Department of Anesthesia Techniques
Title of the lecture:- Cardiovascular system
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CARDIOVASCULAR DISEASE

Cardiovascular disease (CVD) is the most frequent cause of adult death, 1/3 of men and 1/4 of women will die as a result of ischemic heart disease (IHD).

CORONARYARTERY DISEASE (CAD)

Is the most common form of heart disease .

Risk factors:

- Age and sex: Age is the most powerful independent risk factor. Pre-menopausal women have lower rates of disease than men.
- Family history: combination of shared genetic, environmental and lifestyle factors. The most common inherited risk characteristics are,hypertension (HTN), hyperlipidemia, diabetes mellitus DM).
- Smoking. the most important avoidable Risk factor.
- Hypertension, excess risk is related to both systolic blood pressure (SBP) and diastolic blood pressure (DBP), as well as pulse pressure.
- Hypercholesterolaemia .
- Diabetes mellitus. often associated with diffuse disease that is difficult to treat.
- Physical inactivity. doubles the risk of coronary artery disease .
- Obesity . particularly if central or truncal, is an independent risk factor.
- Alcohol. Moderate Alcohol consumption is associated with reduced rates of coronary artery disease. Excess alcohol consumption is associated with hypertension and cerebrovascular disease.
- Other dietary factors. Diets deficient in fresh fruit, vegetables and polyunsaturated fatty acids are associated with an increased risk of CVD.
- Personality. there is little or no evidence to support the popular belief that stress is a major cause of coronary artery disease.
- Social deprivation The impact of Other risk factors is amplified in patients who are socially deprived .

Stable angina

Caused by transient myocardial ischemia. It occurs whenever there is an imbalance between myocardial oxygen supply and demand. Coronary atheroma is by far the most common cause of angina.

Clinical features:

Stable angina is characterised by central chest pain, discomfort or breathlessness that is precipitated by exertion or other forms of stress :

- Physical exertion
- Cold exposure
- Heavy meals

• Intense emotion

Pathophysiology:-

• Fixed stenosis -Stable fibrous plaque

Investigations :

1- Resting electrocardiogram (ECG).

2-Exercise ECG (is usually performed using a standard treadmill while monitoring the patient's ECG, BP and general condition).

3-Coronary arteriography (detailed information about the extent and nature of CAD)

Treatment:

1-Advice to patients with stable angina:-

- Do not smoke
- Aim for ideal body weight
- Take regular exercise (exercise up to, but not beyond, the point of chest discomfort)
- Avoid severe unaccustomed exertion, and vigorous exercise after a heavy meal or in very cold weather.
- Take sublingual nitrate before undertaking exertion

2-Antiplatelet therapy:- aspirin (75 mg) reduces the risk of adverse events such as MI and should be prescribed for all patients with CAD indefinitely.

Clopidogrel (75 mg daily) is an equally effective.

3-Anti-anginal drug treatment: Example:

Nitrates :produce venous and arteriolar dilatation. Sublingual glyceryl trinitrate (GTN) will relieve an attack of angina in2–3 minutes.

Side effects include: headache, symptomatic hypotension .

***Beta-blockers*:** These lower myocardial O2 demand by reducing HR, BP and myocardial contractility.

4-Invasive treatment :- Percutaneous coronary intervention (PCI).

Acute myocardial infarction (AMI)

In AMI, occlusive thrombus is almost always present at the site of rupture or erosion of an atheromatous plaque. Without treatment, the infarctrelated artery remains permanently occluded in 20–30% of patients.

Clinical features:

- Prolonged cardiac pain: chest, throat, arms, epigastrium or back
- Anxiety and fear of impending death
- Nausea and vomiting
- Breathlessness
- Collapse/syncope

Painless or 'silent' MI is particularly common in older patients or those with diabetes mellitus.

Investigations

ECG : The initial ECG may be normal or nondiagnostic 1/3 of cases. Repeated ECGs are important.

Plasma cardiac biomarkers: These biochemical markers are cardio-specific isoform: CK-MB, and the cardiospecific proteins, troponins T and I.

Chest X-ray: The heart size is often normal but there may be cardiomegaly.

Echocardiography: This is useful for assessing ventricular function

Treatment :

1-**Admission** urgently to central care unit (CCU), (risk of death or recurrent myocardial ischaemia during the early unstable phase).

