

# **ISCHAEMIC HEART DISEASE**

**I - IHD**

# Ischaemic heart disease

## Definition

myocardial ischaemia occurs when there is imbalance between the supply of oxygen (and other essential myocardial nutrients ) and the myocardial demand for these substances

The coronary blood flow may be reduced by a mechanical obstruction

- atheroma

- thrombosis

- embolus -

-DISSECTING AORTIC ANEURYSM

coronary ostial stenosis

-VASCULITIS- coronary arteritis-

BEHCET S - KAWASKI

- ANGINA DUE TO DECREASE BLOOD SUPPLY-
- HYPOXIA- ANEMIA-slow coronary flow
- ANGINA DUE TO INCREASE DEMAND
- -tachycardia- thyrotoxicosis-
- LVH-HNT-AS- heavy exertion.
- IHD- NON-OBSTRUCTIVE CORONARY- prevalence 7%- MI- F>M-
- cor.spasm- cocaine- microvascular disease
- thromboembolic-ECTASIA-slow blood flow

# Coronary artery disease CAD

it is the most common cause of ischaemic heart disease.

CAD is the largest single cause of death in the UK.

the main pathological lesion in CAD is (coronary atherosclerosis)-

PLAQUE ULCERATION- FISSUREING- RUPTURE- plat.aggregation-

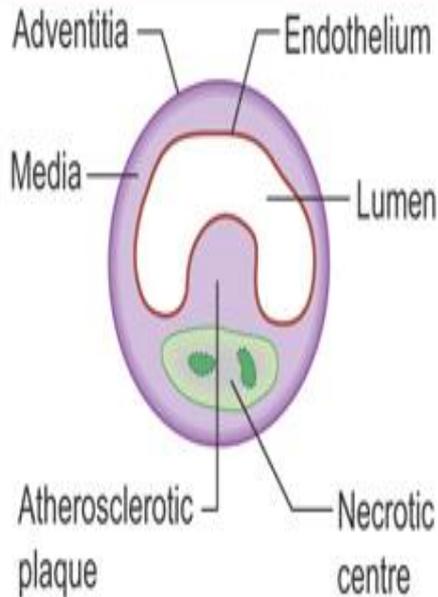
CAD presents clinically as:-

Stable angina pectoris –chronic cor.syn

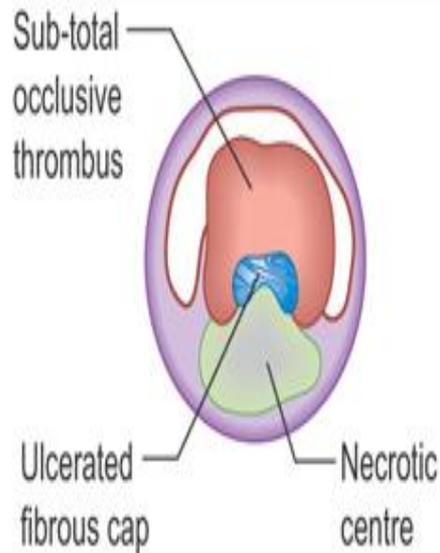
Acute coronary Syndrome-

unstable angina - Myocardial infarction

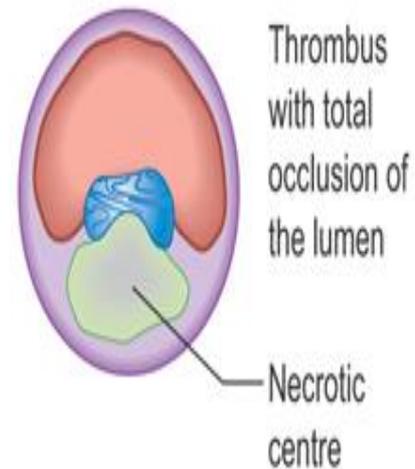
(a) Stable angina pectoris



(b) Unstable angina pectoris



(c) Myocardial infarction (STEM I)



