necrosis in blood.

The lesion is usually a complex ulcerated or fissured atheromatous plaque with adherent platelet-rich thrombus and local coronary artery spasm.



Diagnosis

The assessment of acute chest pain depends on:

1. An analysis of the pain and associated features.
2. Evaluation of the 12-lead ECG
3. Serial measurements of biochemical markers of cardiac damage, such as troponin I and T or CPK-MB.

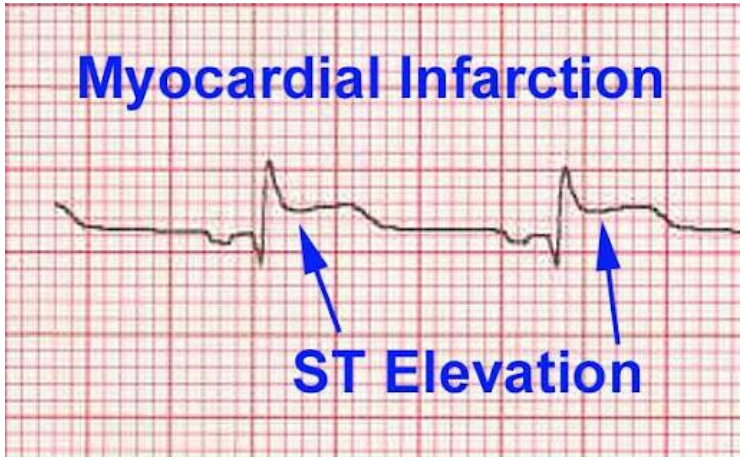
Management

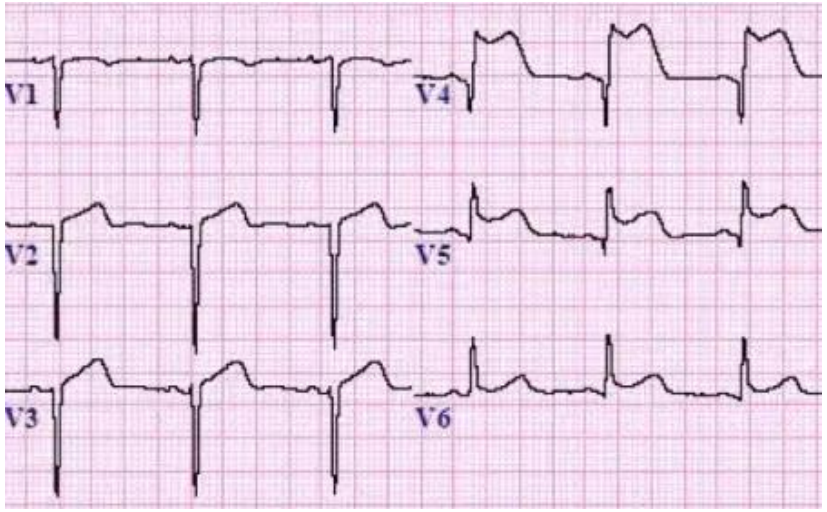
- Admission to the hospital
- Bed rest
- Antiplatelet therapy (aspirin and clopidogrel)
- Anticoagulant therapy (e.g. unfractionated or fractionated heparin)
- A β-blocker (e.g. atenolol or metoprolol).
- Calcium channel blocker (verapamil or diltiazem) if a β-blocker is contraindicated.
- If pain persists or recurs, infusions of intravenous nitrates
- Coronary angiography should be considered for revascularisation in all patients with moderate or high risk.