2-**Analgesia**: relieve distress and lower adrenergic drive and thus reduce vascular resistance, blood pressure (BP),infarct size and susceptibility to ventricular arrhythmias. IV opiates (morphine sulphate).

3-**Antithrombotic therapy**:

Antiplatelet therapy: aspirin daily.

Anticoagulants: reduces the risk of thromboembolism (TE) complications, and prevents re-infarction in the absence of reperfusion therapy or after successful thrombolysis.

4-Anti-anginal therapy:

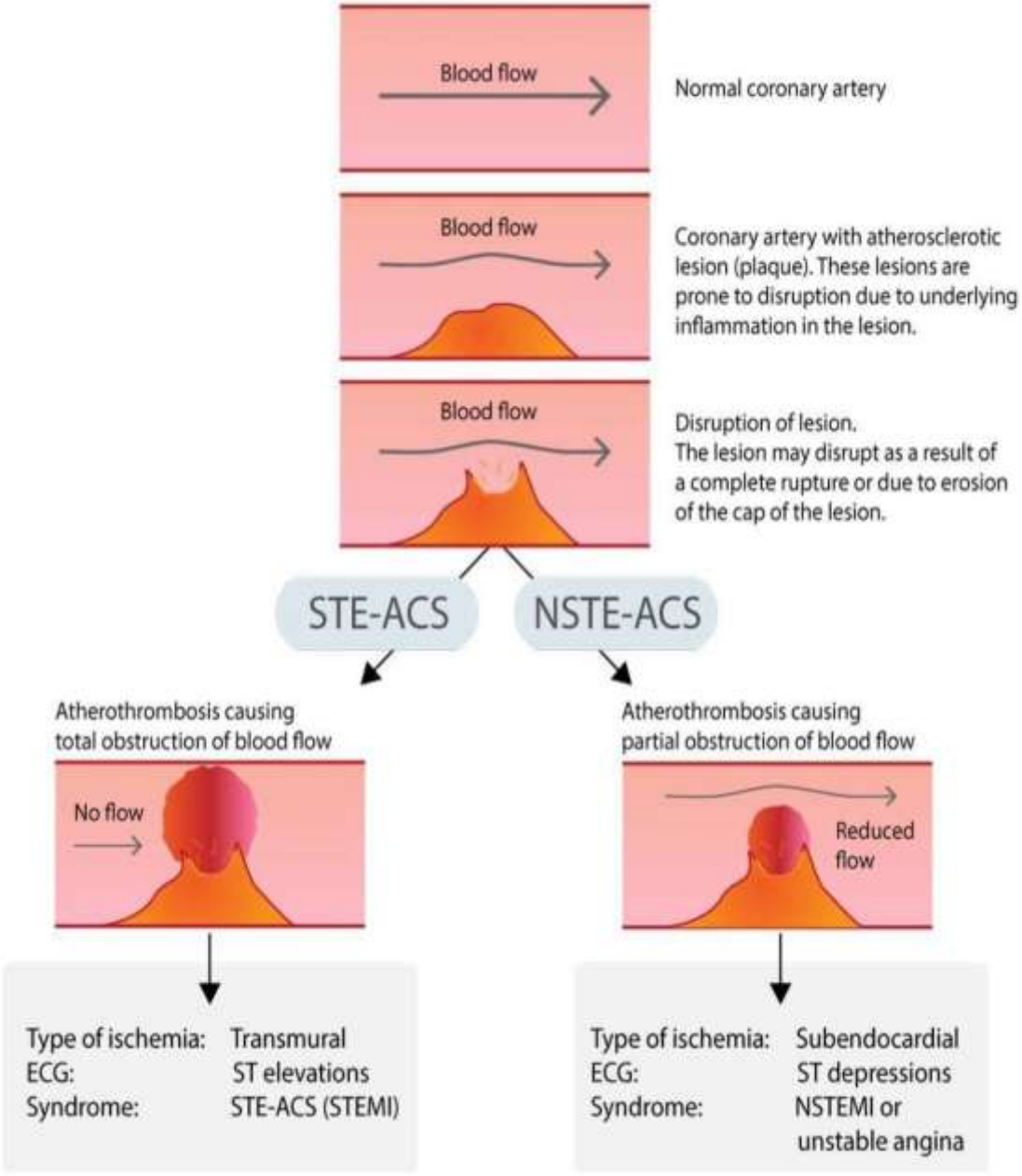
A- Sublingual glyceryl trinitrate .