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# CAD risk factors

## Fixed

Age, gender, family history,

## Changeable

**Hyperlipidaemia**

**Homocysteinaemia**

**Smoking**

**Hypertention**

**Diabetes mellitus**

**Alcohol**

**microalbumin urea**

**-CVA- CKD**

**Personality**

**lack of exercise-**

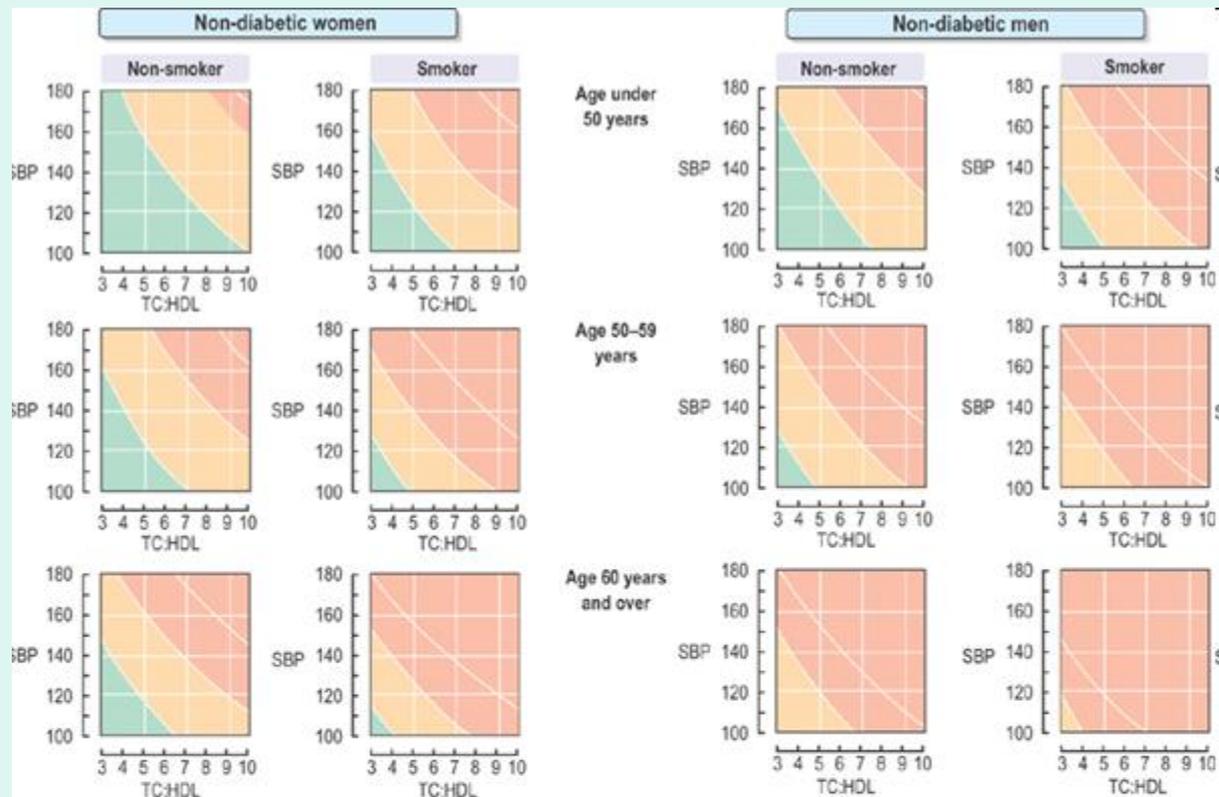
**Obesity**

**Gout**

**IMPOTANCE**

**AIRPOLLUTION**

**Drugs-COCAIN**



CVD risk <10% over next 10 years
  CVD risk 10-20% over next 10 years
  CVD risk >20% over next 10 years

SBP = systolic blood pressure mmHg  
 TC:HDL = serum total cholesterol to HDL cholesterol ratio

CVD risk over next 10 years 30%  
 10% 20%

- To estimate an individual's absolute 10-year risk of developing CVD, choose the panel for the gender, smoking status and age. Within this, define the level of risk from the point where the co-ordinates for SBP and ratio of the total to HDL-cholesterol cross. If no HDL cholesterol result is available, assume it is 1.00 mmol/l and use the lipid scale as total serum cholesterol.
  - Highest risk individuals (red areas) are those whose 10-year CVD risk exceeds 20%, which is approximately equivalent to a 10-year CHD risk of >15% (indicated by the 1998 charts). As a minimum, those with CVD risk >30% (shown by the line within the red area) should be targeted and treated now. When resources allow, others with a CVD risk >20% should be targeted progressively.
  - The chart also assists in identification of individuals with a moderately high 10-year CVD risk — in the range of 10-20% (orange area) and those in whom it is lower than 10% (green area).
  - Smoking status should reflect lifetime exposure to tobacco.
- For further information, see [http://www.bhf.org.uk/professionals/uploaded/aug\\_2004%20v2.pdf](http://www.bhf.org.uk/professionals/uploaded/aug_2004%20v2.pdf)

## **Angina pectoris**

**It is the most important cause of recurrent chest discomfort it is characterized by:-**

- central chest pain, which may radiate to left, right or both arms, throat or jaw and rarely to the back or epigastrium**
- short duration usually lasting less than 10 min.**
- pain is described as tightness and is usually not sever**
- aggravated by exertion- heavy exercise  
walking against cold air- heavy meal**
- relieved by GTN OR by REST**

## Types

**Decubitus angina :- occurs on lying down**

**-ANGINA EQUIVALENT –SOB after exertion**

**Nocturnal angina :- occurs at night**

**Variant (prinzmetal`s) angina :- occurs at rest**

**Unstable angina :- refer to angina of recent onset, worsening angina or post-infarction angina- or angina at rest**

## On examination

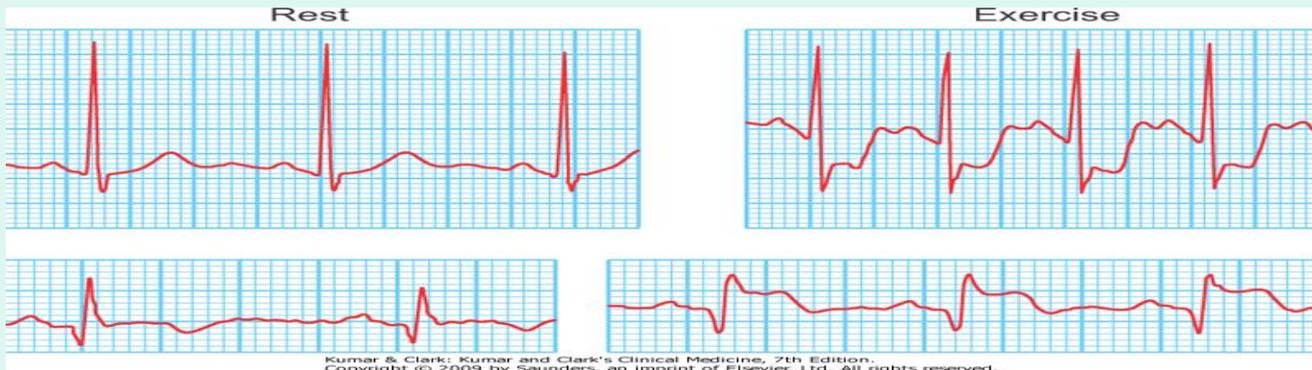
- usually NO finding**
- may have 4<sup>th</sup>. Heart sound**
- signs of associated factors**

## Investigations

- Resting ECG is usually normal between attacks may show ST depression or T inversion during attack

