

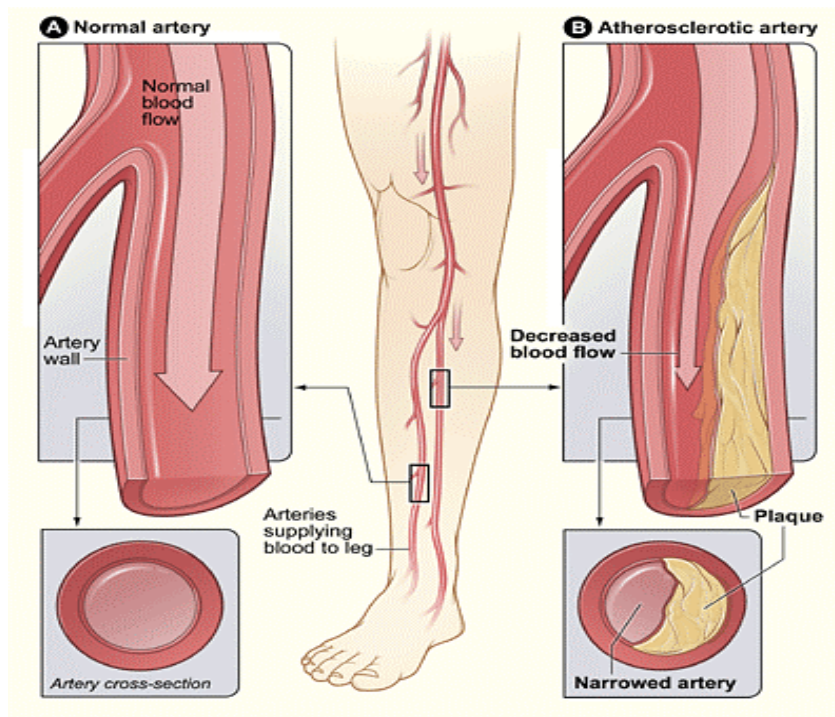
PERIPHERAL ARTERIAL DISEASE

What Is Peripheral Arterial Disease?

Peripheral arterial disease (PAD) occurs when a fatty material called plaque (plak) builds up on the inside walls of the arteries that carry blood from the heart to the head, internal organs, and limbs. PAD is also known as atherosclerotic peripheral arterial disease.

The buildup of plaque on the artery walls is called atherosclerosis (ath-er-o-skler-O-sis), or hardening of the arteries. Atherosclerosis causes the arteries to narrow or become blocked, which can reduce or block blood flow. PAD most commonly affects blood flow to the legs.

Blocked blood flow can cause pain and numbness. It also can increase a person's chance of getting an infection, and it can make it difficult for the person's body to fight the infection. If severe enough, blocked blood flow can cause tissue death (gangrene). PAD is the leading cause of leg amputation.



The illustration shows the location of leg arteries that can be affected by peripheral arterial disease. Figure A shows a normal artery with normal blood flow (the inset image shows a cross-section of the normal artery). Figure B shows an artery with plaque buildup, which is partially blocking blood flow (the inset image shows the degree to which the artery is blocked).

Important General Information

Atherosclerosis can affect arteries anywhere in the body, including the arteries that carry blood to the heart and brain. When atherosclerosis affects the arteries of the heart, it is called coronary artery disease (CAD). CAD can cause a heart attack. If atherosclerosis is in the limbs, it also is likely to be in the coronary arteries.

When atherosclerosis affects the major arteries supplying the brain, it is called carotid artery disease. Carotid artery disease can cause a stroke.

PAD (atherosclerosis in the arteries that supply blood to the limbs, especially the legs) is a common, yet serious disease. Men are more likely to have symptoms of PAD, but both men and women can develop the disease. PAD can impair physical health and diminish the ability to walk.

In the advanced stages of PAD, blood flow to one or both legs can be completely or mostly blocked. This is known as chronic critical limb ischemia (CLI). A very severe blockage in the legs and feet means that the legs do not receive the oxygen or nutrition needed for cellular or skin growth and repair. CLI may lead to painful leg or foot sores, and it could eventually lead to gangrene. If this condition is left untreated, the foot or leg may need to be amputated.