B-β-blockers (e.g. atenolol or metoprolol) relieve pain, reduce arrhythmias and improve short-term mortality

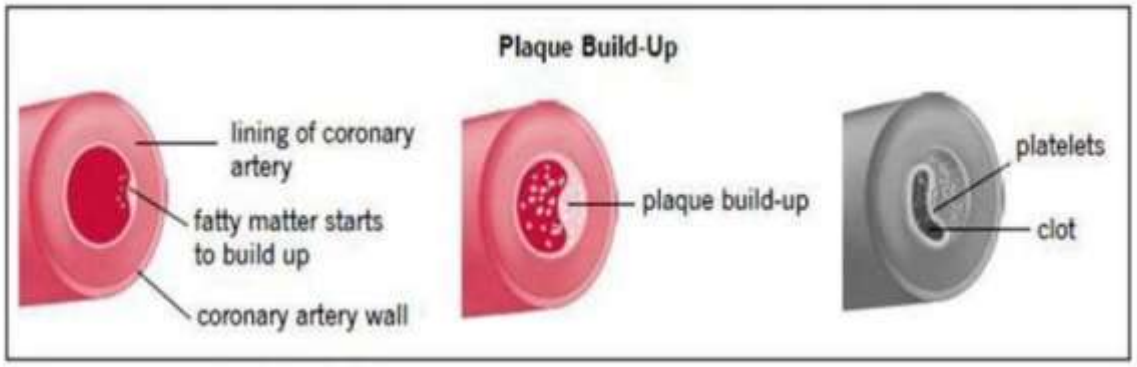
5-Reperfusion therapy:

A-Thrombolysis: **example**: ***alteplase***

B-Primary percutaneous coronary intervention (PCI).



STE-ACS (ST-Elevation Acute Coronary syndrome).
NSTE-ACS (Non ST-Elevation Acute Coronary syndrome).



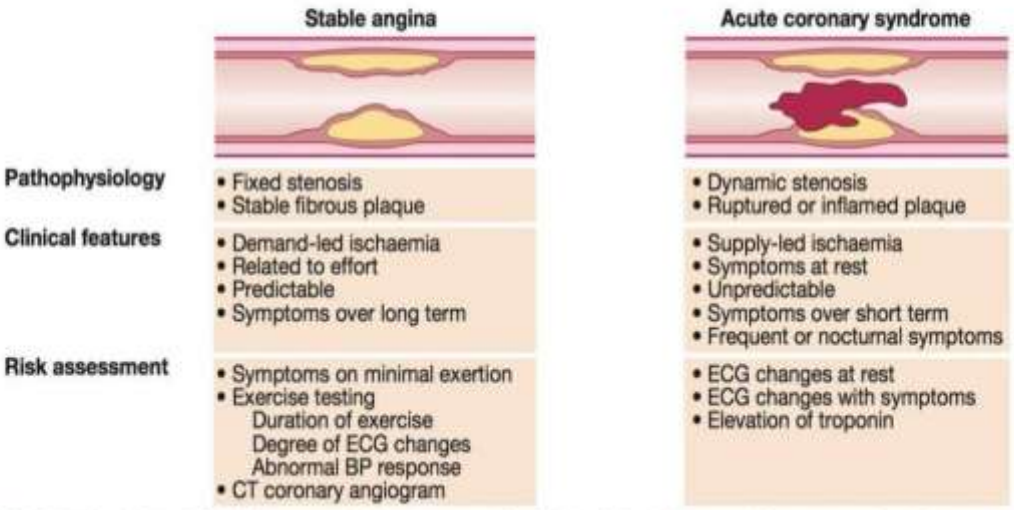
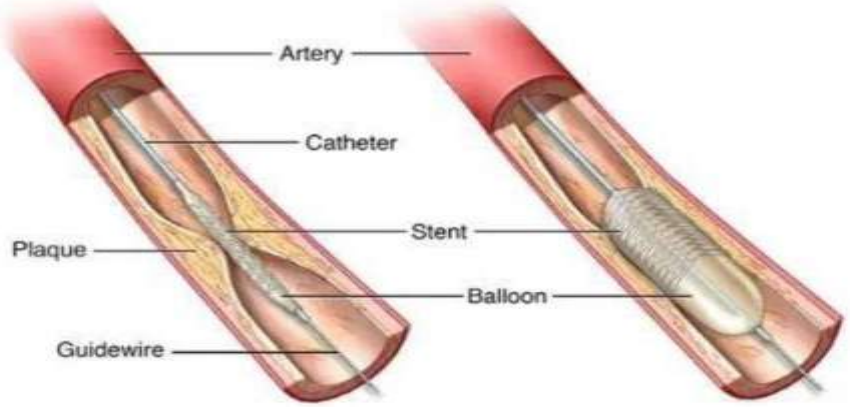
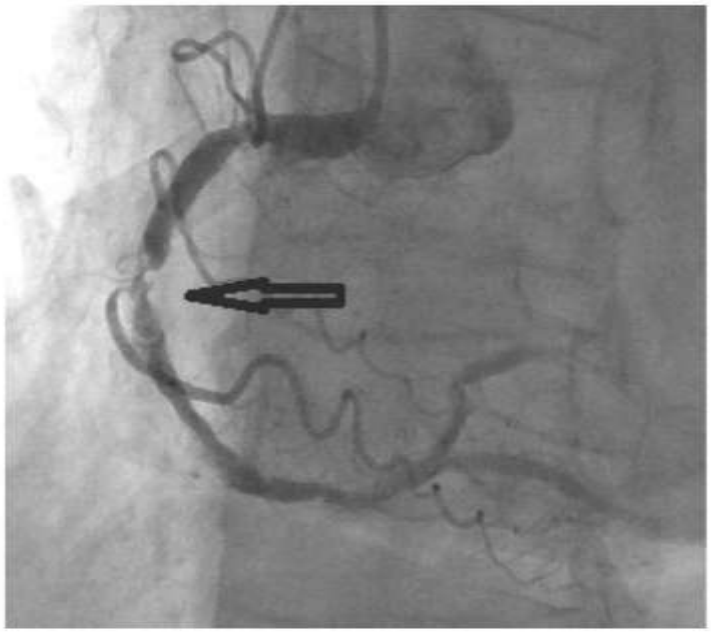