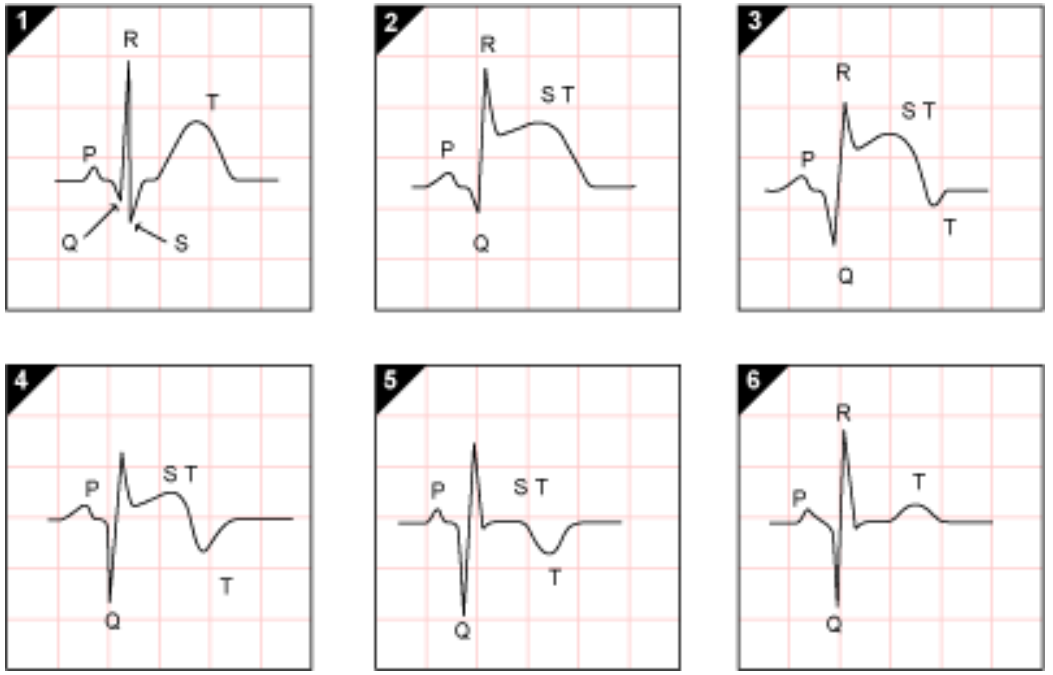
ST- Elevation myocardial infarction (STEMI)

Myocardial infarction (MI) is almost always due to the formation of occlusive thrombus in a coronary artery.

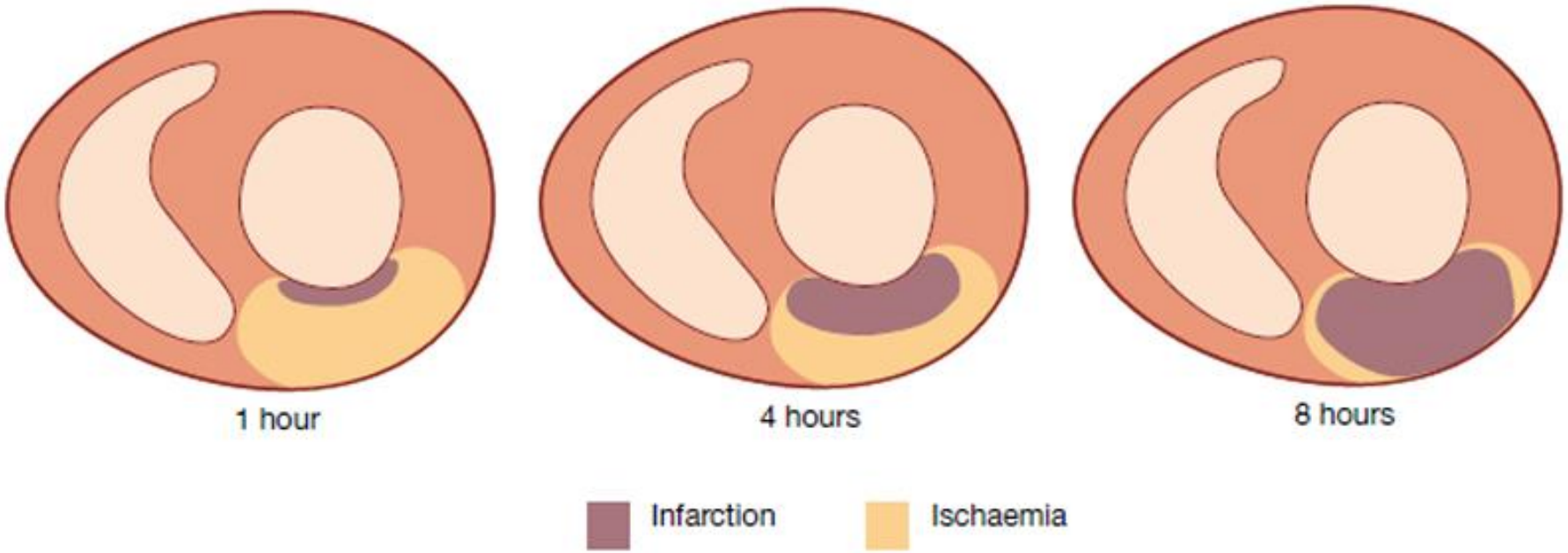
The process of infarction progresses over several hours and therefore it is possible to salvage myocardium and improve outcome.

