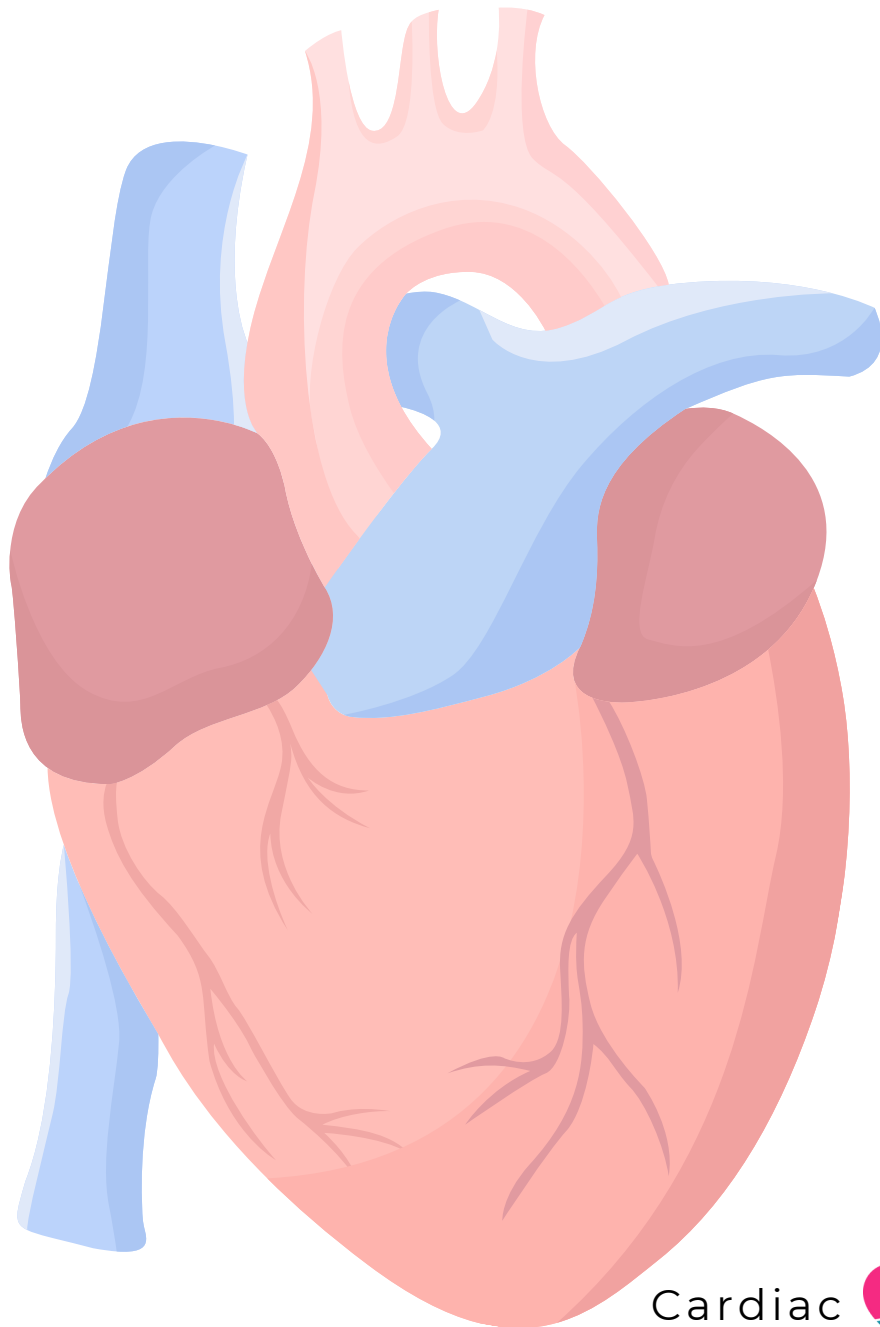


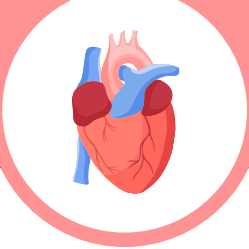
STUDY GUIDE

CORONARY ARTERY DISEASE (CAD)



Cardiac  NursingSOS

LEGAL DISCLAIMER: This study guide is intended for educational purposes only. This is not medical advice and errors may occur. Never treat a patient or make a nursing or medical decision based solely on the information provided in this study guide. Never practice nursing or medicine unless you have a proper license to do so.



