Cardiac angina: sudden onset of pressing and severe pain behind the sternum bone, which spreads to the shoulder and left arm in classic forms and in less cases it spreads to right shoulder and right arm.

Angina pectoris is mainly caused by coronary artery narrowing and causes ischemic heart pain (there is an imbalance between oxygen demand and supply)

Determinants of the heart's need for oxygen:

1) Intraventricular pressure

2) thickness of the ventricular wall

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3) Ventricular volume

4) Heart rate

5) Ventricular contractile force

(Cardiac output formula which equals SVxHR of cardiac index and oxygen demand It shows that oxygen delivery to the heart takes place during diastole When HR increases, diastole time decreases and blood supply to the heart decreases.)

Angina can be treated in two ways:

1) Reduce the need for oxygen to prevail (by reducing heart rate and contraction force)

2) Increase oxygen delivery to the heart (for example, by dilating coronary arteries)

Coronary artery diseases (CHD) include the following:

1) Classic or persistent angina (activity or effort): pain appears as a result of activity.

2) Vasospasm angina (Prinzmetal): It is the cause of vascular vasospasm pain.

3) Acute coronary syndrome (ACS)

.... Unstable angina

..... Angina STEMI: includes a heart attack in which the ST segment is elevated

..... Non-STEMI angina

Risk factors of Disease :-

Correctable: diabetes - blood pressure - lipid disorders and smoking

Uncorrectable: age - gender - family history

DIAGNOSIS

To diagnose symptoms,ECG, EXERCISE test and angiography is helpful.

signs: It includes pain in the chest that becomes intense with the stress of exercise and emotions.

Control: Reducing risk factors and drug therapy helps in special cases of surgical procedures such as angioplasty and stenting. (Angiography will show us to some extent

whether the drug is enough or we should go for a stent)

Goals of drug therapy:-

1) Creating a secondary prevention in order to prevent the progression of the disease

2) Symptom control

Effective drugs in secondary prevention and symptom control:-

Secondary prevention

1) Antiplatelet drugs

2) Statins (cholesterol reduction and(LDL).

3) Beta blocker drugs

4) Medicines ACE Inhibitor

Symptom control

1) Beta blocker

2) calcium channel blockers (CCB)

3) Nitrates

4) potassium channel openers such as Nicorandil, this drug is a nicotinamide nitrate ester and has vasodilator effects.

5) Ranolazine

Secondary prevention

1. Antiplatelet drugs:-

Aspirin

Clopidogrel :-

Prasugrel

Ticagrelor

2. Statins

Lovastatin

Simvastatin

3. Beta blocker

These drugs are used for both secondary prevention and symptom control. Contraindications: asthma, severe peripheral vascular diseases, heart block, bradycardia, hypotension

4. Angiotensin converting enzyme inhibitors (Ace inhibitor):

It has a significant effect in the treatment of diabetes, heart attack, and heart failure, and it can also be used for the secondary prevention of heart ischemia patients.

We have two types of thrombosis:

Venous thrombosis: with drugs like warfarin, heparin

Arterial thrombosis: the most susceptible arteries are in the coronary arteries and cerebral arteries.

In this way, with the formation of atherosclerotic plaque under the endothelium, it becomes dome-shaped inward, gradually its surface becomes fibrotic, in this state, the vessel is prone to rupture, and the accumulation of platelets causes the entry of the coagulation system (internal and external routes), clot formation and the blood flow is closed (in the heart is a heart attack and in the brain is a stroke)

In arterial thrombosis, the primary nucleus is the platelet, so anti-platelet drugs such as aspirin and clopidogrel can prevent arterial thrombosis, which means that even if there is a rupture in the platelet, platelet accumulation does not occur. After aspirin, a drug called Ticlopidine came to the market, which was observed to suppress the bone marrow in a series of people. Clopidogrel entered the market after Ticlopidine which is available in Iran under the brand name Plavix-Swix.

When prescribing ACE Inhibitor drugs, we must be careful not to increase the heart's work too much.

Classification of anti-anginal drugs :-

1) Nitrates

2) Calcium channel blocker (CCB)

(Nitrates and calcium blockers both reduce preload and afterload, but beta blockers only reduce the heart's need for oxygen).

3) Beta blockers

Nitrates:-

Medicines such as nitroglycerin and isosorbide are usually affected by liver enzymes and release nitrate (nitroglycerin has three nitrate groups attached to glycerin, which is released under the influence of liver enzymes) and this released nitrate has a vasodilator effect.

Usually, the oral bioavailability of nitrates is low (less than 10-20%)

The sublingual route is quickly absorbed, and it is used in urgent cases for a quick effect.

The oral product of Nitrocontin is available at 6.4 mg and 2.6 mg.

Nitroglycerin ointment has a very high absorption through the skin, nitroglycerin can also be used intravenously.

Isosorbide dinitrate is available in 5 mg sublingual tablets and 10 mg and 40 mg oral tablets.

Different medicinal forms of nitrates are divided according to the duration of effect:

very short effect: inhaled amyl nitrite with an effect duration of 3 to 5 minutes.

short effect: sublingual nitroglycerin and isosorbide dinitrate with an effect duration of 10 to 30 minutes.

medium effect: nitroglycerin Oral nitricontin and slow isosorbide with a duration of effect of 4 to 8 hours.

long effect: transdermal patch of nitroglycerin with a duration of effect of 8 to 10 hours (can be effective for up to 24 hours). Because tolerance develops, it should be removed after 8 to 10 hours.