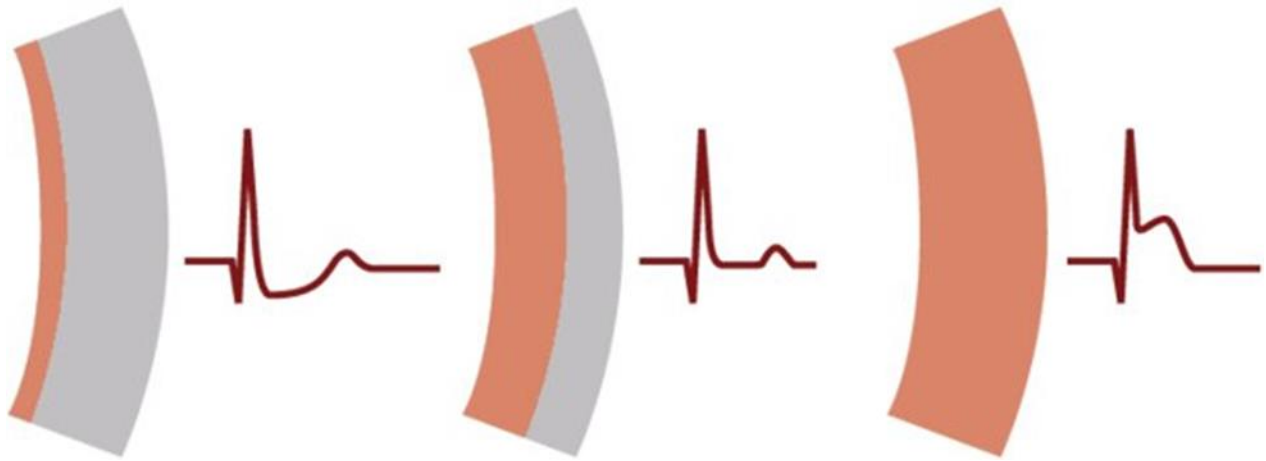






ST- Elevation myocardial infarction …cont.





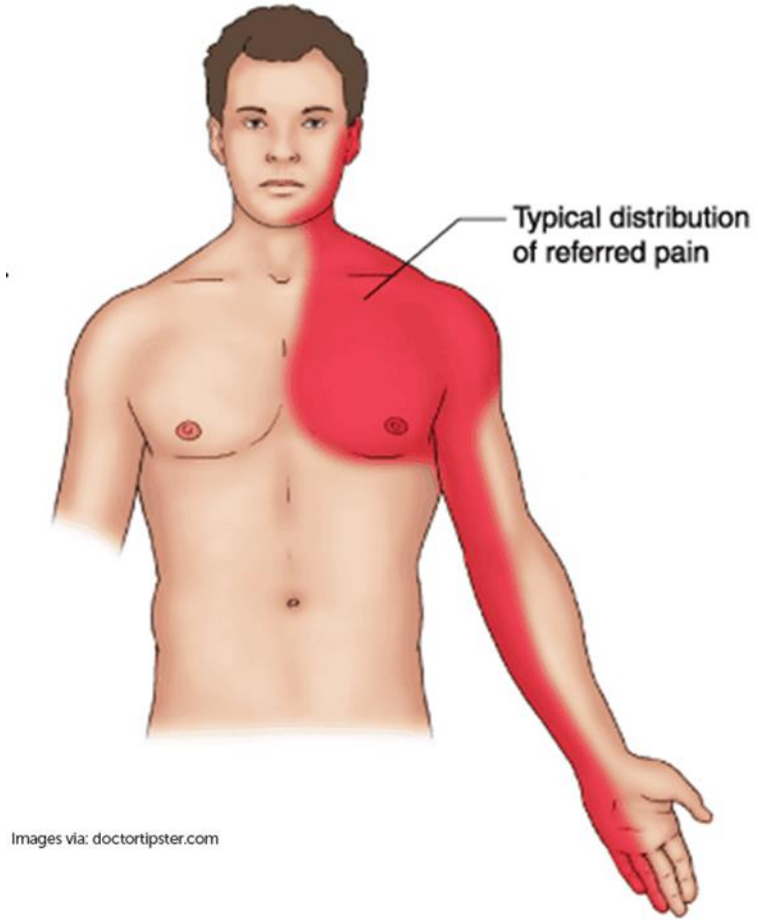
ST- Elevation myocardial infarction …cont.