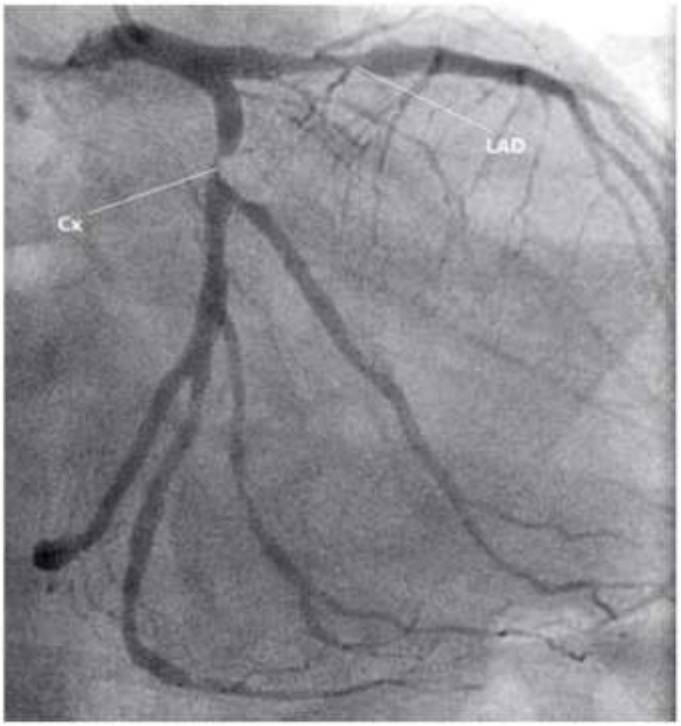
Fig. 18.18 Pathophysiology, clinical features and risk assessment of patients with stable or unstable coronary heart disease.