- Exercise ECG

ST segment depression of  $> 1$  mm. is positive



## **NON-INVASIVE**

**Cardiac scintigraphy (myocardial perfusion scan)**

**EX- ECG- TREADMEL TEST**

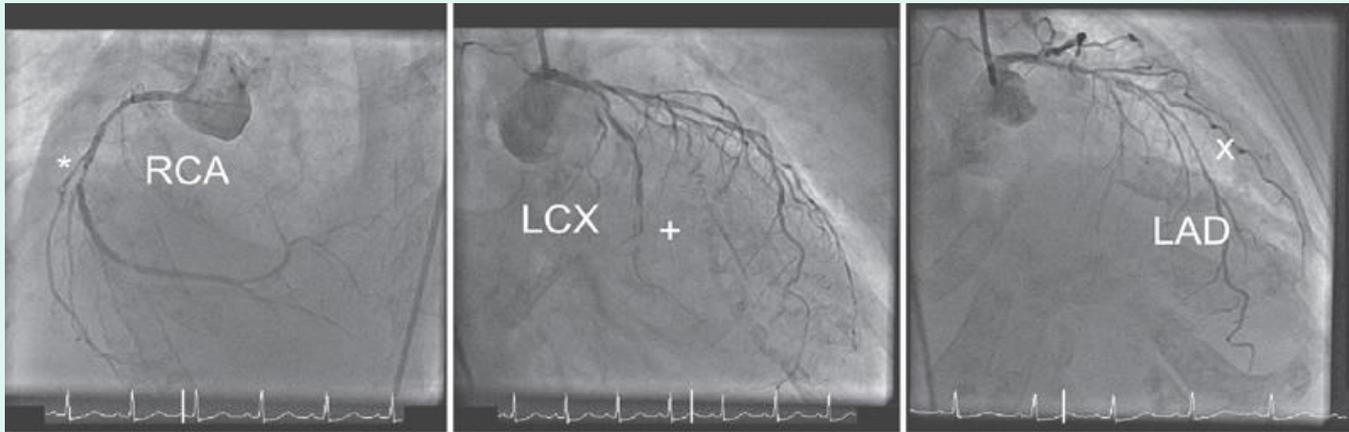
**-Echocardiography –STRESS-ECHO**

**CT coronary angiography**

**Cardiovascular magnetic resonance  
(C-MRA)**

## **INVASIVE**

**Coronary angiography**



**a)**

**(b)**

**(c)**

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# Treatment of angina

## General management

- Assurance and education –life style
- Treat underlying problems such as anaemia, hypertension, hyper –and hypo-thyroidism and diabetes-alcohol stop - Stop smoking
- Treat hypercholesterolaemia
- Weight reduction
- Regular exercise

# **Medical treatment**

## **Symptomatic treatment**

### **Glyceryl trinitrate (GTN)**

**used sublingual tablet or spray, action peaks 4-8 minutes and last 20-30 minutes, transdermal GTN last up to 24 hours**

### **Beta- blockers**

**due to their negative inotropic and chronotropic effect**

**Atenolol, 50 -100 mg. daily**

**Metoprolol 25-50 mg. twice daily**

**Bisoprolol- Nibevolol**

## **IVABRADINE- SA- NODE**

**Long acting nitrates ( e.g. isosorbide mononitrate)**

# Calcium channel blockers

## DIHYDROPYRIDINE

nifedipine

amlodipine

## NONDIHYDROPYRIDINE

VERAPAMINE-

DELTIAZEM

## **Prophylactic medication**

***Aspirin* is used in all patients with  
angina 75 mg.daily**

Lipid lowering therapy-

**1mmol cholesterol = 39mg-**

**--statin-INCLOSIRAN- PCSK9- inhibitor**

**HIGH risk LDL- < 100mg/dl- <70mg/dl**

**VERY high risk-LDL-LEVEL-<55mg/dl**

**extremely high risk recurrent CVA-**

**LDL-< 39mg/dl- HDL >40mg/dl.**

**TGs level < 150mg/dl a fibrate is  
indicated**

# **Percutaneous coronary intervention** **(PCI)**

**Percutaneous transluminal coronary angioplasty PTCA :- the process of dilating a coronary artery stenosis with stent implantation**

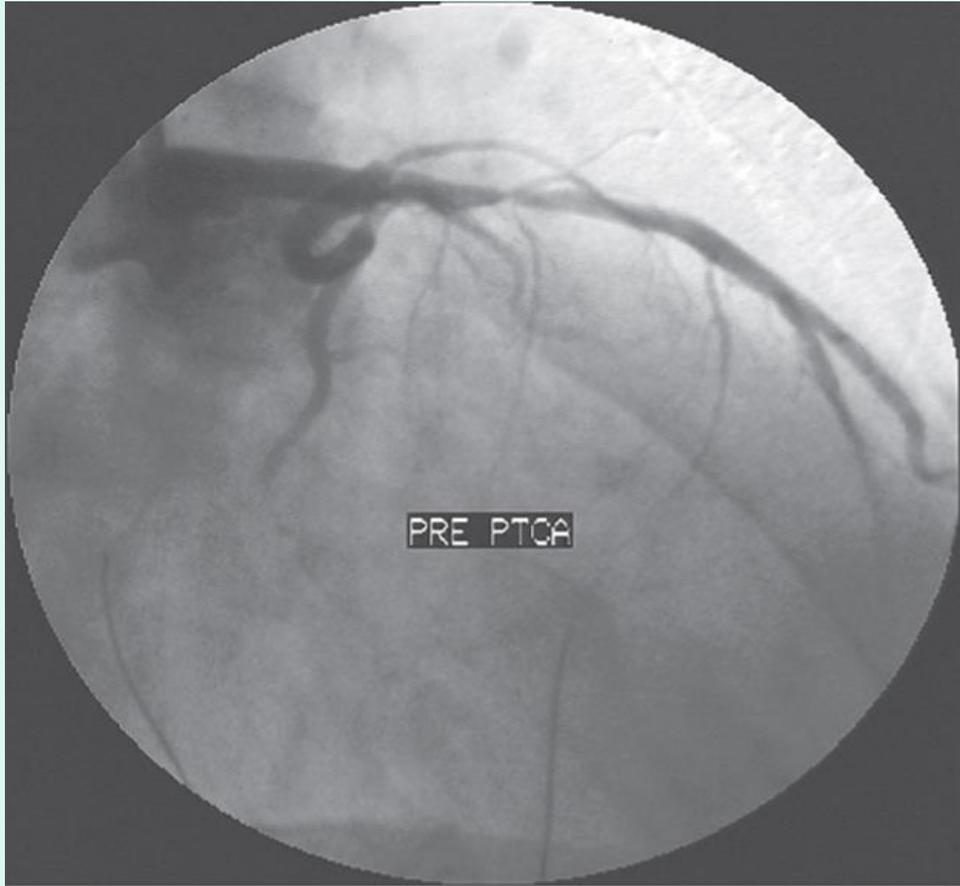
**using an inflatable balloon introduced into the artery via the femoral ,radial or brachial artery**

## PTCA criteria

- It can reduce angina symptoms
- It reduces the requirement for antianginal drug therapy
- It increases exercise capacity
- the best outcome is with a discrete, short-soft lesion in a straight vessel without involving a bifurcation

Risks include acute MI (2%)  
death (1%)

Restenosis and stent thrombosis is the main complication, this has been reduced with the introduction of drug eluted stent



