



Lower Extremity Arterial Disease

Circulating the Facts About Peripheral Vascular Disease

*Brought to you by the Education Committee
of the Society for Vascular Nursing*

www.svnnet.org

Peripheral Artery Disease (PAD)

Many people will be involved in the diagnosis and treatment of Peripheral Artery Disease (PAD), but you are the most important. Your healthcare team will complete an evaluation, order and explain diagnostic test results, and plan your treatment. Treatment may include medications, an interventional procedure or surgery. As a member of the healthcare team, you play a key role in controlling your disease by changing certain habits or risk factors. This informational booklet will give you information about the following:

- Describes circulation of blood
- Describes arterial blood vessel disease of the body
- Describes risk factors for developing artery problems
- Explains diagnostic tests
- Explains interventional and surgical interventions for peripheral artery disease

The Circulatory System

The circulatory system is made up of the heart, **arteries**, **veins**, and **capillaries**:

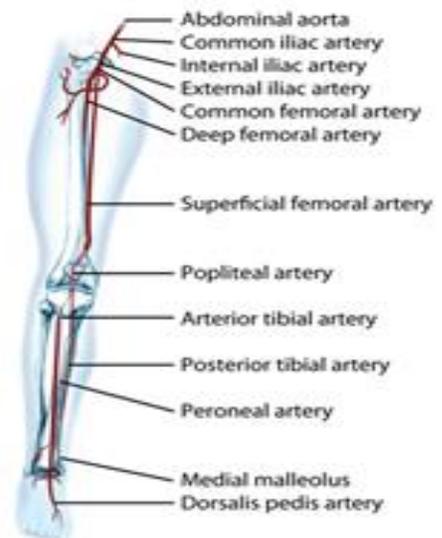
- **arteries** carry the oxygen rich blood and food to your body and internal organs
- **veins** return the blood to the lungs to get oxygen and are repumped by the heart
- **capillaries** are tiny blood vessels that are connected arteries and veins

What is PAD?

The lining of the artery which is normally smooth, becomes rough and thickened by a buildup called **atherosclerosis**, or “hardening of the arteries.”

What Is Atherosclerosis?

- Atherosclerosis is a buildup of cholesterol and fat in the artery and is also known as **plaque**.
- Arteries become blocked and narrowed due to atherosclerosis and this affects blood flow.

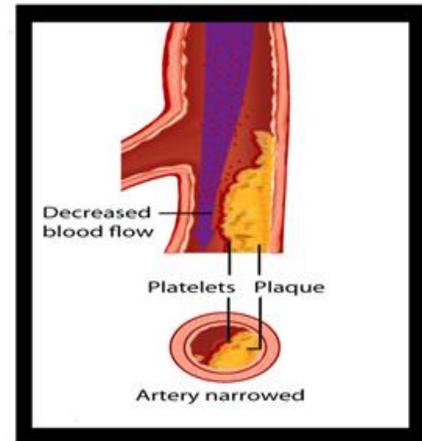


Peripheral Artery Disease (PAD)

PAD comes from plaque that narrows or blocks blood flow in the largest artery in the body (aorta) and in arteries to your arms, pelvis, and legs.

Signs and symptoms of PAD include:

- **Claudication** is painful cramping, fatigue, or weakness in the hip, thigh, calf, arm muscles after activity, such as walking or climbing stairs.
- **Coldness** in the arm or leg when compared with the other side.
- **Ulcers or Sores** on your fingers, toes, feet or legs that won't heal.
- **Rest pain:** when the narrowing or blockage of the arteries worsens, pain in the hands, fingers, toes and feet may occur at rest. Rest pain usually worsens when the legs are elevated, and may be relieved by lowering the legs.



PAD severity is related to the location and amount of atherosclerosis that decreased blood flow through arteries.