Clinical features:

Pain is the main symptom of MI, but breathlessness, vomiting, and collapse or syncope are common features.

The pain occurs in the same sites as angina but is usually more **severe and lasts longer;** it is often described as a tightness, heaviness or constriction in the chest.

Pain may start in the chest and spread (or radiate) to other areas like left arm (or both arms), shoulder, neck, jaw, and the back.



ST- Elevation myocardial infarction …cont

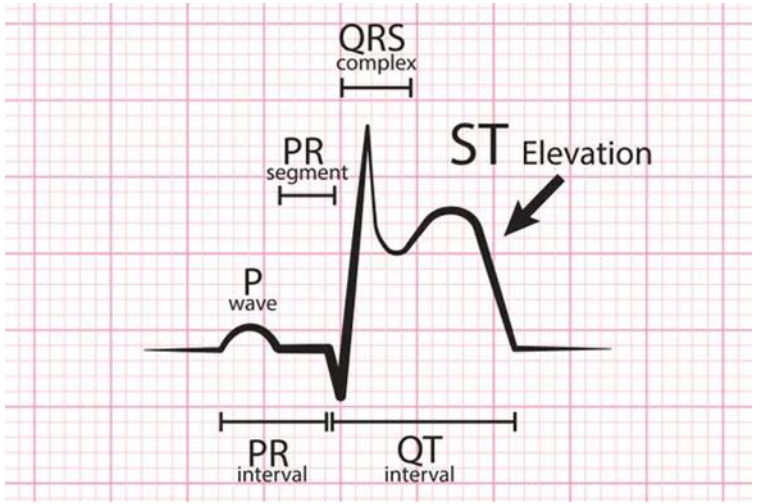


Investigations:

Electrocardiography (ECG):

The earliest ECG change is ST elevation;

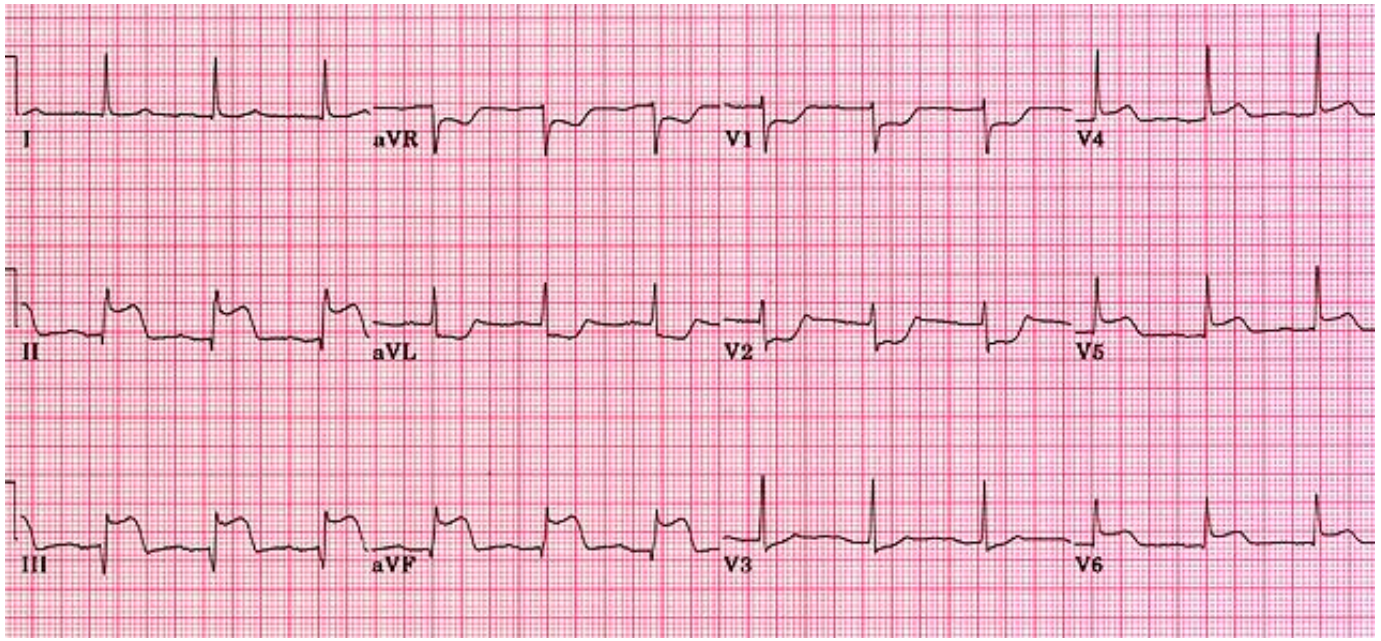
later on there is **decrease in the size of the R wave** and a **Q wave develop**.
Then, the **T wave becomes inverted** because of a change in ventricular repolarisation; this change persists after the ST segment has returned to normal.
The ECG changes are best seen in the leads that 'face' the infarcted area



ST- Elevation myocardial infarction …cont.

