



What is Peripheral Arterial Disease?

Peripheral Arterial Disease (PAD) is also known as atherosclerosis, poor circulation, or hardening of the arteries. PAD progresses over time at variable rates in each individual depending on the area of circulation effected and one's health and family history. The signs and symptoms of PAD may not arise until later in life. For many, the outward indications will not appear until the artery has narrowed by 60 percent or more.

One method the body uses to adapt to the narrowed arteries is the development of smaller peripheral arteries that allow blood flow around the narrowed area. This process is known as collateral circulation and may help explain why many can have PAD without feeling any symptoms.

When a piece of cholesterol, calcium or blood clot abruptly breaks from the lining of the artery or a narrowed artery blocks off completely, blood flow will be totally obstructed and the organ supplied by that artery will suffer damage. The organs in PAD most commonly affected and researched are the legs.

What happens if the disease worsens?

The severity of PAD depends on when it is detected and any pre-existing health factors; especially smoking, high cholesterol, heart disease or diabetes. In the later stages, leg circulation may be so poor that pain occurs in the toes and feet during periods of inactivity or rest. This is especially true at night. This is known as rest pain, which usually worsens when the legs are elevated and is often relieved by lowering the legs (due to the effects of gravity on the blood flow).

Critical Limb Ischemia

The most advanced stages of PAD can lead to Critical Limb Ischemia (CLI) . Here the legs and feet have such severe blockage that they do not receive the oxygen rich blood required for growth and repair of painful sores and even gangrene (dead tissue). This condition, if left untreated, may require amputation.

Risk Factors

An individual is at risk for developing PAD when one or more of these risk factors are present:

Smoking - This is the number one risk factor for PAD. Those that smoke not only put themselves at risk for developing arterial disease but also undermine attempts at treatment.

Diabetes - Individuals with diabetes are at a greater risk for developing PAD due to its effect on blood vessels.

History of Heart Disease - A family history of cardiovascular disease is an indicator for risk at developing PAD.

Hypertension (high blood pressure) - When blood pressure remains high, the lining of the artery walls becomes damaged. Many PAD patients also have high blood pressure.

Age - In the United States, those 50 years or older are at greater risk to develop PAD. PAD affects both men and women, but occurs slightly more in men. The percentage of elderly people that are affected is:

Age	% Affected
40-59	3%
60-69	8%
70 or older	19%

High levels of Homocysteine - This is an amino acid found in plasma (blood). Some recent studies show higher levels are associated with PAD.

Symptoms

For many, the first noticeable symptom of PAD is a painful cramping of leg muscles during walking called intermittent claudication. When a person rests, the cramping goes away. This leg pain can be severe enough to deter a person from normal walking.

Some individuals will not feel cramping or pain but might feel a numbness, weakness or heaviness in the muscles.

In patients whose PAD is more severe, insufficient blood flow to the feet and legs may cause a burning/aching pain in the feet and toes while resting. The pain will occur particularly at night while lying flat. For more information, visit our section on critical leg ischemia. Other symptoms include

- Cooling of skin in specific areas of legs or feet
- Color changes in the skin and loss of hair
- Toe and foot sores that do not heal

“Silent PAD”

Many people are affected by PAD yet they do not have symptoms. These individuals are at a high risk for suffering an early heart attack or stroke. Research has proven that the life expectancy for a person with PAD is greatly reduced. For example, the risk of dying from heart disease is six times higher for those with PAD compared to those without. Therefore, it is important to discuss the possibility of PAD with a health care professional if someone has several of the risk factors for PAD.

Resources

“*Stay in Circulation: Take Steps to Learn About PAD*” national campaign: www.aboutpad.org

The P.A.D. Coalition: www.PADCoalition.org

Diagnosis

Several tests may be required to diagnose PAD and determine the extent of the disease. Some of these tests may be performed in a primary care physician’s office, whereas others may be performed by a vascular specialist or in a vascular lab. Most tests are non-invasive and thus should be fairly painless.

- Medical History and Physical Exam
- Ankle-brachial index (ABI)
- Treadmill Exercise Test
- Reactive Hyperemia Test
- Segmental Pressure Measurements
- PVR Waveform Analysis
- Duplex Arterial Imaging or Ultrasound Imaging
- Photoplethysmography (PPG)
- Arteriogram

Treatment Options

Treatment options vary and depend on the overall health of the patient and the severity of the diagnosis. The physician should provide the patient with adequate information to help understand all options. The majority of intermittent claudication cases are treated without surgery. Multiple long term studies following a large number of patients with claudication demonstrated that only 1 out of 4 developed worsening symptoms. It also found that only 1 out of 20 patients would require an amputation. A treatment plan involves lifestyle changes and one or more of the following:

- Exercise Therapy
- Lifestyle Modifications
- Medication
- Diet
- Smoking Cessation
- Diabetes management
- Blood pressure management
- Foot Care
- Endovascular Therapy
- Vascular Surgery