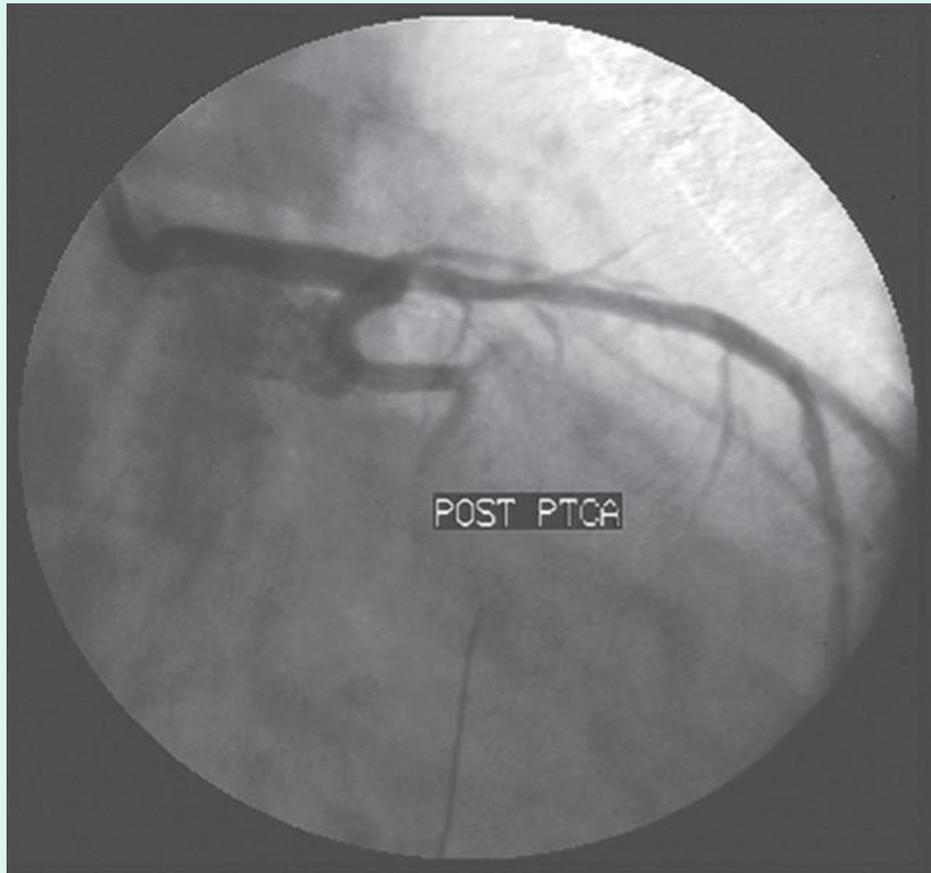
**(a)**

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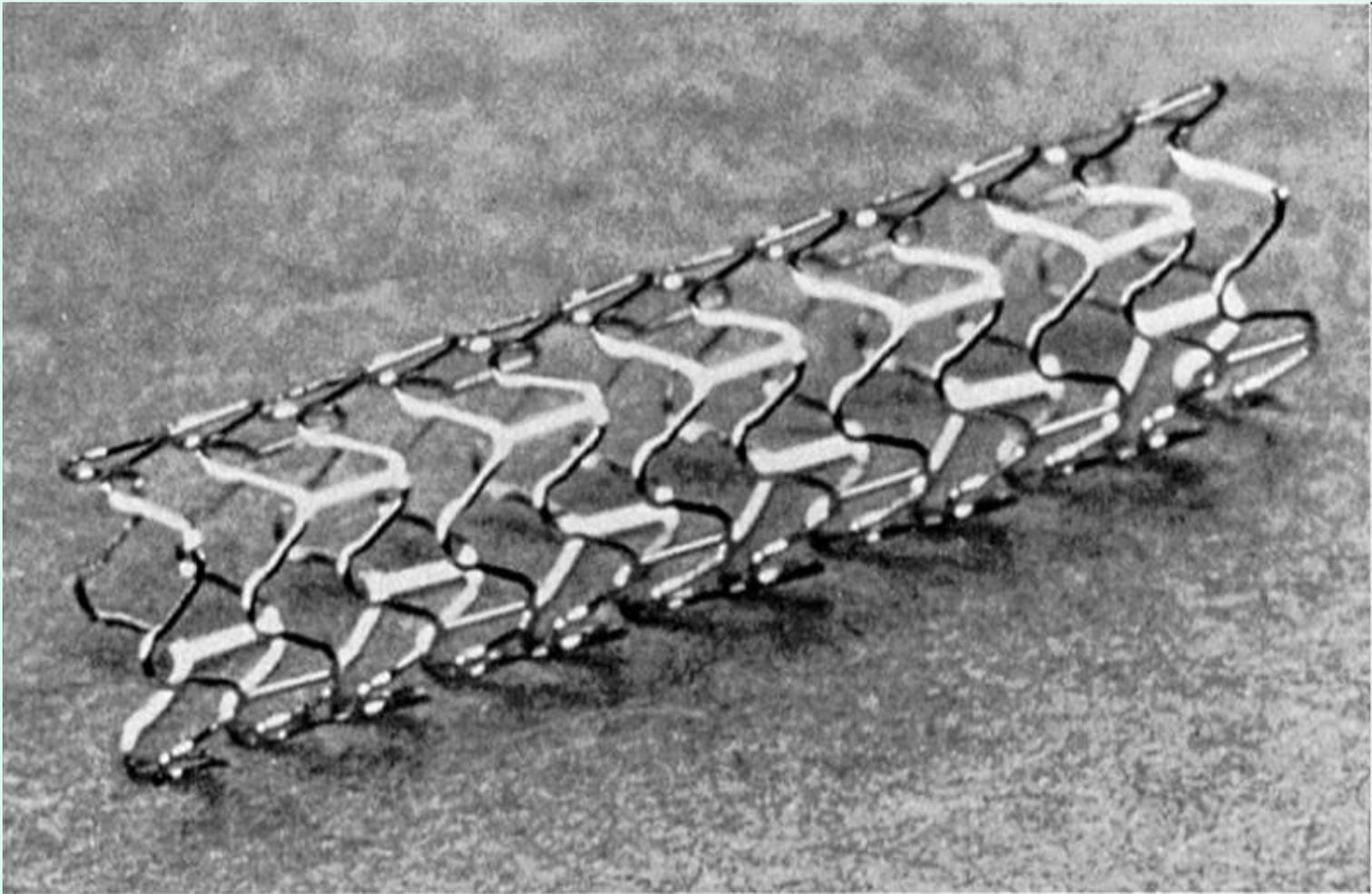
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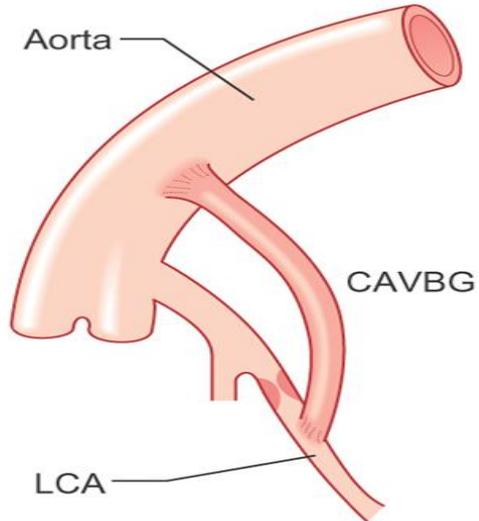
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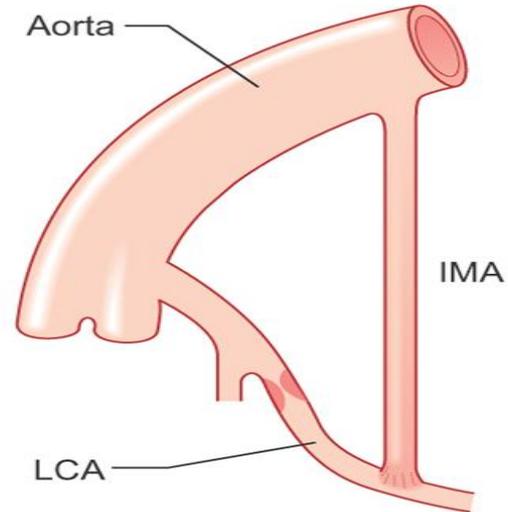
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# Coronary artery bypass grafting (CABG)