- **Collateral circulation** may develop over time as atherosclerosis develops slowly. Collateral circulation is when smaller arteries grow over time and improve blood to the narrowed area
- **Signs and Symptoms of Severe PAD may include:**
- Paleness and coldness of the hand, fingers, feet or toes
- **Feelings of numbness, tingling, or pain in** the hand, fingers, foot, toes.
- **Decreased ability to move** the fingers, and the toes
- **Breakdown of soft tissue and infection**, also known as gangrene

PAD can also cause a blood clot to form in the arteries. It may break off inside the artery and travel in the artery until it blocks blood flow.

- When a blockage by a blood clot occurs suddenly, symptoms may be acute because there is not enough blood flow or collateral circulation
- The lack of blood flow to a hand, foot or other body part is called ischemia.

Who will get PAD?

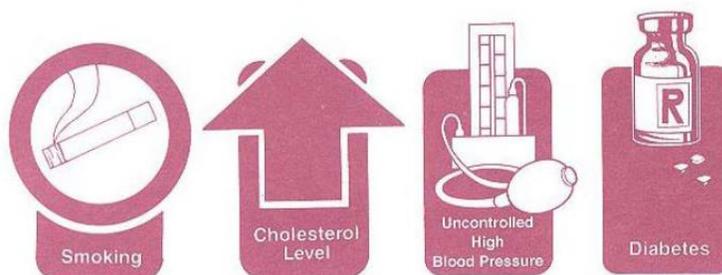
Although atherosclerosis may occur at any age, the disease is more common in people over the age of 45.

Risk Factors

There are two types of risk factor for PAD: those which can be changed and those which cannot be changed.

Risk Factors that can be changed

- Tobacco use and exposure to second hand smoke
- High blood pressure or **hypertension**
- High or low levels of blood cholesterol and fat
- Diabetes
- Heart disease
- Obesity
- Lack of regular exercise



Risk Factors that cannot be changed

- Age
- Sex (male/female)
- Family history of artery disease
- Race
- Genetic conditions

What are the Diagnostic Tests for PAD?

Your healthcare provider may order diagnostic tests to evaluate for PAD. These tests may be **non-invasive** or **invasive**.

Noninvasive Diagnostic Imaging

- Noninvasive testing is painless and without known risk or side effects.
- It does not require the use of needles, contrast or x-ray.
- You may be sent to the non-invasive vascular laboratory to have the blood flow to your legs checked.
- Tests may be performed on an outpatient basis, rather than during a hospital stay.
- No special preparation is needed before the test and no special care is needed afterward.

Vascular Ultrasound (Duplex) Imaging

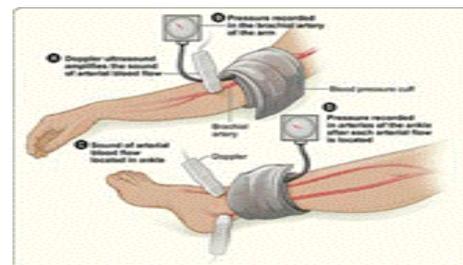
- Ultrasound is a test that uses sound waves to produce pictures of blood vessels in different parts of your body.
- The ultrasound test uses gel and a transducer that can create pictures of blood vessels, measure blood flow and detect narrowing or blockages in blood vessels.

Ultrasound (Duplex) Imaging

- **Carotid** Ultrasound (Duplex) imaging is used to measure blood flow and detect narrowing in the carotid arteries located on both sides of the neck. The ultrasound test uses sound waves, gel and a transducer to produce images.
- **Abdominal Aorta Ultrasound (Duplex) Imaging**
The Abdominal Aorta ultrasound test can detect an enlarged **aorta (aneurysm)** and measure the size. This test includes the use of gel and a transducer that can create pictures of the aorta and blood vessels in the abdomen, measure blood flow and detect narrowing or blockages in blood vessels. Do not eat or drink several hours before this ultrasound test.

Ankle Brachial Index (ABI)

- Your healthcare provider may order a test called the Ankle Brachial Index.
- The ABI compares of blood pressures in your ankles to blood pressures in your arms.



