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ANGINA PECTORIS

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ABSTRACT

Reduced blood flow to the heart is a characteristic of angina pectoris, which is characterized by feelings of choking and suffocating. The main symptoms of angina include chest discomfort, ischemia, and coronary artery disease. Additionally, it lowers the oxygen supply requirement to the heart and causes indigestion or digestive issues. If a someone experiences significant chest discomfort or difficulty breathing, they should see a doctor immediately.

INTRODUCTION

Approximately 500,000 people were diagnosed with angina pectoris, while 10.5 million people in the United States suffered with angina. There are several forms of angina pectoris, including stable, unstable, and Prinzmetal angina. In India, 4.6 million women and 3.2 million men suffer from stable or unstable angina, which has a significant risk factor and a treatable cure.[1]

TYPES OF ANGINA

There are four types of angina.

These forms of angina rely on rest phases or symptom-relieving medications.

1) Stable angina

The primary sign of established coronary artery disease is stable angina. Furthermore, both acute coronary syndromes and chronic stable angina have atherosclerosis as their pathological foundation. The two main goals of stable angina therapy are secondary

prevention and symptomatic alleviation. Regardless of the possibility of percutaneous or surgical revascularization, the pillars of managing chronic coronary artery disease are medication therapy and lifestyle change. A combination of disease-modifying medications, such as nitrates, beta-blockers, calcium channel blockers, Antiplatalet, Statins, and Angiotensin converting enzyme inhibitors, and antinational/ant ischemic medications are the ideal medical therapy. Recently, new types of treatment, such as nicorandil, ivabradine, trimetazidine, and ranolazine, have been created. These treatments have various mechanisms of action. Currently licensed as second-line therapies, these medications have rapidly penetrated the clinical practice and their potential long-term consequences are currently being studied.[2]

2) Unstable angina

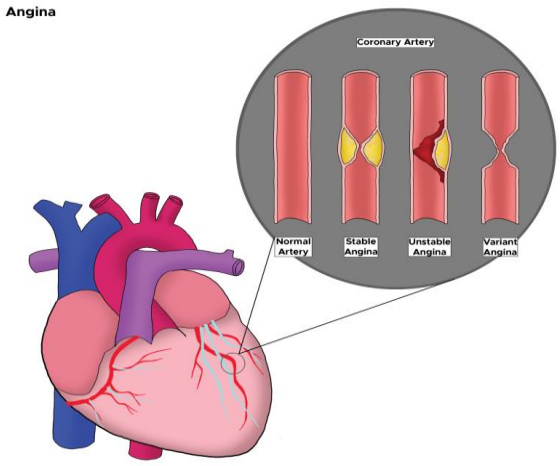
Unstable angina can happen at any time when you're at rest. Alternatively, the angina is getting worse and requiring less physical effort to feel. Usually severe, it lasts for at least 20 minutes, longer than stable angina. Neither relaxation nor the standard angina drugs relieve the discomfort. A heart attack happens when the heart is oxygen-starved and the blood flow doesn't improve. Unstable angina is hazardous and needs to be treated right away. Over the last five years, the pathophysiology of unstable angina has been better understood, which has resulted in more sensible treatment. Patients with unstable angina suffer from complicated atherosclerotic plaques in their coronary arteries, which are the location of fibrin deposition and platelet activation.[3]

3) Prinzmetal angina

Prinzmetal angina, another name for variant angina, is not caused by coronary artery disease. It is brought on by artery spasm in the heart that momentarily lowers blood flow. The primary symptom of variant angina is severe chest discomfort. Variant angina pectoris is appears to be far less prevalent than regular exertional angina an unstable angina at rest, however its incidence is unknown. Variant angina patients usually experience pressure-like, squeezing pain in the retrosternal chest that lasts for several minutes.[4]

4) Nocturnal angina

The primary cause of nocturnal angina is falling asleep, which raises the oxygen demand on the heart and causes the patient's chest to contract. This also increases blood flow, causing the patient's fluids to overload and constrict. These angina symptoms manifest as pain during the day, which eventually leads to heart attraction at night.[4]