Coronary artery vein graft



Internal mammary arterial implantation



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# ISCHAEMIC HEART DISEASE

II

# **Acute coronary syndromes**

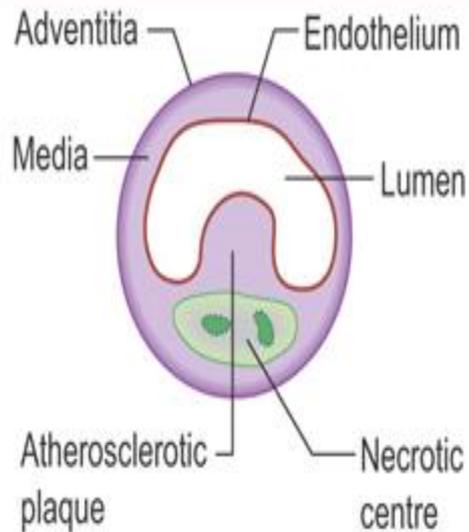
**Unstable angina**

**Non-ST-elevation myocardial infarction  
(NSTEMI)**

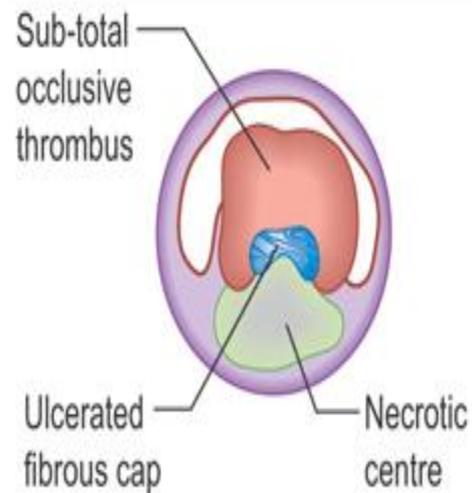
**ST-elevation myocardial infarction (STEMI)**

# Pathophysiology

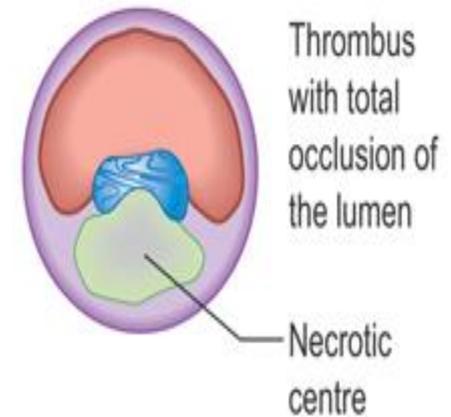
(a) Stable angina pectoris



(b) Unstable angina pectoris



(c) Myocardial infarction (STEM I)



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## **Clinical presentation**

- new onset chest pain, chest pain at rest or deterioration of pre- existing angina- post infarction angina**
- may present with indigestion , chest pain or dyspnea-SOB**
- usually nothing on examination but there may be low BP, basal crackles, S4 ,and cardiac systolic murmurs-MR**

# **Electrocardiogram**

- it may be normal**
- presence of ST depression and T inversion are highly suggestive**
- repeat ECG when patient is in pain**
- persistent ST elevation-or -**
  - new bundle branch block-**
- it indicates complete coronary -**
  - artery occlusion and**
- TRANSMURA myocardial infarction -**
- transient ST elevation is seen with**
  - coronary vasospasm or Prinzmetal`s**
  - angina**

## Biochemical markers

- Cardiac troponin (I ,T and C ) -
- AST and ALT
- LDH
- Creatinine - kinase-MB
- Myoglobin
- OTHER- CRP- ESR- WBC

# **Management**

**All patients need chest pain treatment**

**Rest in bed**

**Oxygen**

**Antiplatelet Aspirin 150 -300 mg. , then 75-100 mg. daily**

**Clopidogrel 300mg. Then 75 mg.**

**P2Y12-**

**PRASUGREL - TICAGRELOR**

**Antithrombin Heparin 5000 units i.v. then 0.25 units kg/ hour**

**LMWH (Enoxaparin )1mg./kg s.c. twice daily**

## **-PCI-Glycoprotein IIB/IIIA inhibitors**

**Abciximab 0.25mg/kg i.v. then 0.125mcg/kg/min.**

**Eptifibatide 180mcg/kg then 2 mcg/kg/min.**

**Tirofiban 0.4 mcg/kg/min. then 0.1mcg/kg/min.**

## **Analgesia**

**Morphine or dimorphine 2.5-5 mg i.v.**

## **Beta- blockers**

**Atenolol 5 mg i.v.then25-50 mg orally daily**

**-Metoprolol BISOPROLOL**

## **Coronary vasodilators**

**Glyceryl trinitrate 2-10 mg /hour i.v./ buccal /or sub  
lingual**

# Plague stabilization/ ventricular remodelling

## -Statins

Simvastatin 20-40 mg daily

Pravastatin 20 -40 mg daily

Atorvastatin 80 mg daily -

**PCSK9- INHIBITORS-INCLISIRAN-**

## ACE inhibitors

Ramipril 2.5 -10 mg daily

Lisinopril 5 – 10 mg daily

-

## ARABS-

**VALSARTAN- CANDESARTAN -**

**TELMISARTAN-**

# Coronary intervention

## PTCA and CABG

- they are recommended in high-risk patients with ACS

## Post ACS :- Risk factor modification

- stop cigarette smoking
- Treat hypertension to a level  $< 130/85$
- Tight diabetic control
- Low fat diet ,with statins to reduce LDL cholesterol TO less than 100 or 70mg in high risk patients-OR 55mg/dl.
- On discharge medication should include aspirin, clopidogrel, beta- blocker ,ACE-inhibitor and GTN spray on need