Pulse Volume Recording Doppler (PVR)

- Your healthcare provider may order a test to make measurements of the blood flow at different points along your legs during rest and exercise.
- Blood pressure cuffs are placed around your arms and legs and pressure readings are compared.
- While walking on a treadmill the blood pressures will be repeated in the arms and legs.
- This type of testing can detect the location and severity of atherosclerosis in the legs.

Invasive Diagnostic Imaging

- You may need to have tests that require the use of needles, contrast and/or x-ray.
- You will be told of any instructions needed before the test.
- Tell your healthcare provider if you have any allergies beforehand.
- There are risks and side effects connected with invasive tests.
- Your healthcare providers will speak with you about any risks and side effects.

Magnetic Resonance Imaging (MRI):

- A x-ray procedure that does not use radiation. Strong magnetic fields and radio waves with a computer make detailed pictures of the body. If you have a pacemaker or other metal device, you cannot have a MRI.

Magnetic Resonance Angiography (MRA):

- A type of MRI that gives pictures of blood vessels in the body. The test uses a contrast medium to help see the blood vessels. An intravenous (IV) line is inserted in your arm and the contrast is injected through it. Pictures of blocked and narrowed arteries in your neck and head are created. If you have a pacemaker or other implanted metal devices, you cannot have a MRA.

Computed Tomography (CT) Scan:

- **CT scan** uses a computer to create picture images using x-rays of different parts of the body.
- The CT Scan is a donut shaped x-ray machine and the patient lies on a table and moves through the machine.

Computed Tomography Angiography (CTA):

- Similar to a CT Scan but contrast is injected through an IV. The contrast creates images of blockages and/or narrowing of the arteries and x-ray pictures are taken. You may be asked not to eat or drink several hours before the test.

Angiography/Angiogram:

- This is an x-ray test that looks at the blood vessels in the body. The test is done in a specialized x-ray room. Contrast is injected through a catheter (hollow tube), put in into an artery in your groin or arm through a skin puncture site. The skin will be numbed so you will not feel the area being worked on.
- The contrast highlights the blood vessels while x-rays are taken.
- This will show narrowing or blockage of the arteries in a different way than a MRI or CT Scan. Afterwards, the tube will be removed and a bandage will be applied to the skin puncture.
- An angiogram will take between 30 to 60 minutes.
- You cannot eat or drink before the study. You will be awake but will be given medication to help you relax. Depending upon the catheter location, after the study you may be asked to lie flat for a few hours. Your blood pressure and bandage over the skin puncture will be checked often.

What Treatments Are Available For PAD?

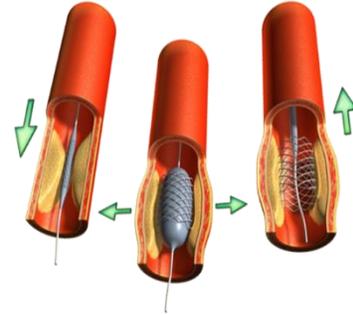
The treatment for PAD depends upon your general condition, your symptoms, test results, and your provider's treatment plan. Medical management or procedures may be recommended. Treatment of severe or progressive disease may require an interventional procedure or surgery. The healthcare team will explain the options and your care.

INTERVENTIONAL PROCEDURES

The following procedures may be used alone or in combination with surgery to treat peripheral artery disease.

Angioplasty/Stenting:

- In **angioplasty**, as the balloon expands, it enlarges the inside of the artery wall to open a blockage.
- A wire mesh tube called a **stent** may be placed in the artery blockage to keep it open and improve blood flow.



Thrombolysis (Clot Busting) Medication:

- If a blood clot is blocking the blood flow, clot busting, medication may be given directly through a catheter to dissolve or break up the clot. This is usually done along with an angiogram.

Athrectomy Catheter Therapy:

- An Athrectomy Catheter is a catheter that is placed into an artery narrowed by plaque.
- The atherectomy blade is used to cut away the plaque from the artery wall, remove the blockage and improve blood flow.
- This is usually done with an angiogram.