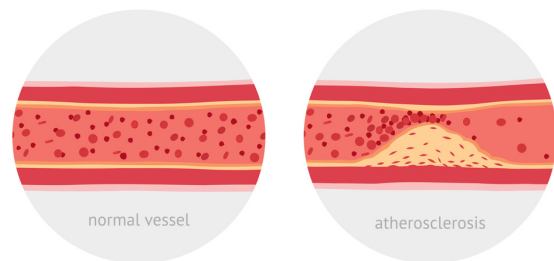
CORONARY ARTERY DISEASE (CAD)

STUDY GUIDE

DEFINITION

Coronary Artery Disease, or CAD, is when the arteries that supply the heart with blood flow to oxygenate and provide nutrients to the heart muscle itself are not letting enough blood flow through, which can lead to ischemia. Since the heart is a muscle, it needs its own blood supply to deliver oxygen and nutrients so that it can continue to function and pump the blood to circulate and oxygenate the rest of the body. When it isn't getting enough blood flow and the heart itself gets ischemic, it won't be able to pump as efficiently or effectively.

CAD can happen with anything that occludes blood flow, but is most commonly caused by atherosclerosis. This is where plaques build up along the blood vessels and decrease or cut off blood flow all together.



Plaque
eranicle / stock.adobe.com

PATHOPHYSIOLOGY

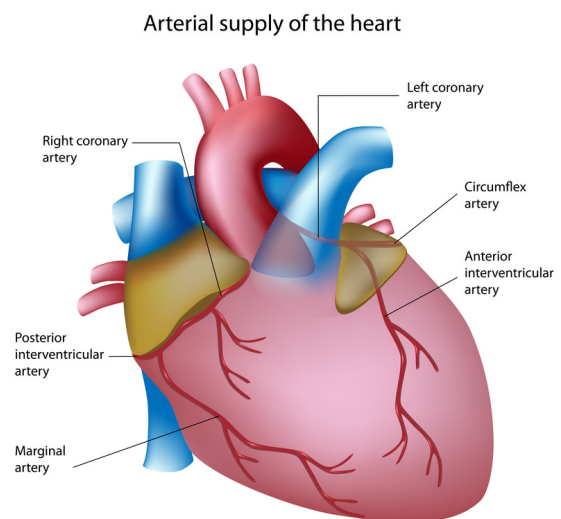
Step 1: Gradual narrowing of the blood vessel

In cases like atherosclerosis, this process can take years, where the blood vessels slowly become occluded with plaque build-up. And over time, the blood just can't flow through the blood vessels as easily.

Step 2: Decrease in blood flow starts to affect the heart's function

There are two main arteries that provide blood flow to the heart and they both come directly off the aorta:

1. The right coronary artery supplies the right side of the heart. There are two smaller arteries that come off of the right artery as well: the right marginal artery and posterior descending artery.
2. The left coronary artery supplies the left side of the heart. Then there are two coming off of the left artery too: the left circumflex artery, which mainly



Coronary arteries
Alila Medical Media / stock.adobe.com

oxygenates the left atrium, and the left anterior descending artery which mainly supplies the left ventricle.

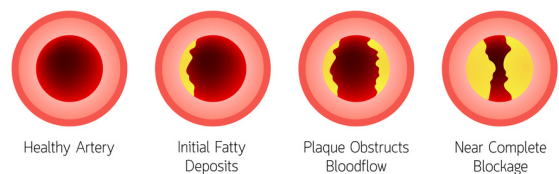
Any decrease in blood flow, caused by plaque build up in any of these vessels, would impact how the heart functions.

Step 3: Ischemia starts to happen to the heart

The blood flow starts to be cut off and you start to see ischemia, or a lack of blood flow to the tissues. In this case, the specific muscle and tissue is the heart.

Step 4: How these plaques are formed

The blood that is pumped through arteries is rich in oxygen and nutrients to help support the tissues and the muscles of the body. One of these nutrients is fat, or more specifically, low density lipoproteins or LDLs. As the blood is passing through the arteries, the lipoproteins start to stick, and they initially just stick to the artery wall. This causes a mild inflammatory response which makes the lining of the vessel even more sticky, and over time as more blood and lipoproteins start to flow through, they start to clump together and stick to each other. As they clump together, they start to calcify and harden. This all builds on itself and you end up with narrowing of the artery because of essentially a build-up and hardening of these lipoproteins, or fat.



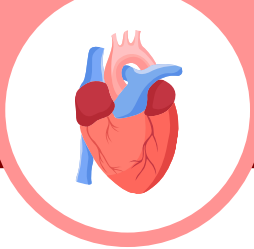
Plaque formation
wowow / stock.adobe.com



Think of trying to blow through a straw if you put honey in the straw. The honey would stick to the edges, making the actual straw super hard to blow through. This is the same concept: the vessels become very narrow, making it hard to pump the blood through them and supply the heart with the nutrients and oxygen it needs to keep working effectively.



In coronary artery disease (CAD), blood flow is decreased to the coronary arteries (the actual heart muscle itself), leaving it unable to function as effectively.



CORONARY ARTERY DISEASE (CAD)

STUDY GUIDE

SIGNS AND SYMPTOMS

Much of Coronary Artery Disease is asymptomatic, showing no symptoms, until the buildup and narrowing worsens. The symptoms only start to appear when the patient is experiencing a severe narrowing or total obstruction of blood flow. This can be problematic because it can go unnoticed and undiagnosed for quite some time, leaving more and more plaque to continue to build up.

