Cardiology Lectures Dr. Ahmed Moyed Hussein

**ATHEROSCLEROSIS**

Atherosclerosis can affect any artery in the body. When it occurs in the heart, it may cause angina, MI and sudden death. in the brain: stroke and transient ischaemic attack (TIA). and in the limbs: claudication and critical limb ischaemia.

***Pathophysiology:***

Atherosclerosis is a progressive inflammatory disorder of the arterial wall that is characterized by focal lipidrich deposits of atheroma that remain clinically silent until they become large enough to impair tissue perfusion, or until ulceration and disruption of the lesion result in thrombotic occlusion or distal embolization of the vessel.

***Risk factors:***

• *Age and sex*. Age is the most powerful independent risk factor for atherosclerosis. Pre-menopausal women have lower rates of disease than men, although this sex difference disappears after the menopause.

• *Family history*. Atherosclerotic vascular disease often runs in families,

• *Smoking*.

• *Hypertension*.

• *Hypercholesterolaemia*.

• *Diabetes mellitus*.

•*Haemostatic factors*. Platelet activation and high plasma fibrinogen concentrations are associated with an increased risk of coronary thrombosis.

• *Physical inactivity.*

• *Obesity*.

• *Alcohol*.

•*Other dietary factors*. Diets deficient in fresh fruit, vegetables and polyunsaturated fatty acids are associated with an increased risk of cardiovascular disease.

• *Personality*. Certain personality traits are associated with an increased risk of coronary disease.

• *Social deprivation*.

***Primary prevention:*** measures to decrease risk of atherosclerosis in persons with no previous history of atherosclerosis, includes:



***Secondary prevention:***

BP should be treated to a target of 140/85 mmHg or lower. Aspirin and ACE inhibitors are of benefit in patients with evidence of vascular disease. And treating hyperlipidemia with statins.

**CORONARY ARTERY DISEASE**

Disease of the coronary arteries is almost always due to atheroma and its complications, particularly thrombosis. Occasionally, the coronary arteries are involved in other disorders such as aortitis, polyarteritis and other connective tissue disorders. ****

**Stable angina**

Angina pectoris is the symptom complex caused by transient myocardial ischaemia. It may occur whenever there is an imbalance between myocardial oxygen supply and demand. Coronary atheroma is by far the most common cause of angina, although the symptom may be a manifestation of other forms of heart disease, particularly aortic valve disease and hypertrophic cardiomyopathy.

***Clinical features:***

Stable angina is characterized by central **chest pain**, discomfort or breathlessness that is precipitated by exertion or other forms of stress like intense emotion, heavy meal or exposure to cold. Less commonly may be aggravated by lying down (decubitus angina), and is promptly relieved by rest. Physical examination is frequently unremarkable but should include a careful search for evidence of valve disease (particularly aortic), important risk factors (e.g. hypertension, diabetes mellitus), left ventricular dysfunction (cardiomegaly, gallop rhythm), other manifestations of arterial disease (carotid bruits, peripheral vascular disease) and unrelated conditions that may exacerbate angina (anaemia, thyrotoxicosis).

***Investigations:***

***Resting ECG:***

The ECG may show evidence of previous MI but is often normal, even in patients with severe coronary artery disease. The most convincing ECG evidence of myocardial ischaemia is the demonstration of reversible ST segment depression or elevation, with or without T-wave inversion, at the time

the patient is experiencing symptoms (whether spontaneous or induced by exercise testing).

***Exercise ECG:***

An exercise tolerance test (ETT) is usually performed using a standard treadmill or bicycle ergometer protocol while monitoring the patient’s ECG, BP and general condition. Planar or down-sloping ST segment depression of 1 mm or more is indicative of ischaemia.



Fig: positive ETT

***CT coronary angiography:*** also can be used for diagnosis of CAD

***Other forms of stress testing***

• ***Myocardial perfusion scanning****.* This may be helpful in the evaluation of those who are unable to exercise. It entails obtaining scintiscans of the myocardium at rest and during stress (either exercise testing or pharmacological stress, such as a controlled infusion of dobutamine), after the administration of an intravenous radioactive isotope, such as 99technetium. A perfusion defect present during stress but not at rest provides evidence of reversible myocardial ischaemia.