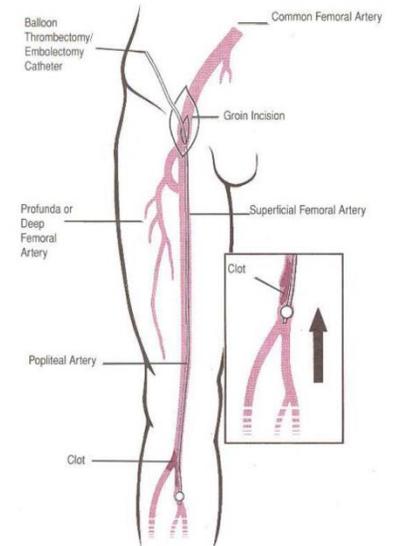
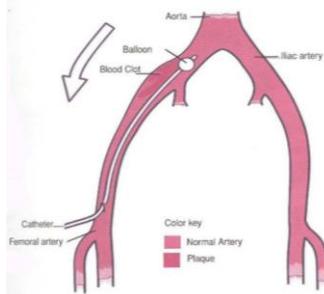
Surgical Intervention for Peripheral Artery Disease:

The goal of surgical intervention on arteries with atherosclerosis are to improve blood flow. Improved blood flow will relieve hand and foot pain, heal ulcers and sores, improve mobility, and prevent amputation.

- Surgical intervention recommendations may include removing the plaque or blood clot from a blocked artery or bypass/revascularization of the blocked artery.

THROMBECTOMY/EMBOLECTOMY

- This surgery involves removing a blood clot that is blocking blood flow in an artery.
- A small catheter, with a balloon at the end of it, is positioned in the artery.
- The balloon is inflated and the catheter is pulled back through the artery, taking with it any blood clot.

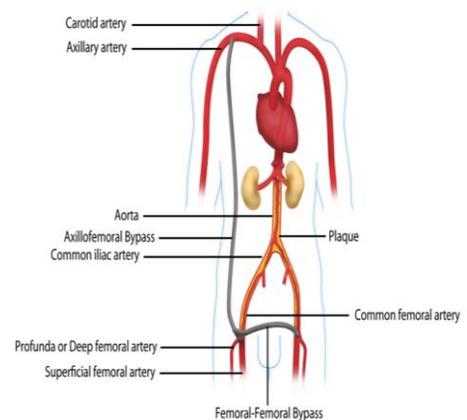


Thrombectomy/Embolectomy of Leg

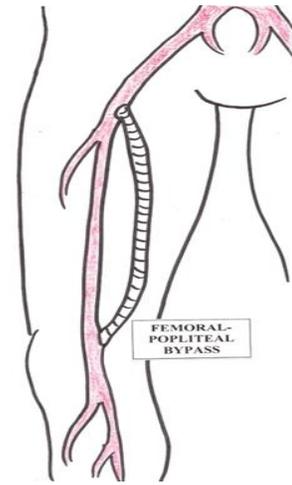
BYPASS (REVASCULARIZATION)

If there are multiple or severe blockages in the arteries, a surgery called a "bypass" may be recommended.

- A superficial vein from the leg may be used as a "replacement artery" to create the bypass.
- Using your own veins gives the best and longest lasting results, but **synthetic material** can be used as well.



- The bypass is performed to route the blood flow around the blocked segments of artery.
- The bypass graft is sewn to an artery above and below the blocked artery, and the blood flow will go through the bypass graft and improve circulation.



PAD may be treated with medications, interventional procedures, or surgical interventions. Interventional and Surgical procedures will improve blood flow, but do not cure atherosclerosis. PAD requires lifestyle changes to prevent further plaque and atherosclerosis formation. Continue to take your prescribed medication, remain tobacco free, and continue with regular followup with your healthcare providers to help prevent progression of PAD.