Percutaneous Coronary Intervention (PCI)

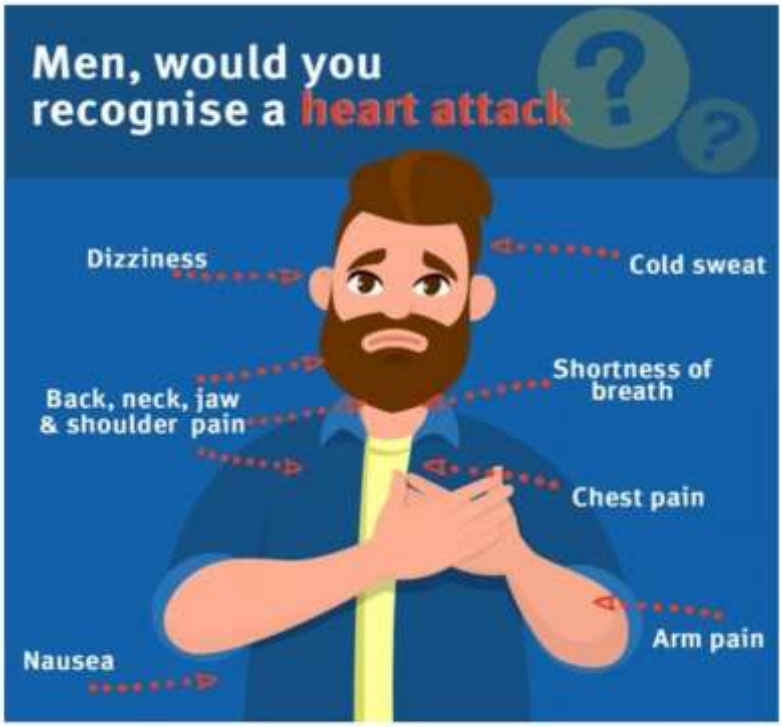




The coronary angiogram (left) shows a subocclusion of of the right coronary artery.



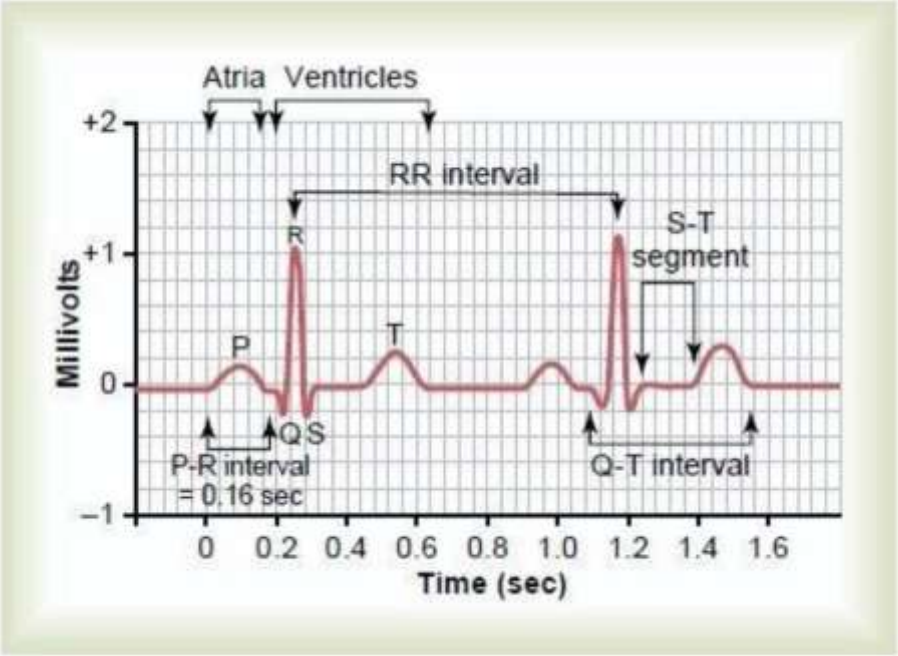
Moderate LAD and severe circumflex arteries stenosis



Man with heart attack

Electrocardiogram

Electrocardiogram: The electrocardiogram (ECG) is used to assess cardiac rhythm and conduction. Heart rate = (300÷ number of large squares between beats).