# **ST- elevation myocardial infarction** **(STEMI)**

**There is cardiac myocytes death due to prolonged ischaemia.**

**Diagnosis**

**is made on clinical history**

**prolonged classical chest pain with**

**ECG findings of MI and**

**elevated biochemical markers-  
troponin I and T,CK- MB.**

**The 1- month mortality of MI**

**may be as high as 50%,**

**50% of deaths occur in first 2 hours**

**because of arrhythmia-VT-VF-CARDIAC ARREST**

# Diagnosis

## Clinical :-

Sever chest pain, lasting 20 minutes , not responding to sublingual GTN, may radiate to the left arm , neck or jaw.

Atypical symptoms include

ACUTE PULMOARY EDEMA-fatigue, pre-syncope -syncope- shock- cardiac arrest-vertigo-CVA.

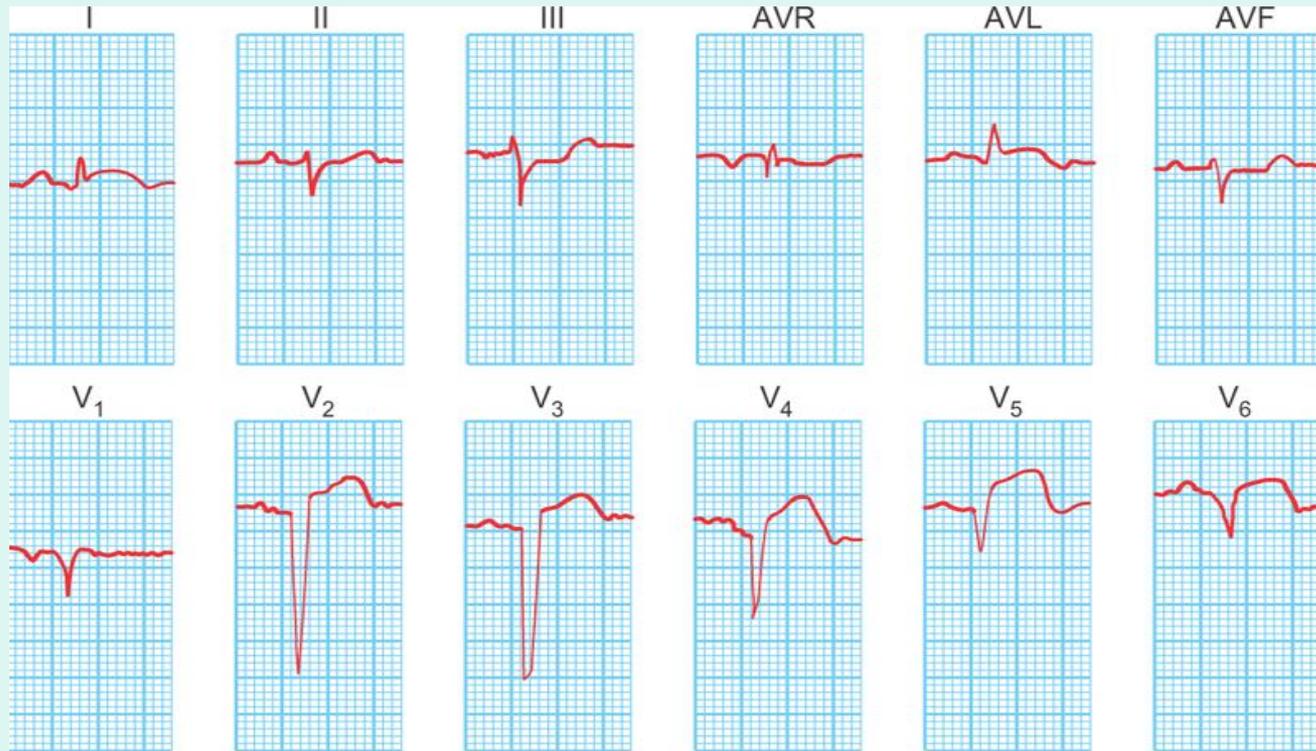
vomiting- epigastric pain.