Outlook

A person with PAD has a six to seven times greater risk of CAD, heart attack, stroke, or transient ischemic attack ("mini stroke") than the rest of the population. If a person has heart disease, he or she has a 1 in 3 chance of having blocked arteries in the legs. Early diagnosis and treatment of PAD, including screening high-risk individuals, are important to prevent disability and save lives. PAD treatment may stop the disease from progressing and reduce the risk of heart attack, heart disease, and stroke.

Although PAD is serious, it is treatable. The buildup of plaque in the arteries can often be stopped or reversed with dietary changes, exercise, and efforts to lower high cholesterol levels and high blood pressure. In some patients, blood flow in the vessels may be improved by medicines or surgery.

What Causes Peripheral Arterial Disease?

The most common cause of peripheral arterial disease (PAD) is atherosclerosis. When atherosclerosis affects the arteries of the limbs, it is called PAD. The exact cause of atherosclerosis is unknown in the majority of cases. In atherosclerosis, the plaque that builds up on artery walls is made up of fat, cholesterol, calcium, and other substances in the blood. Smoking, diabetes, a high blood cholesterol level, and high blood pressure increase the risk of atherosclerosis.

Who Is At Risk for Peripheral Arterial Disease?

Peripheral arterial disease (PAD) affects 8 to 12 million people in the United States. An estimated 5 percent of U.S. adults over age 50 have PAD. Among adults age 65 and older, 12 to 20 percent may have PAD.

Major Risk Factors

Major risk factors for developing PAD include:

- Smoking. Smoking is more closely related to developing PAD than any other risk factor. Smoking increases the risk of developing PAD three to five times. On average, smokers who develop PAD experience symptoms 10 years earlier than nonsmokers who develop PAD. Stopping smoking will slow the progress of PAD. Smoking even one or two cigarettes daily can interfere with the treatment for PAD. Smokers and diabetics have the greatest risk of complications from PAD, including gangrene in the leg from decreased blood flow.
- Chronic or serious illnesses, such as diabetes. One in three people over age 50 with diabetes is likely to have PAD. Anyone over age 50 with diabetes should be screened for PAD.
- Other diseases and conditions, such as:
 - Kidney disease
 - High blood pressure or a family history of it
 - A high cholesterol level or a family history of it
 - Heart disease or a family history of it

- A family history of stroke
- Age. Men who are older than age 50 and women who are older than age 55 are at higher risk for PAD.
-

What Are the Signs and Symptoms of Peripheral Arterial Disease?

At least half of the people who have peripheral arterial disease (PAD) don't have any signs or symptoms of the disease.

People who do have signs or symptoms may have pain when walking or climbing stairs, which may be relieved after resting. This pain is called intermittent claudication (klaw-de-KA-shen). Blood brings oxygen to the muscles, but during exercise, muscles need more blood flow. If there is a blockage in the blood vessels, muscles won't get enough blood. If a person has intermittent claudication and exercises while in pain, his or her muscles may be harmed. When resting, the muscles require less blood flow and the pain goes away. Claudication is more likely in people who also have atherosclerosis in other arteries, such as the heart and brain. About 10 percent of people with PAD have intermittent claudication.

Other signs and symptoms of PAD include:

- Pain, numbness, aching, and heaviness in the muscles
- Cramping in the legs, thighs, calves, and feet
- A weak or absent pulse in the legs or feet
- Sores or wounds on toes, feet, or legs that heal slowly, poorly, or not at all
- Color changes in skin, paleness, or blueness (called cyanosis)
- A decreased temperature in one leg compared to the other leg
- Poor nail growth and decreased hair growth on toes and legs
- Erectile dysfunction, especially among people with diabetes

How Is Peripheral Arterial Disease Diagnosed?