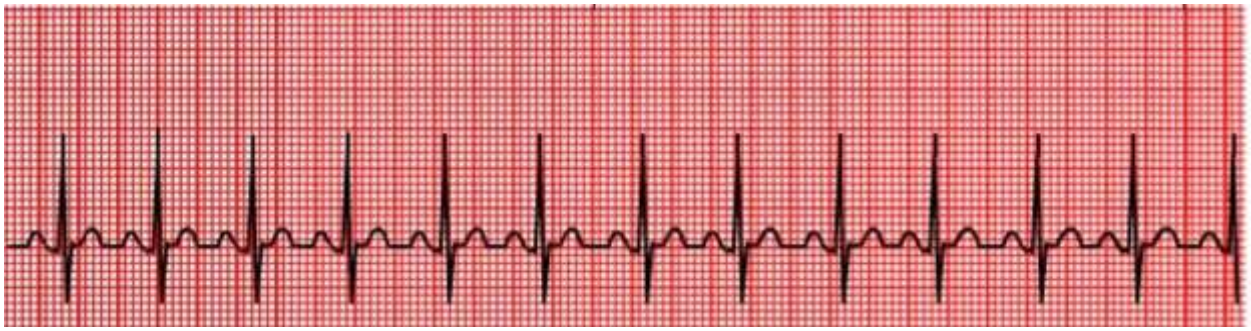


An arrhythmia:- is a problem with the rate or rhythm of heartbeat. It means that your heart beats too quickly, too slowly, or with an irregular pattern.

Sinus tachycardia: a sinus rate of more than 100/min, and is usually due to an increase in sympathetic activity .

Causes of Sinus tachycardia:

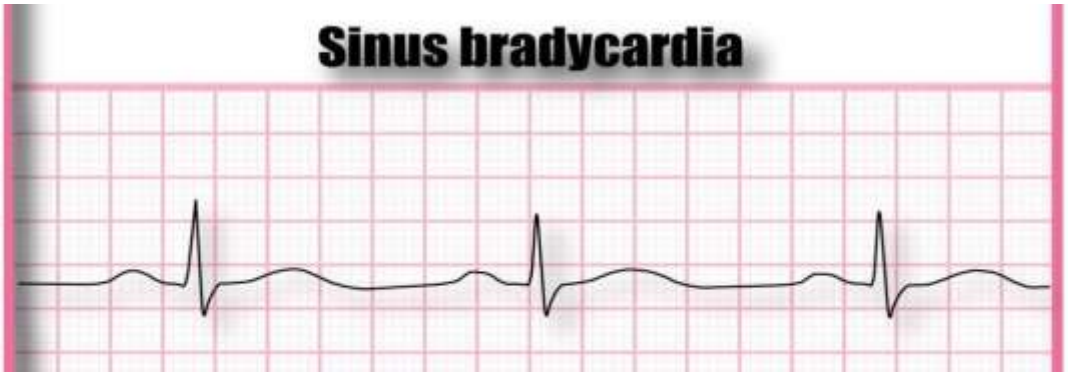
- Physiological (Anxiety, exercise, emotion, pregnancy)
- Fever • Anaemia
- Heart failure
- Thyrotoxicosis
- Drugs, e.g. β-agonists (bronchodilators).



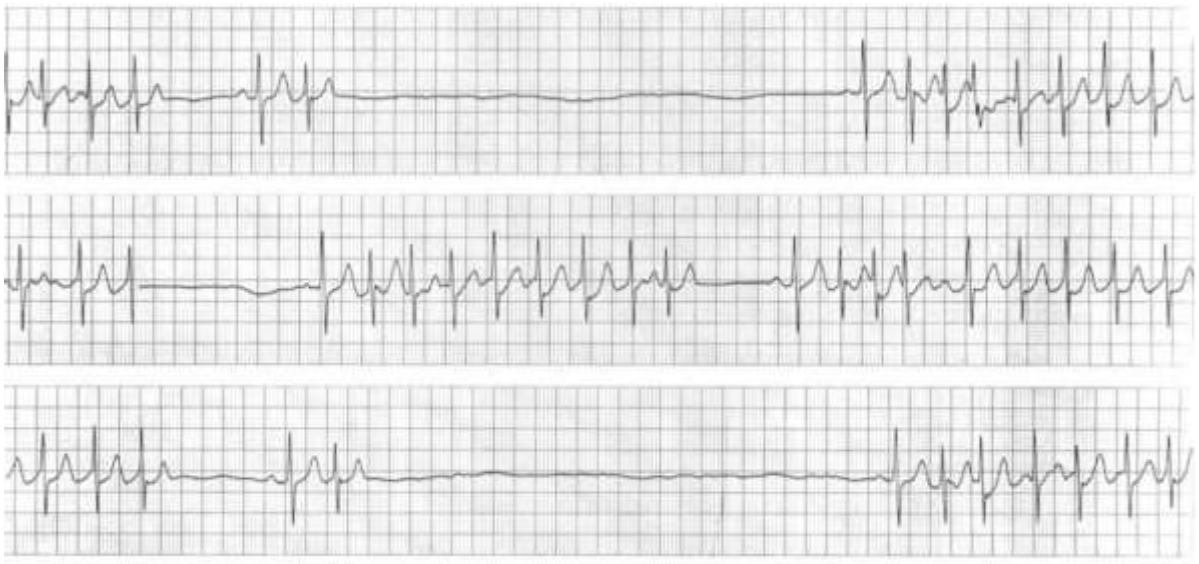
Sinus bradycardia: A sinus rate of less than 60/min may occur in healthy people at rest and is a common finding in athletes.
Some pathological causes are listed:

