

# Patient information: Peripheral artery disease and claudication (Beyond the Basics)

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## CLAUDICATION OVERVIEW

Claudication, which literally means “to limp”, is one of the symptoms of lower extremity peripheral artery disease (PAD), but can also occur in patients who have other vascular problems (eg, aneurysm). Claudication is defined as a pain or discomfort in a group of muscles, usually the legs, thighs, or buttocks, that is worsened by exercise (ie, walking) and relieved with rest.

Although many underlying medical problems can cause claudication, the most common cause is peripheral artery disease, which causes deposits of fatty plaques (atherosclerosis) on the vessel walls. These plaques may progress and result in narrowing or completely block blood flow in the leg arteries ([figure 1](#)).

Another important, but less common, arterial cause of claudication is aneurysm. An aneurysm is an abnormally dilated artery, which is often filled with debris or blood clots that can break off and clog arteries in the leg, sometimes causing claudication as a first symptom. (See ["Popliteal artery aneurysm", section on 'Chronic ischemia'](#) and ["Clinical features and diagnosis of abdominal aortic aneurysm", section on 'Asymptomatic AAA'](#).)

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## PERIPHERAL ARTERY DISEASE RISK FACTORS

The major risk factors for developing PAD include:

- Hypertension (high blood pressure). (See ["Patient information: High blood pressure in adults \(Beyond the Basics\)"](#).)
- Hyperlipidemia (elevated blood levels of lipids, including cholesterol and triglycerides). (See ["Patient information: High cholesterol and lipids \(hyperlipidemia\) \(Beyond the Basics\)"](#).)
- Cigarette smoking. (See ["Patient information: Quitting smoking \(Beyond the Basics\)"](#).)
- Diabetes. (See ["Patient information: Diabetes mellitus type 2: Overview \(Beyond the Basics\)"](#).)

One study found that these risk factors cause claudication in 69 percent of patients with PAD; cigarette smoking was the most important factor [1]. In contrast, alcohol consumption, in moderation, may reduce the risk of PAD and claudication.

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## CLAUDICATION SYMPTOMS

The pain and discomfort associated with claudication vary from person to person. Some people have severe, debilitating discomfort while others have minimal symptoms.

The severity of your symptoms will depend upon how many arteries are affected, how narrowed your arteries are, the number of "alternate" secondary (collateral or detour) vessels available to provide blood when the damaged vessels cannot (so-called collateral circulation), how quickly you walk, and whether you walk up an incline or stairs.

The location of your pain depends upon the location of PAD. A person may have foot, calf, thigh, or buttock pain, either alone or in combination. Calf claudication is the most frequent location of pain, and most commonly results from blockage of the superficial femoral artery in the mid-thigh. Foot claudication may occur from narrowing of an artery in the lower part of the leg (the tibial or peroneal artery).

**Calf pain** — Calf pain is the most common complaint. It is usually described as a gradually restrictive cramp-like pain that always occurs with exercise and is relieved with rest. Claudication pain in the upper two-thirds of the calf is usually due to the narrowing of the main artery in the thigh (the superficial femoral artery), whereas pain in the lower third of the calf is due to disease in the artery behind the knee (the popliteal artery).

**Thigh pain** — Thigh claudication often results from the narrowing of the superficial femoral artery in the upper thigh or from the artery in the groin (the common femoral artery), but can also be caused by blockage of the vessels above the groin (iliac arteries).

**Buttock pain** — When symptomatic, people with a blockage in the artery of their abdomen (the aorta) complain of buttock, hip, or thigh pain. The pain is often described as aching, and there may also be weakness while walking up stairs. Other physical signs include loss of muscle mass and hair loss on the lower extremities. Erectile dysfunction (ED) may also occur when the aorta or iliac arteries are blocked. (See "[Overview of male sexual dysfunction](#)", section on '[Association with cardiovascular disease](#)'.)