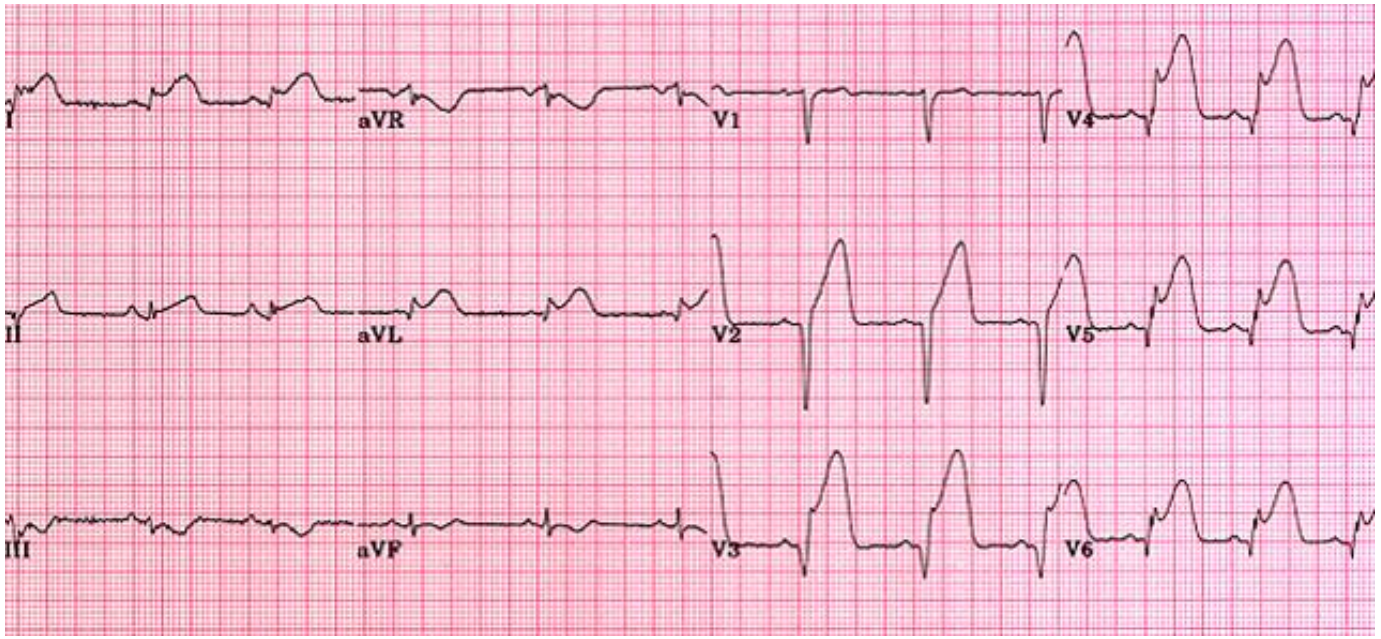
Acute inferior MI →

ST elevation in leads II, III and aVF.



Acute anterolateral MI →

ST segment elevation in leads I, aVL and precordial leads overlying the anterior and lateral surfaces of the heart (V3 - V6)