Autonomic system-

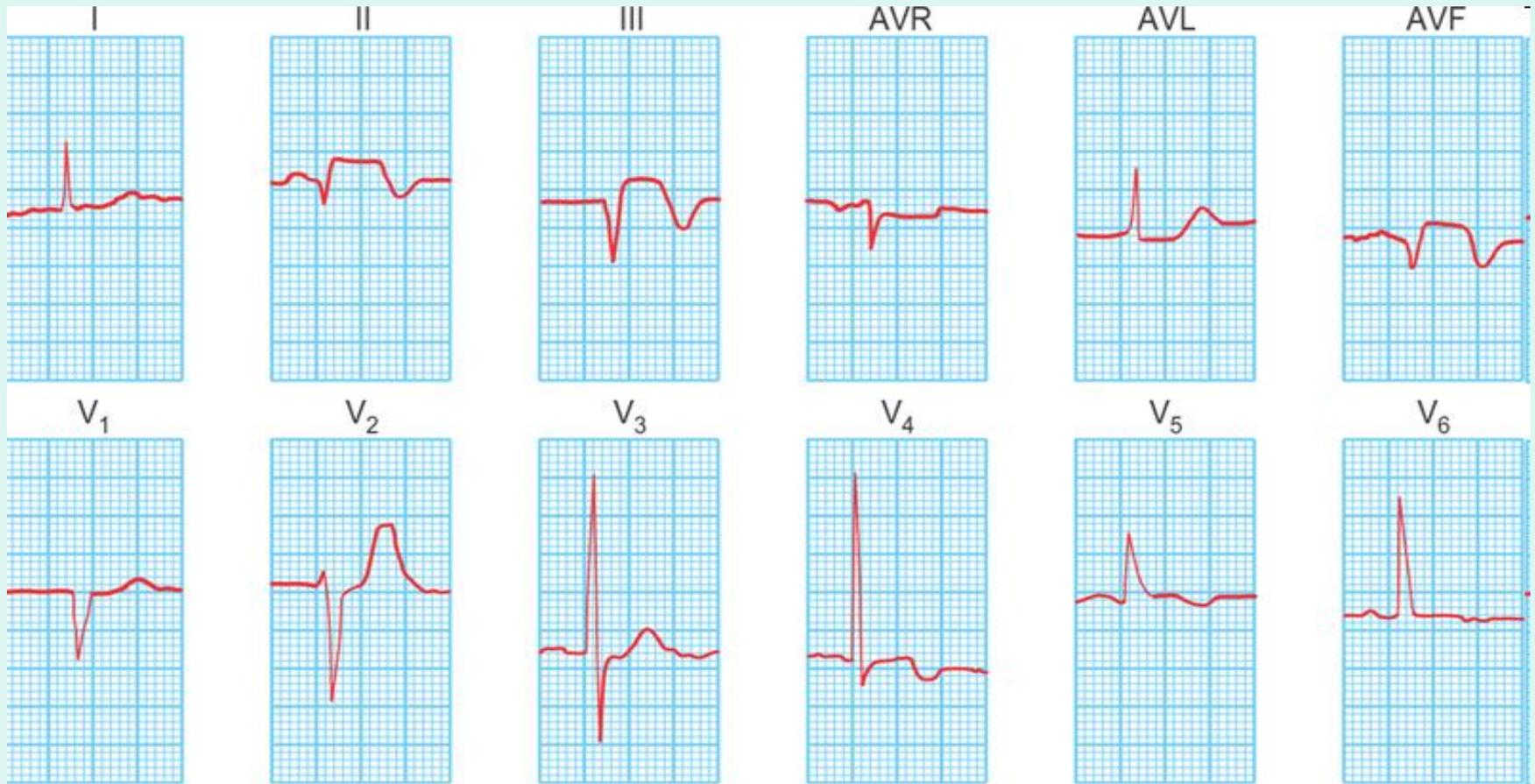
On examination: patient is pale, clammy, sweaty, thready pulse, hypotensive

## **Electrocardiography**

- ECG on admission is usually abnormal, if not it should be repeated every 15 minute while the patient remains in pain**
- ECG changes ( new ST elevation) are usually confined to the leads that face the infarction**
- New LBBB is compatible with diagnosis of MI**
- Continuous cardiac monitoring is required because of the likelihood of significant arrhythmia**



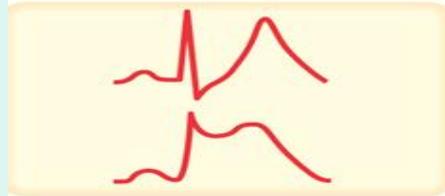
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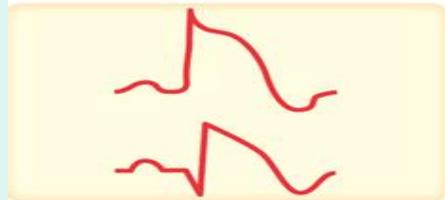
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Before



Minutes afterwards



Hours afterwards



Days afterwards



Weeks afterwards

## **Investigation**

**- Blood sample should be taken for cardiac enzymes troponin I or T level or CK-MB level**

**- Full blood count, serum electrolytes, glucose and lipid profile should be obtained.**

**- ECHO- HK-AK- dyskinatic segment-  
may be helpful to confirm  
a diagnosis of myocardial infarction  
and any abnormal motion**

## Early medical management

### Accident & emergency

- **Bed rest**
- **Oxygen therapy**
- **Intravenous access + blood for markers**
- **I.v. opiates e.g. diamorphine or morphine  
2.5–5mg + antiemetic, e.g. metoclopramide  
10mg**

- Aspirin 150-300mg and clopidogrel 300mg—new anti-plat.p2y12
- Sublingual GTN 0.3-1mg ,repeated
- Beta-blockers
- Refer for PCI if available, preceded by giving (GP IIb/IIIa) inhibitors. -
- Alternatively give thrombolysis - for -  
ST-ELEVATION –NEW LBBB -

# Fibrinolysis

- Fibrinolytic agents enhance the breakdown of occlusive thromboses by the activation of plasminogen to form plasmin.
- Streptokinase is initially used , it causes allergy
- Tissue plasminogen activator(t-PA ), r-PA(reteplase),TNK –t-PA (tenecteplase)
- Aspirin should be used with fibrinolysis,
- Heparin is recommended with t-PA or tenecteplase but not with streptokinase.

## **Percutaneous coronary intervention (PCI)**

**- It needs specialized expert cardiology center- D00R-TO NEEDLE**

**- Earlier referral gives the better result**

**The use of abciximab ( GP IIb/IIIa inhibitor) prior to PCI reduce immediate outcome ( death, myocardial infarction, urgent**