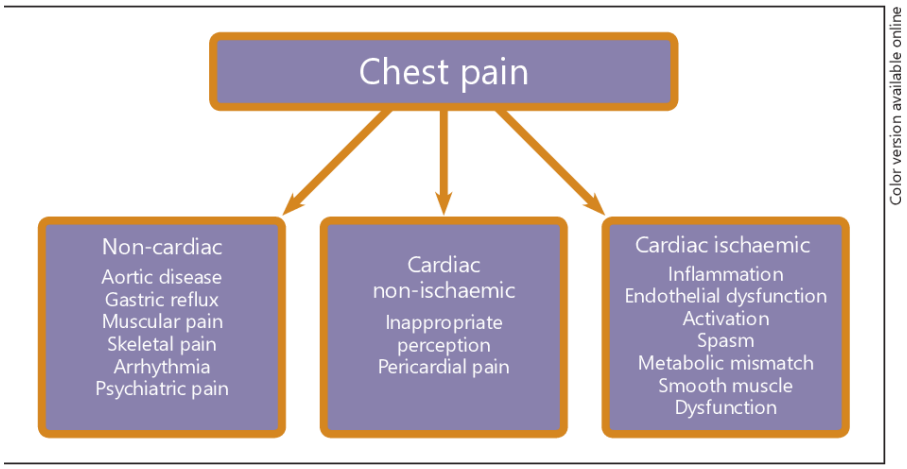


PATHOPHYSIOLOGY

The most important pathophysiology is cause of chest pain due to the reduced oxygen supply and also inadequate oxygen delivery via the coronaries in spite of the heart tissue's increasing demand. This causes ischemic alternations in the region those particular coronary arteries supply.[7]

Based on mechanism and causes they are classified into three groups they are: non-cardiac, cardiac non-ischemic causes and cardiac ischemic causes.

Causes of non-cardiac chest discomfort are gastro esophageal refuel illness, musculoskeletal abnormalities, pulmonary and aortic disease, and psychological problems. Causes of non-ischemic heart discomfort are pericarditis and pericardial disorder.[8]



CAUSES

The angina may also causes from the coronary micro vascular spasm, anoxemia of the myocardium or by the extra coronary disease.

In the case of coronary micro vascular spasm chest pain in a subset of patients with microvacular angina may be related to coronary microvacular spasm and subsequent myocardial ischemia. Out of the 117 patients, 63 (54%) experienced microvacular spasm, 25 (21%) reported unusual chest pain, and 29 (25%) had large-artery spasm. Microvascular angina can happen both at the rest and when you're exercising. Angina during exercise is through to be caused by a decrease in the coronary microvessel's vasodilator ability, although the exact mechanism behind angina during rest in unknown. Our goal was to investigate the theory that myocardial ischemia at rest is caused by primary hyperconstricvation (spasm) of coronary microvessels.[5]

The both non-cardiovascular and cardiovascular conditions can include chest pain. The skin, chest wall, intrathoracic structures, and sub diaphragmatic organs are examples of the latter. The heart, pleura, aorta, and esophagus are all supplied by sensory fibers from the same spinal segments, making it problematic to link the chest pain to the heart or extracardiac organs.

The angina pectoris is characterized by chest pain or discomfort of cardiac origin that that results from an imbalance between the oxygen supply and demand in the heart. Since the quiescent heart requires just a small portion of the oxygen used, the myocardium's metabolic oxygen requirements are primarily determined by myocardial constriction.

The angina mainly occurs by the reduced blood flow to muscle of the heart. It can also cause the condition like ischemia due to the enough oxygen is not supplied to the heart muscle.[6]

SYMPTOMS

- Shortness of breath
- Chest pain
- Burning sensation
- Pressure on the chest
- Squeezing.

These symptoms may leads to the pain in the arms, neck, jaw shoulder or back.

RISK FACTORS

In the case of angina major risk factors includes

1. **Tobacco use**
2. **Familiar history**
3. **Increasing age**
4. **Diabetes**
5. **Obesity**
6. **Emotional factors**
7. **Increased blood pressure**
8. **Misuses of drugs**
9. **Increased cholesterol or triglycerides**

	Patients	Controls	p
Age, years	63 (57–71)	63 (58–71)	NS
Male/female	34/10	34/13	NS
Current smokers, n (%)	8 (18)	1 (2)	<0.05
Waist circumference, cm	101 (94–107)	95 (88–98)	<0.001
Total cholesterol, mmol/l	4.6 (4.0–5.4)	5.7 (4.9–6.6)	<0.001
LDL cholesterol, mmol/l	2.4 (2.1–3.4)	3.6 (2.8–4.2)	<0.001
HDL cholesterol, mmol/l	1.2 (1.1–1.4)	1.5 (1.2–1.7)	<0.001
Triglycerides, mmol/l	1.4 (1.1–1.7)	1.1 (0.93–1.6)	<0.05
Creatinine, µmol/l	92 (83–104)	88 (78–99)	NS
White blood cells, cell/µl	6600 (5100–8400)	5500 (4600–6400)	0.001
Diabetes, n (%)	7(16)	0 (0)	0,005
Hypertension, n (%)	32 (73)	0 (0)	<0,001
Statin, long-term treatment, n (%)	36 (86)	0 (0)	<0,001