ST- Elevation myocardial infarction …cont

Plasma biochemical markers

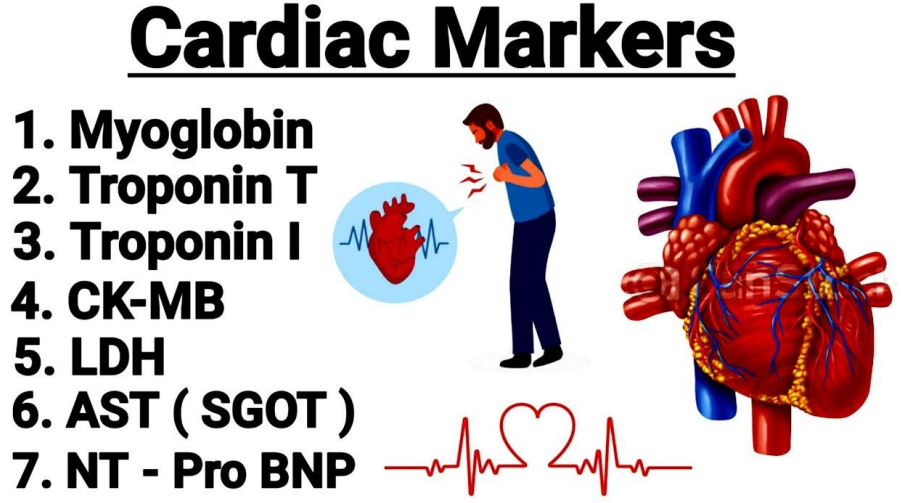
MI causes a rise in the plasma concentration of enzymes and proteins that are normally concentrated within cardiac cells. The biochemical markers that are widely used in the detection of MI are:

Creatine kinase (CK)

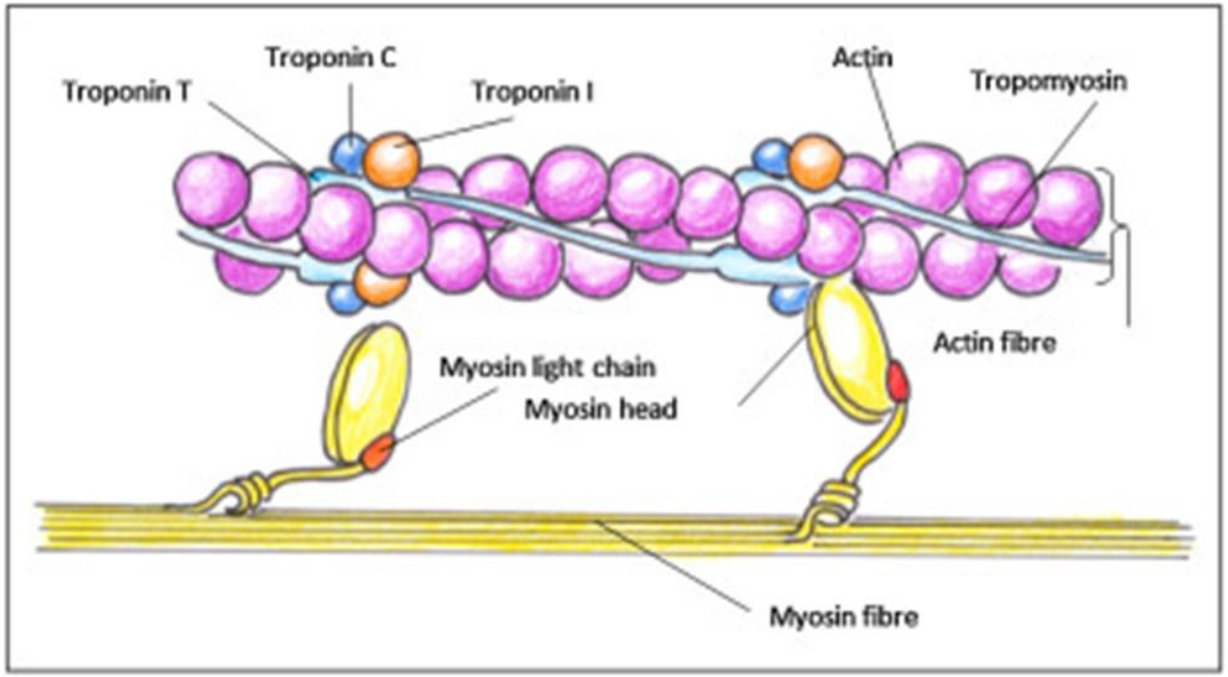
A sensitive and cardiospecific isoform of this enzyme is **CK-MB**