MECHANISM OF ACTION :- Nitrate in coronary smooth muscle cells releases nitric oxide, nitric oxide (NO) activates the enzyme guanylyl cyclase, then this enzyme Converts GTP to CGMP.

The effects of nitrates on veins are more than on arteries, coronary arteries can also dilate under the effect of these drugs. (The least effect of nitrates is on the arterioles)

As the preload and afterload of the heart decreases, the work of the heart becomes lighter and the heart's need for oxygen decreases.

In addition to vasodilation, nitrate has relaxing effects on other smooth muscles, such as respiratory and digestive muscles, even the bile ducts and urinary ducts, but the effects of nitrate on the vessels are more prominent.

Nitrates reduce platelet aggregation by increasing CGMP in platelets.

Nitrates do not have a direct effect on the heart rate, but due to their strong vasodilatory effect, there is a strong reflex tachycardia.

Drug interactions

Sildenafil, tadalafil and other drugs used to treat male impotence seriously interfere with nitrates in such a way that nitrates increase CGMP, on the other hand, Sildenafil prevents the inactivation of CGMP by inhibiting phosphodiesterase 5. In this way, when two drugs are taken at the same time, CGMP increases greatly and causes severe hypotension.

Side effects :-

Complications due to vasodilatation: reflex tachycardia, postural drop in blood pressure, throbbing headache (especially at the beginning of treatment and with sublingual products, this headache occurs quickly) nitrites in high concentration cause methemoglobinemia, but nitrates doesn't cause this complication.

TOLERANCE :-

Usually, tolerance may develop after taking nitrates. Tolerance may develop the effects and side effects of the drug.

Causes of tolerance

Reduction of sulfhydryl groups

Increased production of free radicals

Cyanide treatment

In general, nitrates and nitrites can be used in cyanide poisoning

a) Amyl nitrite: Amyl nitrite is used for inhalation in cyanide poisoning. Amyl nitrite is supplied in injections that have a cover (such as sterile gas) around the injection. These injection is broken when are used.

Mechanism :- Amyl nitrite converts a part of hemoglobin into methaemoglobin (Fe2 is converted into Fe3) and because cyanide has a high affinity for Fe3 in the mitochondria, it is provided with a large source of iron in the blood, and the so-called cyanide is trapped after binding. Cyanide to methemoglobin in red blood cells provides sulfur to the body with the help of sodium sulfate (as a sulfur donating agent), and with the help of sulfur, cyanide is converted into thiocyanate, which is much less toxic than cyanide and is gradually eliminated from the body.

b) B) Hydroxocobalamin: Another way of cyanide poisoning is to use hydroxocobalamin. Hydroxocobalamin forms a complex with cyanide and cyanocobalamin, which produces the same vitamin B12.

Reminder: As mentioned, Nicorandil is a nicotinamide nitrate ester and all nitrates reduce the preload and afterload of the heart.

Clinical use of nitrates: The standard treatment for UA and acute angina pain is sublingual nitroglycerin. If the transdermal patch is used, the blood level is maintained for 24 hours, but after 8 to 10 hours the tolerance is created, so in children it should changed every 10 to 12 hours.

CCB (calcium channel blockers) :-

Amlodipine

Felodipine

Verrapamil

Diltiazem

This group of drugs have good dilation effects and make the work of the heart easier by dilating the blood vessels. Some CCB drugs such as diltiazem and verapamil are effective in **reducing the heart rate** and **reducing the contraction force of the heart**, thus reducing the heart's need for oxygen. CCB drugs, especially diltiazem and verapamil, have dual effects on the heart: they make the heart work lighter and increase dilation of vessels or vasodilation.

Mechanism of Action :-

1. Calcium that enters the smooth muscle cell through the channel causes the activation of the myosin light chain and contraction occurs, the inhibition of this channel by this medicine cause dilatation.
2. Decreased heart rate due to calcium-dependent block in the AV node
3. Severe vasodilation resulting in reflex tachycardia

4. A small amount of relaxant of the muscles of the uterus, bronchi and intestines, so the use of CCB in pregnancy is prohibited

CCB:-

Di hydropyridines: nifedipine, amlodipine, nimodipine

Non-dihydropyridines: diltiazem, verapamil

Clinical application :-

Prophylaxis treatment in activity angina and angina during rest, nefedipine in acute attacks of angina, nefedipine plays a role if it is fast-acting, tachycardia gives reflex and risk of MI (not understood clearly here please check)

Treatment of AV nodal arrhythmias such as SVT and PSVT with diltiazem and verapamil

Treatment of hypertension

Treatment of stroke resulting from SAH

Raynaud's phenomenon and blood pressure, migraine, premature birth,

COMPLICATIONS :-

Nausea, hot flashes, peritibial edema, dizziness

CHF, AV node block, decreased SA node activity

Constipation, Adam, increased heart size

Severe reflex tachycardia

BETA-BLOCKERS :-

Medicines such as propranolol, carvedilol, and atenolol are in this group.

These drugs show good effects on classic angina and reduce blood pressure, heart rate and contraction force, as a result of the heart's work and the need for Oxygen also decreases.

If nitrates are used to eliminate heart palpitations, it can be combined with beta blocker drugs.

In many cases, we use nitrate, CCB or beta blocker or all three together.

One of the adverse effects of beta blockers is the increase in end-diastolic volume. This effect is reduced by combining the drug with nitrates.

Send deployment :- placed in the blocked vessel, it opens like a spring and increases blood circulation.