

III) Pharmacotherapy of Angina pectoris

Angina pectoris develops as a result of an imbalance between the oxygen supply and the oxygen demand of the myocardium. It is a symptom of myocardial ischemia. When the increase in coronary blood flow is unable to match the increased oxygen demand, angina develops.

Drugs used in angina pectoris

Organic nitrates e.g. nitro-glycerine, isosorbide dinitrate, etc. Beta-adrenergic blocking agents e.g. propranolol, atenolol, etc. Calcium channel blocking agents e.g. verapamil, nifedipine, etc. Miscellaneous drugs e.g. aspirin, heparin, dipyridamole.

1. **Organic nitrates** are potent vasodilators and successfully used in the therapy of angina pectoris for over 100 years. The effects of nitrates are mediated through the direct relaxant action on smooth muscles. The action of nitrates begins after 2-3 minutes when chewed or held under the tongue and the action lasts for 2 hours. Adverse effects include flushing, weakness, dizziness, tachycardia, palpitation, vertigo, sweating, syncope localized burning with sublingual preparation and contact dermatitis with ointment.

Therapeutic uses: prophylaxis and treatment of angina pectoris, post-myocardial infarction, coronary insufficiency, acute LVF (left ventricle failure)

2. **Adrenergic blocking agents:** Exercise and emotional excitement induce angina in the susceptible subject by the increase in heart rate, blood pressure and myocardial contractility through increased sympathetic activity. Beta receptor-blocking agents prevent angina by blocking all these effects. In most patients, the net effect is a beneficial reduction in cardiac workload and myocardial oxygen consumption e.g. **atenolol, propranolol metoprolol, and labetalol.**

Adverse effects: Lethargy, fatigue, rash, cold hands and feet, nausea, breathlessness, nightmares and bronchospasm. Selective beta-blockers have relatively lesser adverse effects.

Therapeutic uses other than angina include hypertension, Cardiac arrhythmias, post-myocardial infarction and pheochromocytoma.

3. **Calcium channel blockers:** calcium is necessary for the excitation-contraction coupling in both the cardiac and smooth muscles. Calcium channel blockers appear to involve their interference with the calcium entry into the myocardial and vascular smooth muscle, thus decreasing the availability of intracellular calcium e.g. **nifedipine, felodipine, verapamil and diltiazem.**

Other therapeutic uses: hypertension, acute coronary insufficiency, tachycardia,

Adverse effects: flushing nausea/vomiting, headache, Ankle swelling, dizziness, constipation, etc.

4. Miscellaneous drugs, e.g. **Acetylsalicylic acid**

Acetylsalicylic acid (aspirin) at low doses given intermittently decreases the synthesis of thromboxane A₂. Thus, at doses of 75 mg per day, it can produce antiplatelet activity and reduce the risk of myocardial infarction in anginal patients.

IV) Anti-arrhythmias

An arrhythmia is **an abnormality of the heart's rhythm**. It may be bradycardia, tachycardia, or irregular cardiac arrhythmias arise as the result of either of the:

- a) Disorders of impulse formation and/ or
- b) Disorders of impulse conduction.

Antiarrhythmic drugs are used to prevent or correct cardiac arrhythmias. Drugs used in the treatment of cardiac arrhythmias are traditionally classified into:

Class (I): **Sodium channel blockers** which include quinidine, lidocaine, phenytoin, flecainide, etc.

Class (II): **Beta-adrenergic** blockers which include propranolol, atenolol, etc. Class (III): **Potassium channel blockers** e.g. amiodarone, bretylium.

Class (IV): **Calcium channel blockers** e.g. verapamil, etc.

Class (V): **Digitalis** e.g. digoxin.

Quinidine: It blocks sodium channels so that there is an increase in the threshold for excitability. It is well absorbed orally

Adverse effects: SA block, severe headache, diplopia and photophobia.

Lidocaine, which is used commonly as a local anaesthetic blocks both open and inactivated sodium channels and decreases automaticity. It is given parenterally.

Adverse effects: excessive doses cause massive cardiac arrest, dizziness, drowsiness, seizures, etc.

Propranolol: Myocardial sympathetic beta receptor stimulation increases automaticity, enhances A.V. conduction velocity and shortens the refractory period. Propranolol can reverse these effects

Therapeutic uses: This is useful in tachyarrhythmias, phaeochromocytoma (adrenal gland tumour) and thyrotoxicosis crisis. It is also useful in patients with atrial fibrillation.