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## CLAUDICATION DIAGNOSIS

The diagnosis of claudication is based upon the signs and symptoms described above. Noninvasive tests can be performed to confirm the diagnosis and estimate the severity of the disease.

**Ankle-arm index** — The ankle-brachial index (ABI), also called the ankle-arm index, is used to confirm the diagnosis of PAD. The ABI measures the resting blood pressure at the ankle compared with the blood pressure in the arm. A normal value is between 0.9 and 1.3. If the test is normal at rest in a patient with symptoms of claudication, it is often repeated following exercise, comparing values at rest and following treadmill walking.

**Segmental blood pressure** — Blood pressure can be measured at other levels in the legs (calf, low thigh, high thigh) to determine the level and extent of PAD. Such measurements are called segmental limb pressures.

**Imaging** — Ultrasonography is a noninvasive test that can be used to see the location and severity of the narrowing in the blood vessels. Computed tomography (CT) and magnetic resonance angiography (MRA) are other noninvasive ways of looking at blood vessels. These tests are usually used if symptoms do not improve with medical treatment or if they suddenly get worse. In this situation, invasive imaging tests (ie, arteriography) might also be considered, especially if your doctor thinks that a procedure (revascularization) to treat PAD would be helpful. (See '[Percutaneous angioplasty and stenting](#)' below and '[Surgery](#)' below.)

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## CLAUDICATION TREATMENT

The treatment of claudication involves medical therapy with or without some form of revascularization (angioplasty/stenting, surgical bypass). Most people with claudication are treated medically, which includes reducing risk factors, exercise training, and using medications that may improve walking distance [2].

In spite of appropriate medical treatment, some people may have incapacitating claudication that prevents them from working or carrying out other important daily tasks. These patients may be candidates for revascularization procedures, which include percutaneous angioplasty and stenting of the narrowed or blocked vessels, or a surgical procedure that opens or bypasses the blockage.

**Reduce risk factors** — As mentioned above, the main risk factors for PAD are cigarette smoking, diabetes mellitus, high blood pressure, and high cholesterol or lipids. All people with claudication should work to control these risk factors.

- Lowering cholesterol can prevent worsening of PAD and can reduce the symptoms of claudication. A blood LDL-cholesterol level below 100 mg/dL (2.6 mmol/L) is recommended. Treatment may include lifestyle changes (diet

and exercise) and/or lipid-lowering medications. (See "[Patient information: High cholesterol and lipids \(hyperlipidemia\) \(Beyond the Basics\)](#)".)

- Quitting smoking and improving control of diabetes and high blood pressure may also improve claudication symptoms (ie, pain), but even more importantly, it helps to reduce the risk of coronary artery disease. (See "[Patient information: Quitting smoking \(Beyond the Basics\)](#)".)

Antiplatelet agents (medications that reduce blood clotting in an artery, vein, or the heart) are recommended for **all** patients with PAD. While these medications may only modestly improve claudication symptoms, treatment reduces the need for surgery and decreases the risk of myocardial infarction (heart attack), stroke, or death from PAD.

Aspirin (81 to 325 mg/day) is an accepted antiplatelet medication for people with PAD. Treatment with another antiplatelet agent, clopidogrel, has modest advantages compared with aspirin alone in preventing stroke, myocardial infarction, and PAD [3]. Some patients do not respond as expected to antiplatelet therapy. (See "[Clopidogrel resistance and clopidogrel treatment failure](#)".)

**Exercise** — Exercise programs reduce the symptoms of claudication, including increasing the distance and time that one can walk before developing symptoms [4]. Patients who respond to an exercise program can expect improvement within two months. Motivated patients who are supervised achieve the best results. The benefits of exercise diminish when exercise training stops.

Supervised exercise training involves walking on a treadmill or a track for 45 to 60 minutes at least three times per week. The sessions are supervised by an exercise physiologist, physical therapist, or nurse. The intensity of exercise can be adjusted based upon symptoms or other cardiovascular problems (such as an abnormal heart rhythm or chest pain) that develop during exercise. Supervised training is not reimbursed by most insurance companies, and although encouraged, nonsupervised walking programs do not result in the same amount of improvement.