Fig: positive myocardial perfusion scan

• ***Stress echocardiography****.*

***Coronary arteriography:***

This provides detailed anatomical information about the extent and nature of coronary artery disease. The procedure is performed under local anaesthesia and requires specialized radiological equipment, cardiac monitoring and an experienced operating team.



***Management:***

***general measures:***

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***Antiplatelet therapy:***

Low-dose (100 mg) aspirin reduces the risk of adverse events such as MI and should be prescribed for all patients with coronary artery disease indefinitely. Clopidogrel (75 mg daily) is an equally effective antiplatelet agent that can be prescribed if aspirin causes troublesome dyspepsia or other side-effects.

***Anti-anginal drug treatment:***

Five groups of drug are used to help relieve or prevent the symptoms of angina: nitrates, β-blockers, calcium antagonists, potassium channel activators and an I*f*

channel antagonist.

***Nitrates:***

These drugs act directly on vascular smooth muscle to produce venous and arteriolar dilatation. Their beneficial effects are due to a reduction in myocardial oxygen demand (lower preload and afterload) and an increase in myocardial oxygen supply (coronary vasodilatation). It given as Sublingual glyceryl trinitrate (GTN) tab or spray ; however, a variety of alternative nitrate preparations can provide a more prolonged therapeutic effect. GTN can be given transcutaneously as a patch (5–10 mg daily), or as a slow-release buccal tablet (1–5 mg 4 times daily). Other nitrates, such as isosorbide dinitrate (10–20 mg 3 times daily up to 120 mg perday) and isosorbide mononitrate (20–60 mg once or twice daily), can be given by mouth.

Side-effects include headache, symptomatic hypotension and, rarely, syncope.

***Beta-blockers:***

These lower myocardial oxygen demand by reducing heart rate, BP and myocardial contractility,

***Calcium channel antagonists:***

These drugs inhibit the slow inward current caused by the entry of extracellular calcium through the cell membrane of excitable cells, particularly cardiac and arteriolar smooth muscle, and lower myocardial oxygen demand by reducing BP and myocardial contractility. verapamil and diltiazem are particularly suitable for patients who are not receiving a β-blocker (e.g. those with airways obstruction) because they slow SA node firing, inhibit conduction through the AV node and tend to cause a bradycardia. Calcium channel antagonists reduce myocardial contractility and can aggravate or precipitate heart failure. Other unwanted effects include peripheral oedema, flushing, headache and dizziness.

***Potassium channel activators:***

These have arterial and venous dilating properties but do not exhibit the tolerance seen with nitrates. Nicorandil (10–30 mg twice daily orally) is the only drug in this class currently available for clinical use.

***If channel antagonist:***

Ivabradine is the first of this class of drug. It induces bradycardia by modulating ion channels in the sinus node. In contrast to β-blockers and rate-limiting calcium antagonists, it does not have other cardiovascular effects.

The goal is the control of angina with minimum side-effects and the simplest possible drug regimen. and revascularization should be considered if an appropriate combination of two or more drugs fails to achieve an acceptable symptomatic response.

***Invasive treatment:***

***Percutaneous coronary intervention:***

Percutaneous coronary intervention (PCI) is performed by passing a fine guidewire across a coronary stenosis under radiographic control and using it to position a balloon, which is then inflated to dilate the stenosis with or without stent implantation. PCI is mainly indicated in patient with persistent angina despite optimum medical therapy.

***Coronary artery bypass grafting:***

It involve grafting the diseased vessel using venous or arterial graft directly to aorta.

***Prognosis:***

Symptoms are a poor guide to prognosis; nevertheless, the 5-year mortality of patients with severe angina is nearly double that of patients with mild symptoms. In general, the prognosis of coronary artery disease is related to the number of diseased vessels and the degree of left ventricular dysfunction.