Peripheral arterial disease (PAD) is diagnosed based on general medical and family history, history of leg or heart problems, personal risk factors, a physical exam, and test results. An accurate diagnosis is critical, because people with PAD face a six to seven times higher risk of heart disease or stroke than the rest of the population. PAD is often diagnosed after

symptoms are reported. If you have PAD, your doctor also may want to look for signs of coronary artery disease (CAD).

Specialists Involved

Mild PAD may be managed by a primary care doctor, internist, or general practitioner. For more advanced PAD, a vascular specialist (a doctor who specializes in treating blood vessel problems) may be involved. A cardiologist (a doctor who specializes in heart diseases) also may be involved in the care of patients with PAD.

Medical and Family History

Medical and family history is important in diagnosing PAD. Your doctor may:

- Ask about your family history of cardiovascular disease
- Review your medical history, including high blood pressure or diabetes
- Ask about any symptoms, including any symptoms that occur when walking or exercising
- Ask if you are currently or used to be a smoker
- Ask if you have any symptoms in the legs when sitting, standing, walking, or climbing
- Review your diet
- Review your current medicines

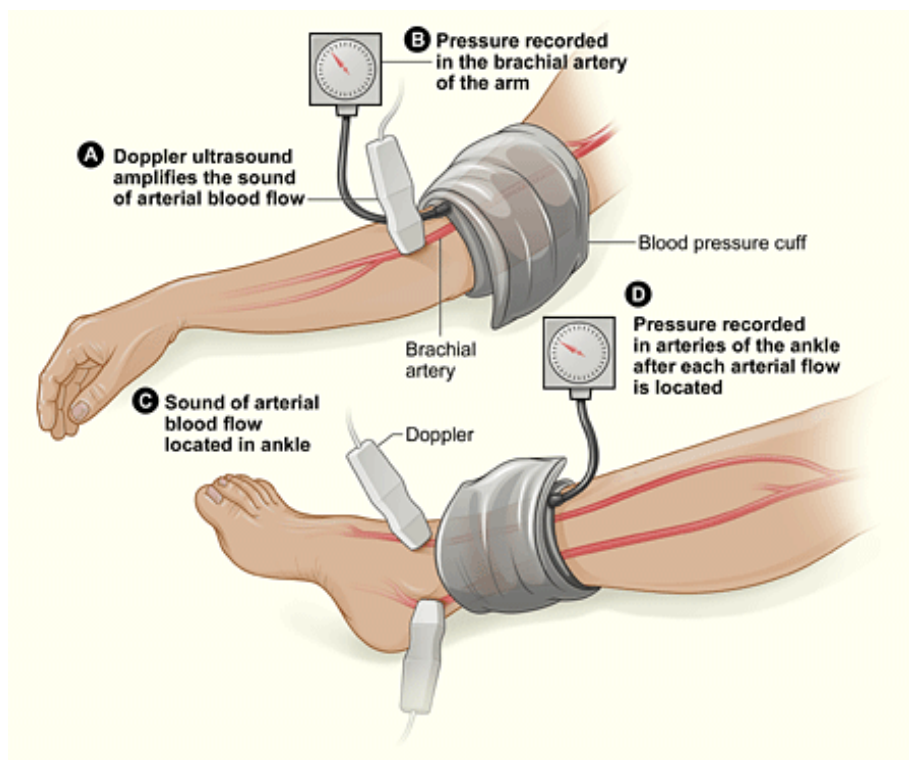
Physical Exam

The physical exam may involve:

- Checking blood flow in your leg or foot to see if the pulse is either weak or absent.
- Checking pulses in your leg arteries for an abnormal whooshing sound called a bruit (broo-E). A bruit can be heard with a stethoscope and may be a warning of a narrow or blocked section of an artery.
- Checking for poor wound healing.
- Comparing blood pressure between your limbs to see if blood pressure is lower in the affected limb.
- Checking hair, skin, and nails for any changes that may indicate PAD.