**-Revascularization –RESCUE- PCI after fibrinolysis is discouraged**

## **Coronary artery bypass surgery**

**This is usually reserved for the complication of myocardial infarction- FAILURE--PCI**

## **ComplicationS of myocardial infarction**

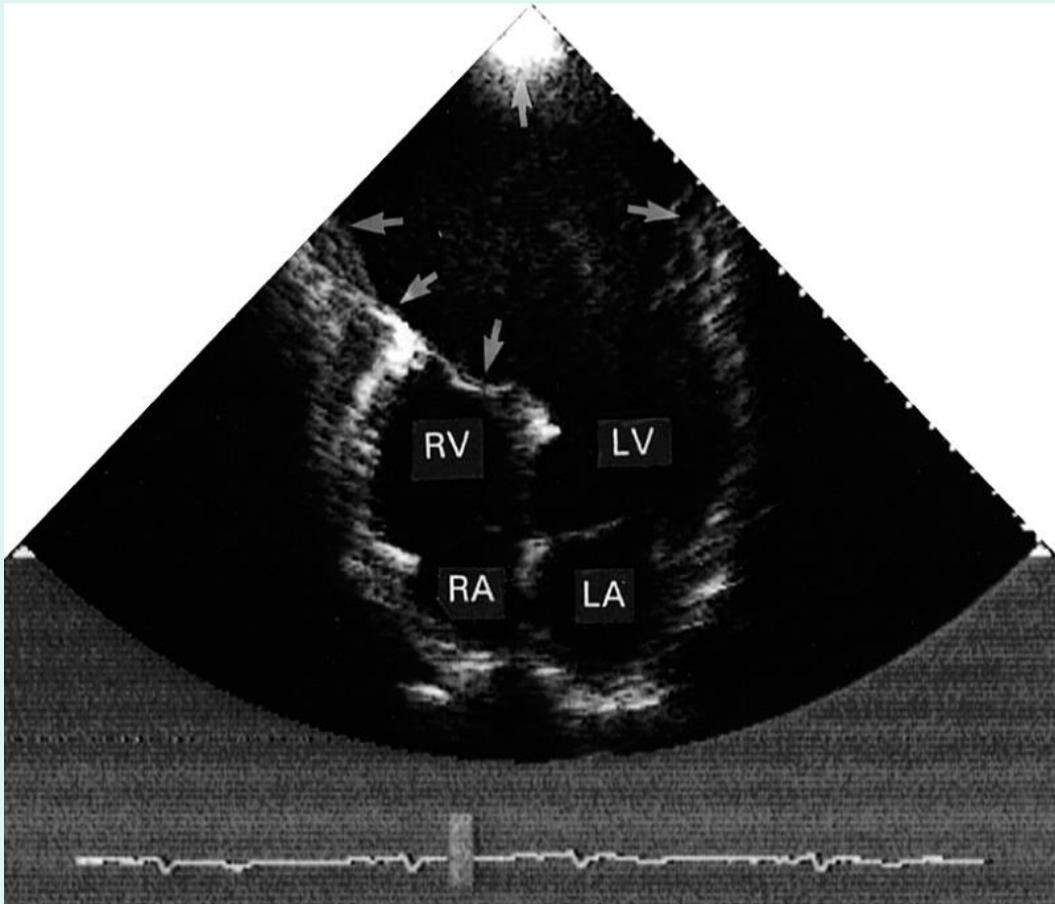
**1- Heart failure treated with furosemide i.v., ACE inhibitors, i.v. inotropes such as dopamine, if there is cardiogenic shock then intra-aortic balloon pump may be required.**

**2- Myocardial rupture and aneurysmal dilatation treatment is surgical**

**3- Ventricular septal defect: treated by intra- aortic balloon pump and coronary angiography then surgery**

**4- Mitral regurgitation: treated surgically**

**5-RV- INFARCTION- INF.MI.**



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## **5- Cardiac arrhythmia :-**

a-ventricular tachycardia is treated with i.v. beta- blockers (metoprolol 5 mg. )  
lidocaine 50-100mg.,or amiodarone  
900-1200 mg.per 24 hours

b- ventricular fibrillation require  
defibrillation- CRT

c- atrial fibrillation is treated with beta-  
blockers and digoxin, amiodarone-  
cardioversion may be needed

**6- Conduction disturbances : most  
commonly heart block , treated by  
atropine or temporary pacemaker**

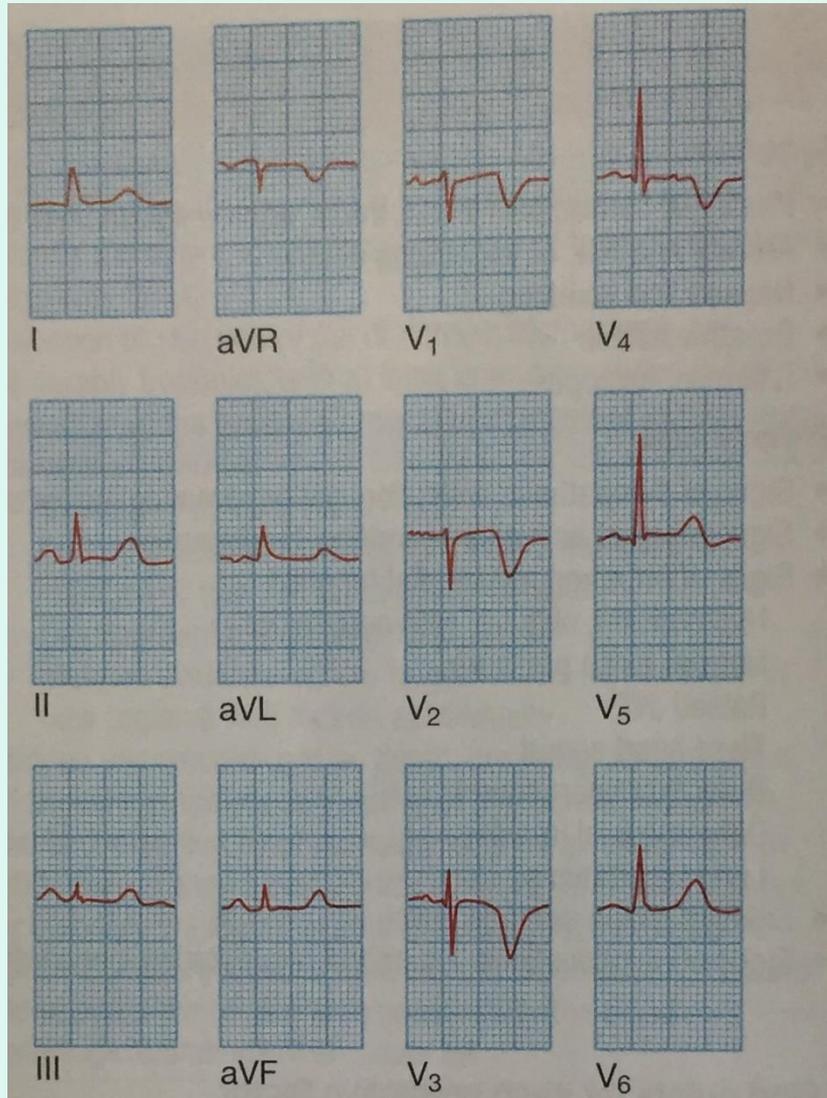
**7- Post-MI- pericarditis –  
pericardial tamponade  
Dressler`s syndrome**

## **Post – MI lifestyle modification**

- Low fat diet**
- Stop smoking**
- Active exercise for 20-30 minutes /day**
- Weight reduction**
- Treat hypertension to less 130/85**
- Treat diabetes to maintain HbA1c < 7%**

## **Post-MI drug therapy**

- Aspirin 75-100mg/day
- Beta-blocker e.g. metoprolol 50 mg twice daily
- ACE inhibitors e.g. ramipril 2.5 mg twice daily, if intolerant use ARB, e.g. valsartan 20 mg twice daily
- Statins e.g. simvastatin 20-80 mg/day
- Aldosterone antagonist, e.g. eplerenone 25 mg / day



~~ECG~~ Recent anterior non-ST elevation (subendocardial) MI. There is deep symmetrical T wave inversion together with a reduction in the