Data are given as median (inter-quartile range).
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	Prevalence of angina pectoris		
Risk factors	Total %	Male %	Female %
Cholestrol	25	32	68
Smoking	13	61.54	38.46
Family history	22	31.81	68.18
Hypertension	8	37.50	62.50
Diabetes	4	50	50
Alcohol	16	56.25	43.75
Obesity	12	58.33	41.66

PREVENTION

1. Stop smoking
2. Maintain a balanced diet
3. Maintaining a proper body weight
4. Avoid or reduces alcohol consumption
5. Avoid junk foods
6. Take a healthy diet
7. Control your blood pressure and also monitor your blood pressure daily
8. Relief from stress
9. Take regular recommended medication or vaccines to avoid the heart problems like heart stroke or attract.

DIAGNOSIS

Your health care professional will perform a physical examination and a ask you about your symptoms in order to diagnosed about angina.

The following test are used to identified and validate angina. They are

1) Chest X-ray: An X-ray of the chest can reveal the stage of lungs and heart. To check whether the heart is enlarged and to find out if any other conditions are causing the symptoms of chest discomfort, a chest X-ray may be performed. A tiny amount of radiation is applied to the chest during X-ray imaging in order to create images of the heart and chest.

2) Computer tomography scan (CT) or coronary angiography: A cardiac CT scan involves lying on a doughnut shaped machine, collecting images of the heart and chest. It can show heart enlargement or narrowed arteries, it can identified chest pain causes like aortic disease or blood clots. It uses X-ray equipment and sophisticated computers.

3) Magnetic resonance imaging scan (MRI): This test produced line grained pictures of the heart using radio waves and magnetic fields. Usually, the produced involves lying on a table with in a lengthy tube shaped device that creates finely detailed images of the blood arteries and heart anatomy. Without requiring an invasive catheter to be placed through the arteries and into the heart, this examination checks the coronary arteries, which are the blood vessels that supply the heart with oxygen and blood. It does this by evaluating the degree of artery narrowing caused by plaque similar to blood draws a tiny puncture in the arm vein is utilized to inject contrast material.

4) Electrocardiogram (ECG): An ECG test measure heart electrical activity using patches on the chest, arms, and legs. It can detect heartbeat abnormalities, such as arrhythmias, and show ischemia (lack of oxygen and blood) to the heart, and can be used to diagnose heart problems. And in order to determine whether blood flow through the heart has been slowed or stopped.

5) Stress test: A stress test evaluates heart performance with activity, typically involving physical exercise and recording an ECG. Doctors assess heart rate and blood flow changes. If exercise is not possible, medications mimic the heart's response. Angina diagnosis may by easier when the heart is working harder. Other tests may be conducted simultaneously.

6) Echocardiogram: An echocardiography creates images of the heart in action using sound waves. These photos might depict the flow of blood via the heart. During a stress test, an echocardiography may be performed. The motion of heart walls is measured. Reduced mobility inside of the heart's wall could suggest decreased blood flow to coronary artery constriction.

TREATMENT

The treatment includes both medication and surgical processes.

Medication like using Nitrates, Aspirin, Beta-blockers, Statins and Calcium channel blockers. New types of treatments involved such as Nicorandil, Ivabradine, Trimetazidine, and Ranolazine.

Medications

Nitrates

Nitrates have in a different variety of forms, and both short and long organic nitrates have been demonstrated to be beneficial in the treatment of angina.[9]

These nitrates have the sublingual nitroglycerin in tablets and sprays are effective in treating acute angina pectoris episodes by decreasing oxygen demand and dilating the coronary arteries. The patient may feel discomfort under the tongue, but the patients should not chew or swallow the tablets. Long acting nitrates such as isosorbide mononitrate, isosorbide dinitrate and isosorbide trinitrates, can decrease the frequency of angina attacks and improve exercise tolerance.[10]

Nitrates can be used to treat an acute bout of angina. Nitrates main function is to lowering the oxygen demand.[9]

In some patients may not tolerate nitrates due to headache, but is usually subsides with continued use, it leads to occurrence of tachyphylaxis; long acting nitrates have been demoted to second-line therapy.[9]

Beta-blockers

Beta-blockers are an antianginal agent that reduces the oxygen demand by decreasing heart rate, cardiac contractility, and blood pressure.[10]

Beta-blockers are mainly used to treat and prevent a variety of ailments, including arrhythmias, heart failure, and history of myocardial infarction, angina pectoris and others. Were originally used to treat hypertension and angina in the 1970's in the United Kingdom.[9]

The beta-blockers are reducing the frequency of angina and improve exercise tolerance during the stress test. Not all beta-blockers are FDA approved for angina treatment, but some are effective. Beta-blockers can improve cardiovascular outcomes after myocardial infarction in patients with heart failure and hypertension.[10]

Statins

These Statins drugs are helps to lower the blood levels of low density lipoprotein (LDL) it also known as "bad cholesterol" more amount of LDL cholesterol in your blood vessels or in the brain leads to a heart attack or stroke.