Amiodarone: This drug is used in the treatment of refractory supraventricular tachyarrhythmias and ventricular tachyarrhythmias. It depresses sinus, atrial and A.V nodal function.

Verapamil: this drug acts by blocking the movement of calcium ions through the channels. **It is contraindicated in patients on beta blockers and quinidine.**

It is the drug of choice in case of paroxysmal supraventricular tachycardia for rapid conversion to sinus rhythm.

Digoxin causes a shortening of the atrial refractory period with small doses (vagal action or parasympathetic).

Bradycardia : Medicine to treat a slow heartbeat (such as **atropine**) may be given by emergency medical services (EMS) or in the emergency room (ER). Atropine may cause difficulty swallowing.

Medicines to treat a Tachycardia include:

Procedures and devices: If medicines do not treat arrhythmia adequately, may need one of the following procedures or devices.

Cardioversion

Cardioversion is a procedure that uses external electric shocks to restore a normal heart rhythm. Cardioversion is called defibrillation when it is done in an emergency to prevent death when irregular heartbeats in the lower chambers of your heart, the ventricles, threatens to, or actually causes, **cardiac arrest**.

While the procedure takes only a few minutes, it requires that patient arrive a few hours before the procedure. To prepare, him will be given anesthesia through an intravenous (IV) line in arm to asleep. Although uncommon, cardioversion has some risks. This procedure can cause blood clots to break away and travel from the heart to other tissues or

organs and cause a stroke or other problems. Taking anticlotting medicines before and after cardioversion can reduce this risk.

Catheter ablation

Catheter ablation is a procedure to stop abnormal electrical signals from moving through the heart and causing an irregular heartbeat.

Ablation is done through a procedure called **cardiac catheterization** that passes flexible tubes, or catheters, through blood vessels until they reach the heart. Some catheters have wire electrodes that record and locate the source of an abnormal heartbeats. Other catheters can deliver treatments. A machine will send either radiofrequency (RF) waves, extremely cold temperatures, or laser light through the catheter tip to create a scar on the heart. The scar prevents abnormal electrical signals from causing irregular heartbeat.

Catheter ablation has some risks both during the procedure and during recovery, including:

- Bleeding
- Infection
- Blood vessel damage
- Heart damage
- Arrhythmias
- Blood clots

Implantable cardioverter defibrillators (ICDs)

Defibrillators are devices that restore a normal heartbeat by sending an electric pulse or shock to the heart. They are used to prevent or correct an arrhythmia, a heartbeat that is uneven or that is too slow or too fast. Defibrillators can also restore a heartbeat if the heart suddenly stops. Different types of defibrillators work in different ways. ICDs can prevent sudden death among people who have a high risk of a life-threatening arrhythmia. They are surgically placed inside the body. It can take time and effort to get used to living with a defibrillator, and it is important to be aware of possible risks and complications.

Pacemakers

A pacemaker is a small device that sends electrical pulses to help heart beat at a normal rate and rhythm. Pacemakers can also be used to help the heart chambers beat together in sync so heart can pump blood more efficiently to the body. Patient may need a temporary (short-term) or permanent (long-term) pacemaker.

Treating the cause of arrhythmia

a problem with electrolytes levels, high blood pressure, heart disease, sleep apnea, or thyroid disease. All can cause arrhythmia.

Vagal maneuvers

Vagal maneuvers are relaxation techniques that may help slow your heart rate.

Techniques healthcare team may guide patient through include:

- Coughing or gagging
- Holding breath and bearing down, which is called the Valsalva maneuver
- Lying down
- Placing a towel dipped in ice-cold water over patient face.

V-Antihypotensive drugs

used to elevate low blood pressure and may be classified as follows:

I. **Agents intended to increase the volume of blood in active circulation.** These include intravenous fluids such as whole blood, plasma, plasma components, plasma substitutes and solution of crystalloids

II. **Vasoconstrictor drugs** include:

- Peripherally acting vasoconstrictors which are further divided into **sympathomimetic drugs** and **direct vasoconstrictors**.

Sympathomimetics used to elevate blood pressure include **adrenaline, noradrenaline, methoxamine, phenylephrine, and ephedrine.**

Direct vasoconstrictors include **vasopressin** and **angiotensin.**