Diagnostic Tests and Procedures

A simple test called an ankle-brachial index (ABI) can be used to diagnose PAD. The ABI compares blood pressure in the ankle with blood pressure in the arm to see how well blood is flowing. A normal ABI is 1.0 or greater (with a range of 0.90 to 1.30). The test takes about 10–15 minutes to measure both arms and both ankles. It can help the doctor find out if PAD is affecting the legs, but it will not identify which blood vessels are blocked. The ABI can be performed yearly if necessary to see if the disease is getting worse.



The illustration shows the ankle-brachial index (ABI) test. The ABI gives the ratio of the systolic blood pressure in the ankle to the systolic blood pressure in the brachial artery of the arm.

A Doppler ultrasound is a test that uses sound waves to tell whether a blood vessel is open or blocked. This test uses a blood pressure cuff and special device to measure blood flow in the veins and arteries in the arms and legs. The Doppler ultrasound can help to determine the level and degree of PAD.

A treadmill test will provide more information on the severity of the symptoms and the level of exercise that provokes symptoms. For this test,

you will walk on a treadmill, which will help identify any difficulties that you may have during normal walking.

A magnetic resonance angiogram (MRA) uses radio wave energy to take pictures of blood vessels inside the body. MRA is a type of magnetic resonance imaging (MRI) scan. An MRA can detect problems that may cause reduced blood flow in the blood vessels. It can determine the location and degree of blockage. A patient with a pacemaker, prosthetic joint, stent, surgical clips, mechanical heart valve, or other metallic devices in his or her body might not be eligible for an MRA depending on the type of metallic device.

An arteriogram is a "road map" of the arteries used to pinpoint the exact location of the blockage in a limb. An x ray is taken after injecting dye through a needle or catheter into an artery. When the dye is injected, the patient may feel mildly flushed. The pictures from the x ray can determine the location, type, and extent of the blockage. Some hospitals are using a newer method that uses tiny ultrasound cameras to take pictures inside the blood vessel.

Blood tests may be done to check the patient's blood sugar level to screen for diabetes. Blood tests also may be used to check the patient's cholesterol levels.

How Is Peripheral Arterial Disease Treated?

Goals of Treatment

The overall goals for treating peripheral arterial disease (PAD) are to reduce symptoms, improve quality of life, and prevent complications. Treatment is based on symptoms, risk factors, physical exam results, and diagnostic tests.

Specific Types of Treatment

Specific treatments for PAD include lifestyle changes, medicines, and surgery or special procedures.

Lifestyle Changes

Treatment often includes making long-lasting lifestyle changes, such as:

- Quitting smoking. Smoking increases the risk of developing PAD three to five times. The risk for coronary artery disease (CAD) decreases rapidly if the smoker quits. The risk for CAD decreases 40 percent within 5 years of stopping smoking.
- Lowering blood pressure. Lowering blood pressure can help to avoid the risk of stroke, heart attack, congestive heart failure, and kidney disease.
- Lowering high cholesterol levels. Lowering cholesterol levels can delay or even reverse the buildup of plaque in the arteries.
- Lowering blood glucose levels if you have diabetes. A hemoglobin A1C test—a test that gives an estimate of how well blood sugar has been controlled over the past 3 months—may be performed.
- Talk with your doctor about participating in a supervised exercise therapy program. Follow a low-saturated fat, low-cholesterol diet, and eat foods with less salt, total fat, and saturated fat. Eat more fruits, vegetables, and low-fat dairy products. If you are overweight or obese, work with your doctor to develop a reasonable weight-loss plan. If you are diabetic or at risk for critical limb ischemia, have your feet examined regularly.

Medicines

Medicines may be prescribed to:

- Lower high cholesterol levels and high blood pressure
- Thin the blood to prevent clots from forming due to low blood flow
- Dissolve blood clots
- Help improve pain in the legs that is the result of walking or climbing stairs (claudication)
- Some medicines lower the level of low density lipoprotein (LDL) cholesterol. LDL is the "bad" cholesterol. The higher the LDL level in the blood, the greater the chance of heart disease. Medicines may include statins, such as lovastatin, simvastatin, pravastatin, fluvastatin, and atorvastatin. Other medicines may include ezetimibe, gemfibrozil, and certain binding agents.