**Medication to improve walking distance** — A number of medical therapies may be helpful in people with claudication to help improve walking distance.

**Cilostazol** — Cilostazol is the most effective medication for treatment of claudication symptoms, particularly when combined with exercise. A clinician may also recommend cilostazol for people who have a limited ability to walk due to claudication. This is especially true for people who do not respond adequately to other measures and those who do not want or who are not healthy enough for revascularization.

Cilostazol should be taken one-half hour before or two hours after eating because high fat meals increase the amount of drug absorbed by the body. Diltiazem, omeprazole, and grapefruit juice should not be taken at the same time as cilostazol. Cilostazol may be taken safely with aspirin and/or clopidogrel. Potential side effects of cilostazol include headache, loose or soft stools, diarrhea, dizziness, and palpitations. Cilostazol is not used in patients with heart failure.

**Naftidrofuryl** — Another medication, naftidrofuryl, has antispasmodic activity and also helps patients have more pain-free walking compared with taking placebos [5]. This medication is commonly used in Europe.

**Statin therapy** — Statins are medications used to lower cholesterol. Statin therapy may slow progression or possibly induce regression of lower limb atherosclerosis. A number of trials in patients with hyperlipidemia and PAD have shown beneficial effects of lipid lowering on the natural history of PAD. A systematic review that specifically evaluated patients with lower limb PAD concluded that lipid-lowering therapy reduced disease progression, helped alleviate symptoms, and improved total walking times and pain-free walking distance [6].

**Unproven or ineffective treatments** — Many other drug therapies have been tried for treating claudication, but are either much less effective than the therapies listed above, or are ineffective. These include pentoxifylline, herbal remedies (Ginkgo biloba, Padma 28), and others. Some treatments may be harmful (eg, chelation therapy). Many other treatments are investigational (eg, angiotensin inhibitors, antioxidants, bosentan, prostanoids, vorapaxar, and other phosphodiesterase inhibitors).

Pentoxifylline (Trental) has been available for many years for the treatment of claudication, although studies of its effectiveness have shown mixed results. It is less effective than cilostazol, but may be used if cilostazol fails to reduce symptoms. Potential side effects include upset stomach, nausea, and vomiting.

Herbal remedies (eg, Ginkgo biloba, Padma 28) have been tried, but are not monitored or regulated in the United States, raising concerns about purity and consistency of doses in some formulations. One of these, ginkgo biloba, may improve symptoms of claudication. However, most studies had a flawed design, making it difficult to conclude whether it is safe or effective. Ginkgo biloba, therefore, cannot be recommended for claudication based on the available scientific data.

Chelation therapy (the repeated intravenous infusion of EDTA) and vitamin E supplementation have been investigated as treatments for claudication. However, studies have shown no benefit and these treatments are not recommended.

**Revascularization** — In selected patients with severe lifestyle-limiting claudication, particularly if medical therapy has been unsuccessful, your doctor may recommend a procedure to increase the amount of blood flow to the extremities. Revascularization procedures can be generally divided into two general categories: “catheter-based” procedures, such as balloon angioplasty with or without stenting, or “surgery”, such as bypass or endarterectomy. Increasingly, revascularization may involve a combination of multiple techniques and devices, called “hybrid” procedures, all sharing the objective of improving blood flow. The selection of revascularization technique depends upon a variety of factors, such as your particular anatomy, severity of symptoms, prior interventions, suitability for anesthesia, skill-set and experience of your physician, as well as your personal preferences. There is no “standardized” revascularization procedure for claudication.

**Percutaneous angioplasty and stenting** — A percutaneous intervention (without incisions) is generally attempted before surgery since it is less invasive and has fewer cardiovascular risks. Percutaneous procedures are performed through a catheter placed in the groin region into the femoral artery. Balloon angioplasty involves threading a guidewire through the narrowed or blocked vessel. A deflated balloon is placed over the wire and the balloon is inflated and then deflated. This opens the vessel and allows blood to flow more freely.