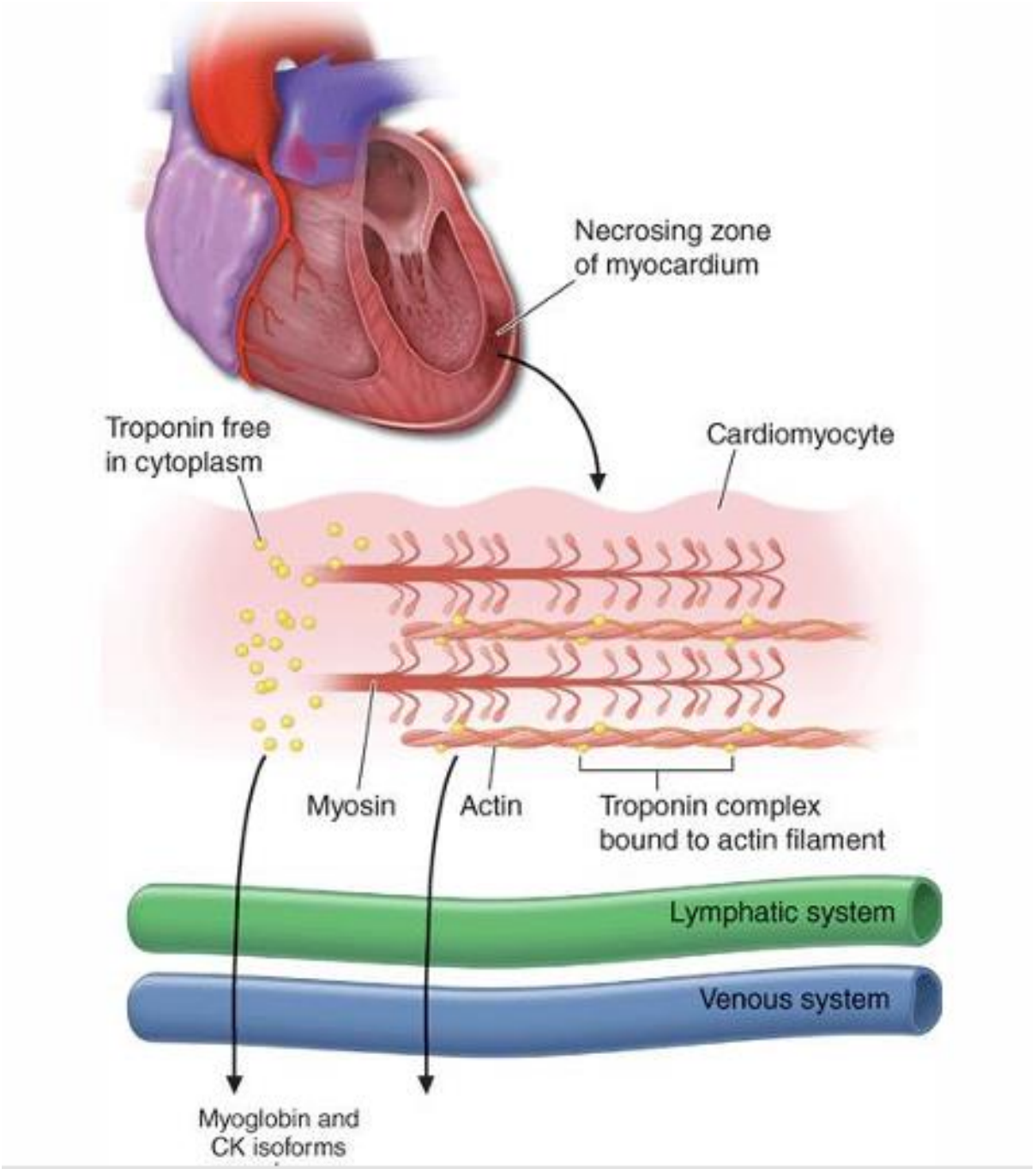
The cardiospecific proteins, **troponins T** and **troponin I**.

Serial (usually daily) estimations are helpful because the change in plasma concentrations of these markers is of diagnostic value.