Blood pressure should be lowered if it is too high. Treatment should aim for a blood pressure lower than 130/80 mmHg. Many medicines are available to

lower blood pressure, such as angiotensin-converting enzyme (ACE) inhibitors, angiotensin receptor blockers (ARBs), beta-blockers, diuretics ("water pills"), and calcium channel blockers.

Anticoagulants or blood thinners may be prescribed to prevent clots in the arteries. Thrombolytic therapy involves clot-dissolving drugs inserted into an artery to break up a blood clot. To stop platelets from clumping together, antiplatelet drugs such as clopidogrel (Plavix®) and aspirin may be prescribed. To help increase distances walked without pain and help improve claudication, pentoxifylline (Trental®) or cilostazol (Pletal®) may be prescribed.

Surgeries or Special Procedures

Surgery may be necessary if blood flow in a limb is completely or almost completely blocked. In bypass grafting surgery, the doctor uses a blood vessel from another part of your body or a tube made of synthetic (man-made) material to make a graft. This graft bypasses the blockage in the artery, allowing blood to flow around it. Surgery does not cure PAD, but it may increase blood flow to the limb.

Angioplasty (AN-jee-oh-plas-tee) may be performed to restore blood flow through a narrowed or blocked artery. During the procedure, a thin tube (catheter) is inserted into a blocked artery and a small balloon on the tip of the catheter is inflated. When the balloon is inflated, plaque is pushed against the artery walls. This causes the artery to widen, restoring blood flow. A stent, a tiny mesh tube that looks like a small spring, is now used in most angioplasties. Some stents are coated with medicine to help prevent the artery from closing again.

Other Types of Treatment

Cell and gene therapies are currently being researched, but are not yet available outside of clinical trials. For further information about clinical trials, see the Links to Other Information About Peripheral Arterial Disease section.

How Can Peripheral Arterial Disease Be Prevented?

There are a number of ways to try to prevent peripheral arterial disease (PAD). If you are a smoker, quit smoking. On average, smokers who

develop PAD experience symptoms 10 years earlier than nonsmokers who develop PAD. Work to control your blood pressure, cholesterol, and glucose levels. Talk with your doctor about beginning a supervised exercise therapy program. If you are overweight or obese, work with your doctor to develop a reasonable weight-loss plan. Finally, follow a low-fat, low-cholesterol diet and eat more fruits and vegetables.

Key Points

- Peripheral arterial disease (PAD) occurs when a fatty material called plaque builds up on the inside walls of the arteries that carry blood to the limbs.
- PAD is a common, yet serious disease.
- PAD affects 8 to 12 million people in the United States. An estimated 5 percent of U.S. adults over age 50 have PAD. Among adults age 65 and older, 12 to 20 percent may have PAD.
- PAD can impair physical health and diminish a person's ability to walk.
- People with PAD have an increased risk for heart attack.
- Early diagnosis and treatment of PAD are important to prevent disability and save lives.
- PAD screening for individuals at high risk is very important.
- PAD can be treated with lifestyle changes, medicines, and/or surgery and special procedures.
- Treatment often includes making long-lasting lifestyle changes, including quitting smoking, lowering high blood pressure, lowering high cholesterol levels, and lowering blood glucose levels if you are diabetic.
- PAD treatment may stop the disease from progressing and reduce the risk of heart attack, heart disease, stroke, and kidney failure.
- Surgery may be necessary to supply more blood flow to the leg if a person has severe symptoms.

Additional Information

- Peripheral Arterial Disease Coalition -
<http://www.padcoalition.org/wp/>
- VascularWeb -
http://www.vascularweb.org/_CONTRIBUTION_PAGES/Patient_Information/NorthPoint/Leg_Artery_Disease.html

*Source: NIH
Reviewed 11/2007.*

This pamphlet is provided for informational purposes only. It is not meant to be used for self-diagnosis or treatment. This is not a substitute for consultation with a healthcare provider. If you have any questions or concerns, consult with your physician. Use of trade names is for identification purposes only and does not imply endorsement by St. Anthony's Physician Organization.