A stent is often used to hold the vessel open after angioplasty. A stent is an expandable tube made of a wire mesh. The goal of a stent is to prevent restenosis, meaning the vessel becomes narrowed again. Stents work better in some vessels compared with others. “Drug-eluting” balloons and stents are sometimes used; these release medication to help the vessel stay open longer.

Angioplasty and stenting are most successful for treating single, short segment blockages, but advancements in technology have allowed treatment of multiple, longer and even completely blocked segments. However, restenosis is more common when longer or blocked segments are treated. (See ["Percutaneous interventional procedures in the patient with lower extremity claudication"](#).)

**Surgery** — Revascularization involves sewing in a graft (usually a vein, but sometimes man-made material) to go around (bypass) the narrowed or blocked area of the blood vessel, which improves blood flow to the rest of the leg. The best candidates for surgery are those who are under the age of 70 years, do not have diabetes, and have little disease in the vessels below the knee. Many people with diabetes or over age 70 years are able to have successful surgery, but it is important for these patients to understand that they have a higher risk for postoperative complications. (See ["Surgical management of claudication"](#).)

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## WHERE TO GET MORE INFORMATION

Your healthcare provider is the best source of information for questions and concerns related to your medical problem.

This article will be updated as needed on our web site ([www.uptodate.com/patients](http://www.uptodate.com/patients)). Related topics for patients, as well as selected articles written for healthcare professionals, are also available. Some of the most relevant are listed below.

**Patient level information** — UpToDate offers two types of patient education materials.

**The Basics** — The Basics patient education pieces answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials.

[Patient information: Peripheral artery disease and claudication \(The Basics\)](#)

[Patient information: Atherosclerosis \(The Basics\)](#)

[Patient information: Doppler ultrasound \(The Basics\)](#)

[Patient information: Vasculitis \(The Basics\)](#)

**Beyond the Basics** — Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are best for patients who want in-depth information and are comfortable with some medical jargon.

[Patient information: Quitting smoking \(Beyond the Basics\)](#)

[Patient information: Diabetes mellitus type 2: Overview \(Beyond the Basics\)](#)

[Patient information: High cholesterol and lipids \(hyperlipidemia\) \(Beyond the Basics\)](#)

[Patient information: High blood pressure in adults \(Beyond the Basics\)](#)

**Professional level information** — Professional level articles are designed to keep doctors and other health professionals up-to-date on the latest medical findings. These articles are thorough, long, and complex, and they contain multiple references to the research on which they are based. Professional level articles are best for people who are comfortable with a lot of medical terminology and who want to read the same materials their doctors are reading.

[Clinical features and diagnosis of lower extremity peripheral artery disease](#)

[Surgical management of claudication](#)

[Management of claudication](#)

[Noninvasive diagnosis of arterial disease](#)

[Percutaneous interventional procedures in the patient with lower extremity claudication](#)

The following organizations also provide reliable health information.

- National Library of Medicine

(<http://www.nlm.nih.gov/medlineplus/peripheralarterialdisease.html>, available in Spanish)

- National Heart, Lung, and Blood Institute

([www.nhlbi.nih.gov/health/dci/Diseases/pad/pad\\_what.html](http://www.nhlbi.nih.gov/health/dci/Diseases/pad/pad_what.html))

- American Heart Association

([http://www.heart.org/HEARTORG/Conditions/More/PeripheralArteryDisease/About-Peripheral-Artery-Disease-PAD\\_UCM\\_301301\\_Article.jsp](http://www.heart.org/HEARTORG/Conditions/More/PeripheralArteryDisease/About-Peripheral-Artery-Disease-PAD_UCM_301301_Article.jsp))

- Peripheral Arterial Disease (PAD) Coalition

([vascular-disease.org/padcoalition](http://vascular-disease.org/padcoalition))

[1-4,7]

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## References

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