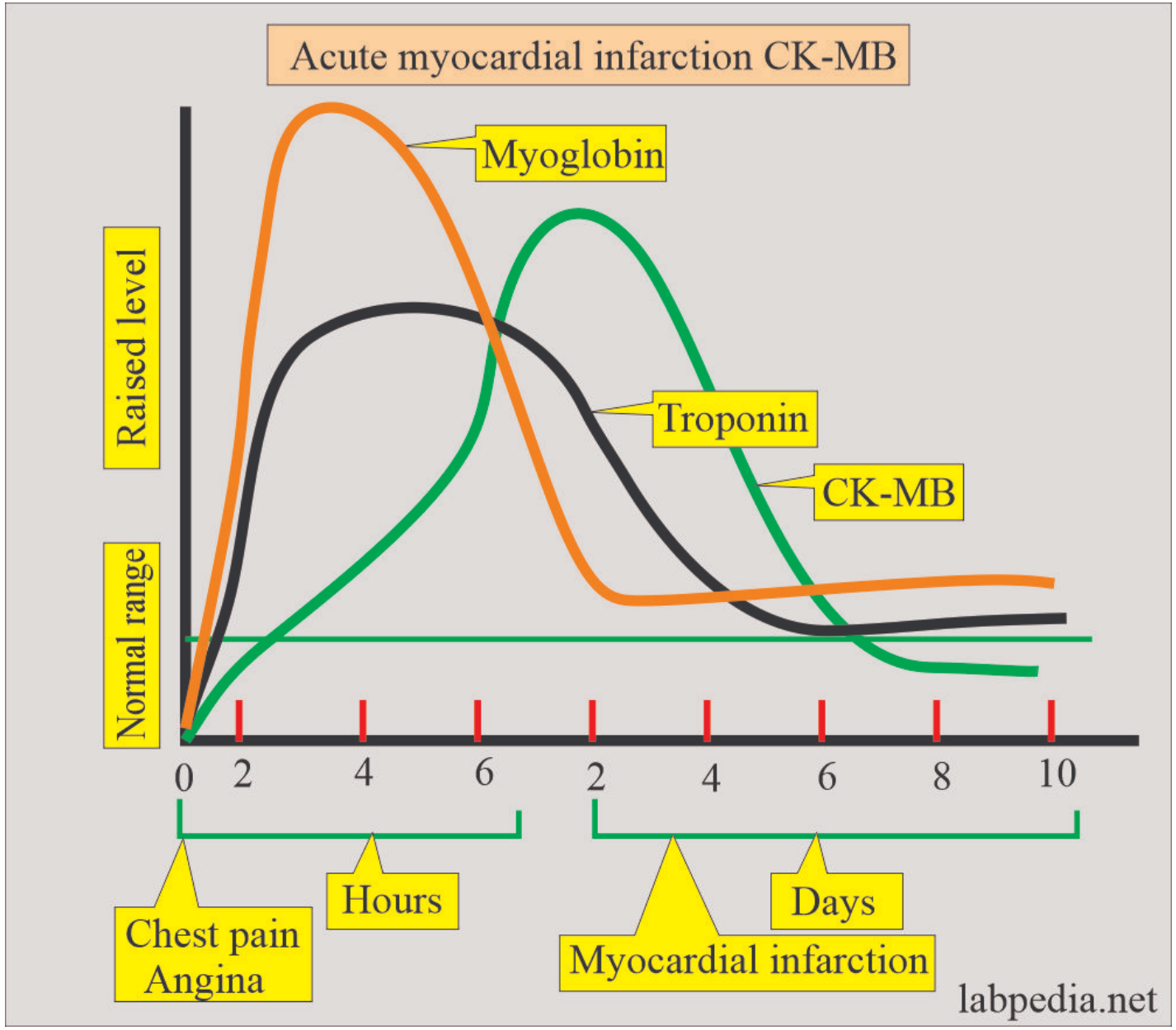


ST- Elevation myocardial infarction …cont





ST- Elevation myocardial infarction …cont.



Summary of cardiac acute MI markers

ST- Elevation myocardial infarction …cont.



Management :

Early management:

- Patients with suspected acute MI require immediate access to **medical/paramedical care and defibrillation facilities.**
- Patient with severe chest pain requires urgent **medical assessment and analgesia**.
- Patients are usually managed in a **cardiac care unit (CCU)** because this offers cardiac expert , monitoring and resuscitation facilities.







Provide facilities for defibrillation

Immediate measures

- High-flow oxygen
- I.V access
- ECG monitoring
- 12-lead ECG
- I.V. analgesia (opiates) and antiemetic
- Aspirin 300 mg

Reperfusion

- Primary percutaneous coronary intervention (PCI) or thrombolysis

Management of acute complications

- Arrhythmias
- Ischemia
- Heart failure

Maintaining vessel patency

Antiplatelet therapy

Aspirin and clopidogrel

Anticoagulants

Intravenous heparin or subcutaneous low molecular weight heparin

Adjunctive therapy

Beta-blockers

Nitrates and other agents

Complication of MI

- **Arrhythmias**
- **Ischaemia**
- **Acute circulatory failure**
- **Pericarditis**
- **Mechanical complications:**
  - Papillary muscle damage (mitral regurgitation)
  - Rupture of interventricular septum (ventricular septal defect)
  - Rupture of left ventricular free wall (cardiac tamponade)
- **Embolism**
- **Ventricular aneurysm**


THANK
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