Causes of Sinus bradycardia:

- MI ,SA noose disease (sick sinus syndrome).
- Hypothermia-Hypothyroidism.
- Cholestatic jaundice-Raised intracranial pressure.
- Drugs, e.g. β-blockers, digoxin, verapamil.



Sinoatrial disease(sick sinus syndrome): is most common in older people. The underlying pathology involves fibrosis, degenerative changes or ischaemia of the SA (sinus) node.



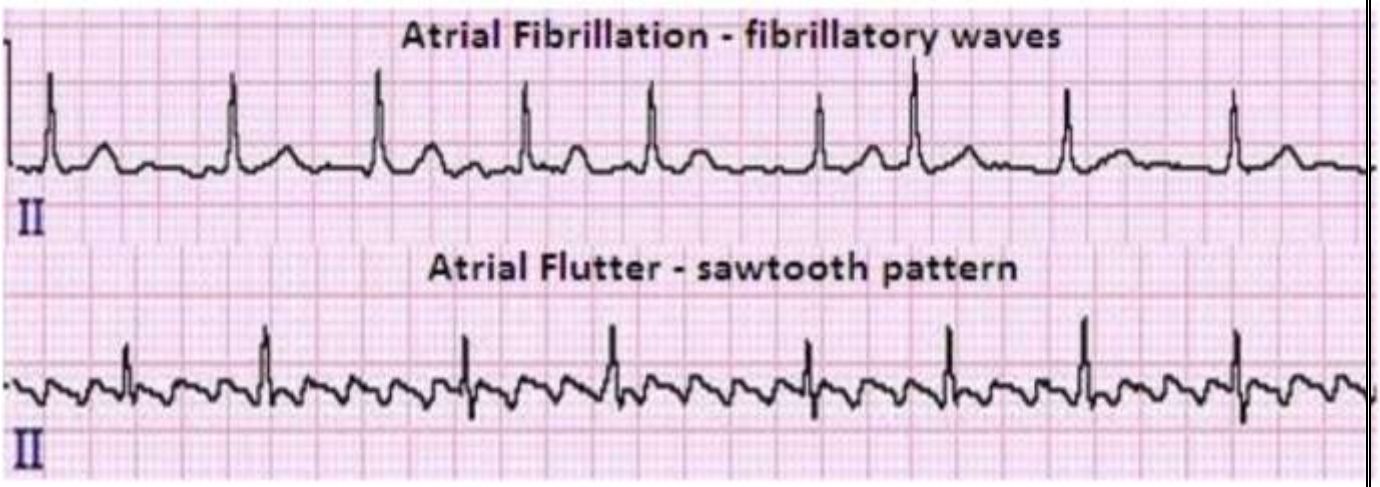
Atrial ectopic beats :- usually cause no symptoms but can give the sensation of a missed beat or an abnormally strong beat.
Treatment is rarely necessary but β-blockers can be used if symptoms are intrusive.

1-Supraventricular tachycardia: This includes irregular heartbeats that start above the ventricles. Supraventricular tachycardia causes episodes of a pounding heartbeat that start and stop suddenly

2-Atrial fibrillation: Atrial fibrillation (AF) is the most common sustained cardiac arrhythmia, causes a rapid, uncoordinated heartbeat.

Atrial fibrillation may be temporary and start and stop on its own. But some episodes may not stop unless treated.

3. Atrial flutter: Atrial flutter is similar to Atrial fibrillation but the heartbeats are more organized. The ECG shows saw-toothed flutter waves .



Supraventricular' tachycardias (SVT):-

This term describes a group of narrow-complex tachycardias caused by atrial re-entry circuits or abnormal atria foci. SVT commonly have a similar appearance on ECG with regular narrow QRS with no preceding p wave.