The Statins may reduce the risk of angina and heart diseases.

Aspirin

The main role of the aspirin is to reduce the risk of blood clotting in the vessels and heart attacks may reduces by taking this aspirin drug. And improves blood flow through the narrow of arteries.

Calcium channel blockers

Calcium channel blockers, including dihydropyridine calcium channel blockers like nifedipine, amlodipine, nisoldipine, felodipine, and nifedipine, work by inhibiting calcium

movements across L-type calcium channel in cardiac muscle and blood vessels of smooth muscle.[9]

These induce the vasodilatation and slow heart rate, potentially causing bradycardia or conduction abnormalities. These blockers can improve oxygen delivery, decrease after load, and reduces myocardial oxygen demand. Some blockers like verapamil and diltiazem can also reduce cardiac contractility in patients with compromised cardiac function. However, not all calcium blockers are approved for treating angina.[10]

It also improves the flow of blood vessels by widen and relax. Adverse effects include bradycardia, conduction disturbance, constipation, edema, heart failure, hypotension, headache, dizziness, and also gastro intestinal side effects.

Recent treatments

Nicorandil

Nicorandil is an antianginal drug that causes dilation of coronary and peripheral resistance arteries by activating ATP-sensitive potassium channels. It lowers the preload and after load dilation of the coronary arteries.[10]

A Japanese meta-analysis indicated that nicorandil short term efficacy was comparable to that of Beta-blockers, calcium blockers or nitrates.[9]

Nicorandil has been found in studies to reduce significant adverse cardiovascular events in patients with chronic angina. However, the efficacy of nicorandil as an antianginal medication is debatable.[10]

Nicotinamide ester with a moiety of nitrate and an adenosine –sensitive potassium channel opener, improves coronary blood flow and avoids coronary artery spasm.[9]

Ranolazine

Ranolazine is a derivate of orally active piperazine is as effective as atenolol as an antianginal and anti-ischemic drug.[9]

Ranolazine has been used to treat angina in the United States for roughly ten years. It inhibits the late sodium current, lowering intercellular sodium and sodium-calcium exchange,

resulting in calcium overload in ischemic cardiomyocytes. These decreasing the excess of calcium resulting in improving microvascular perfusion.

Beta-blockers and calcium channel blockers, has no effects on heart rate or blood pressure. When used with beta-blockers or calcium blockers.[10]

Clinical trials have demonstrated that it improves exercise times during stress testing and reduces the frequency of angina and usage of nitroglycerin.[9]

Ivabradine

It is an antianginal drug that decreases the heart rate while having no effect on cardiac contractility or blood pressure. Ivabradine suppresses the hyper polarization activated, mixed Na/K inward current.[10]

When compare to beta-blockers and other atenolol, ivabradine, an add-on therapy to atenolol, has been demonstrated to increase exercise time and prevent angina problems.[9]

It causes a reduction in heart rate of roughly 10beats per minute on average. It is also linked to phosphates, flashes, or increased light brightness in specific parts of the visual field.[10]

Trimetazidine

The trimetazidine is an angina adjunct medication, is accessible in Europe and Asia but not in the United States.[9]

Trimetazidine is an antianginal drug that acts on fatty acid oxidation to some extent, diverting energy metabolism to glucose utilization. This reduces the oxygen requirements of cardiac cells and increases workout duration.[10]

It reduces angina frequency in symptomatic individuals without changing heart rate or blood pressure, as observed in TRIMPOL trials I and II.[9]

These trimetazidine once used with long-acting nitrates or beta-blockers, it reduces angina frequency, nitroglycerin in consumption.[10]

Surgical process

In surgical process it involves angioplasty with stenting and coronary artery bypass graft surgery (CABG).