Chest pain

The first symptom is usually chest pain because the heart muscle needs oxygen and nutrients, and when the blood flow is compromised it will become ischemic and cause pain. The pain initially might only be during increased activity or exercise because the heart is requiring more blood flow during that time and the narrowed vessels might not be able to keep up with the demands. This is called chronic stable angina pectoris; the heart is experiencing a brief period of ischemia during times of exertion, but when the patient rests, the heart is able to be properly oxygenated and the pain is resolved.

Unstable angina pectoris

Stable angina pectoris can progress to unstable angina pectoris as the plaque continues to build up. The patient will experience chest pain even when at rest, and it doesn't necessarily go away with rest. It isn't as predictable, and this is the warning sign that the blood is facing more and more resistance due to the build up of plaques while it is trying to oxygenate the heart. This is when the coronary arteries are more occluded and the blood is not able to properly supply the heart muscle. This pain is not relieved by rest and can be more severe in general.



Stable angina pectoris will go away with rest. Unstable angina pectoris does not go away with rest

Shortness of breath and feel weak or tired

The patient may also experience shortness of breath and feel very weak or tired. This is all due to the heart not being properly supplied with blood because of the obstructed coronary artery. So, the heart muscle becomes ischemic and that leads to the heart not being able to fully keep up with the demands of the body.

Remember, if the heart itself isn't properly oxygenated and nourished, it will not be able to pump as effectively. And if the heart can't pump as effectively, it will affect every part of the body since the heart is responsible with pumping the blood to the rest of the body to properly oxygenate and nourish it.

May be able to see changes on an EKG

There may be changes to the ST segment caused by ischemia:

- This would be seen as an ST depression on an EKG.
- Could be seen as an ST elevation if there is an actual injury to the cardiac tissue from more long-term ischemia.

Any elevations or depressions in the ST segment can also indicate there is some ischemia happening.

NURSING ASSESSMENT

Thorough cardiac assessment

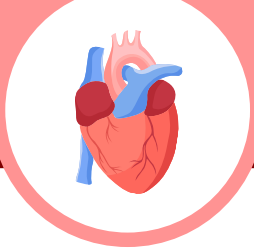
Monitor blood pressure, heart rate, and pulses. Assess for any chest pain, assessing frequency, intensity, and any factors that trigger or relieve the pain. There is stable and unstable angina, which indicate how progressive and occluded the arteries are. Stable angina will be relieved with rest, and unstable angina will not be relieved with rest or as predictable.

EKG to monitor for any arrhythmias or any changes to the ST segment

The ST segment will be elevated with ischemia that has caused actual injury to the heart muscle, and depressed with ischemia that has not caused damage.

Stress test to monitor for any changes during exertion

A stress test, where the patient exercises while attached to a cardiac monitor, can be done to monitor for any changes during exertion. The arteries may not be fully occluded and only unable to meet the demands of the heart during exercise, so a stress test would help assess this.



CORONARY ARTERY DISEASE (CAD)

STUDY GUIDE

Cardiac catheterization or coronary angiography

A cardiac catheterization or coronary angiography can be done to better visualize the blood flow for the heart and any areas where the vessels are occluded. In some cases of chronic ischemia, the vessels will actually try to form collaterals, or different pathways to properly supply the heart with blood. This occurs when there is ischemia for a long period of time.

Assess the patient's blood

Assess the patient's LDL cholesterol levels through a blood test, as well as their HDL and triglyceride levels. This will help to assess if they are at risk for atherosclerosis. Assess creatine kinase, or CK, which demonstrates muscle breakdown. More specifically, assess CK-MB (which is specific to the heart muscle), as well as troponin levels, to identify if the heart is actively ischemic. CK-MB and troponin are waste products of muscle breakdown specifically for the heart, and would be elevated if the heart was experiencing ischemia.

NURSING INTERVENTIONS

Managing CAD and preventing progression is long term. These patients will need to be continuously aware of their cardiac health and monitoring for symptoms of worsening occlusion or total blockage, which can lead to irreversible cardiac injury or even death.

Patient education

The main goal of interventions for coronary artery disease is to educate your patient on lifestyle changes to help prevent worsening disease. These lifestyle changes can include weight loss, healthier diet, increasing their activity, and stopping smoking. Those are all risk factors for atherosclerosis, and reducing them will help to prevent the progression of buildup of plaque and obstruction of blood flow.

Medications

Medications such as nitroglycerine can be given during an acute angina attack to help relax the vessels and increase blood flow to the heart. Antihypertensive's such as calcium channel blockers, ACE inhibitors, and beta blockers can be used to help dilate the blood vessels and increase blood flow to the heart itself.



Be sure to check out the medication database for more details on these medications!

Surgical procedures

In some cases, surgical procedures can be done to help open up the occluded coronary arteries:

- A stent can be placed to help the artery remain open and allow adequate blood flow.
- Coronary artery bypass surgery, where the artery is rerouted and a graft is used to oxygenate the heart, is another option.