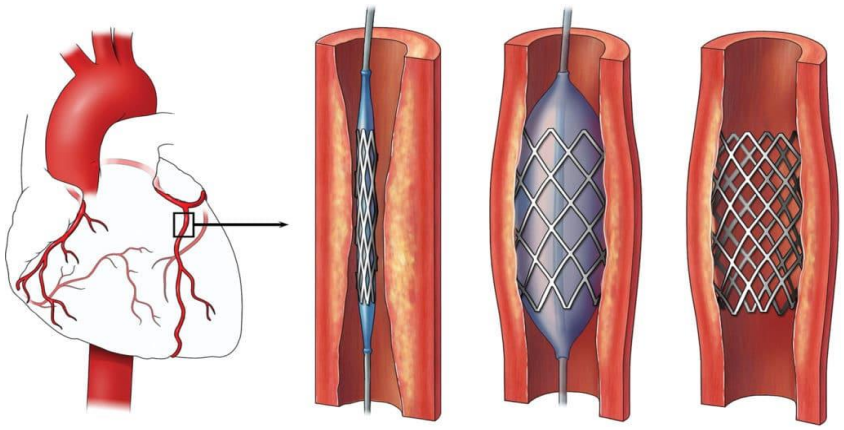
Angioplasty with stenting

Angioplasty is a non-invase technique for opening blocked coronary arteries caused by coronary artery disease.

This technique done in the emergency cases, such as heart attack.

They contain small, expandable metal mesh coils that are inserted into the freshly opened artery and it enters into the blood vessels were it is blocked and its bulged likes a balloon and the metal mesh coils was expanded and it widen the artery it improves the blood flows.

After installation of the metal mesh into the blockage arteries the tissue lined into it for 3 to 12 months time. Anti platelets were administered to reduce platelet stickiness and prevent blood clot from forming within the stent known as drug-eluting stents are coated with drugs to prevent the tissue growing inside the stent.



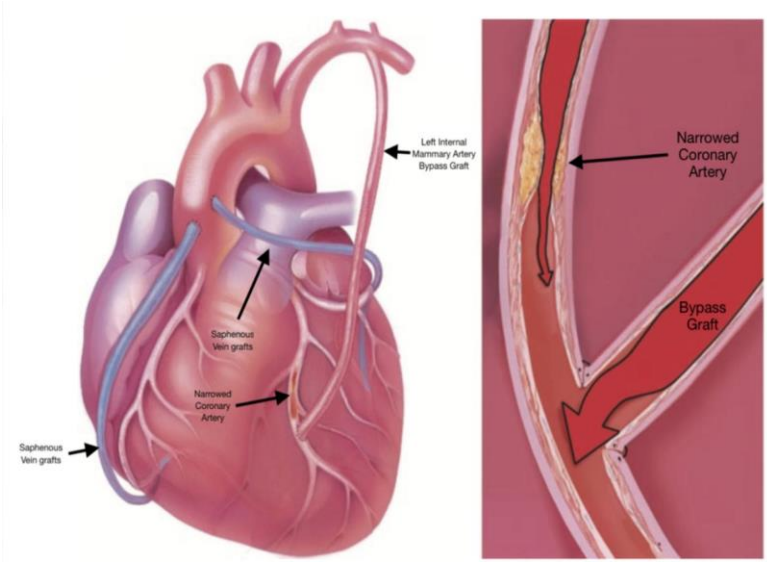
Coronary artery bypass graft surgery (CABG)

In the case of coronary artery bypass surgery the, an artery or a vein is blocked by the deposition of calcium and fatty substances. Therefore, the heart artery or a vein is blocked or become narrowed it leads to decrease in blood flow to heart or oxygen (ischemia).

Symptoms of chest pain (angina pectoris). In more severe circumstances, a heart attack, heart failure, myocardial infarction, or any other rhythm problems can result in sudden cardiac death.

The procedure involved in coronary artery bypass surgery or CABG it is a treatment that uses yours own veins (typically from the legs) or arteries (generally from the chest or arm) to bypass blocked sections and improve blood flow to your heart muscle. As a result, bypass

surgery can significantly lessen or alleviate chest pain for the majority of people, as well as extend life for those with specific of coronary artery disease.



KEYWORDS: Coronary artery disease, Angina pectoris, Beta-blockers, Statins, Aspirin, Nitrates, Calcium channel blockers, Nicorandil, Ivabradine, Trimetazidine, Ranolazine, Angioplasty, CABG.

CONCLUSION

The effort of angina is a chronic disease that results in considerable morbidity and severe cardiovascular consequences. The angina is classified into two types, in which a variant angina and narrowing the coronary artery by the atherosclerosis. In which the blood flow is decreased without regard for demand variations. Advances in understanding the variables that affect effective treatments. Standard therapies by using the Beta-blockers, Nitrates, Calcium channel blockers and recent therapy's such as Ranolazine, Nicorandil, Trimetazidine, Ivabradine are effective, however they do not usually entirely alleviate angina. Revascularization is advised in high-risk cases and when traditional medical therapy fails to provide adequate results.

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