

What is claudication?

Claudication is pain and/or cramping in the lower leg due to inadequate blood flow to the muscles. The pain usually causes the person to limp. The word "claudication" comes from the Latin "claudicare" meaning to limp. Claudication typically is felt while [walking](#), and subsides with rest. It is commonly referred to as "intermittent" claudication because it comes and goes with exertion and rest. (In severe claudication, the pain is also felt at rest.)

What causes claudication?

Several medical problems can cause claudication, but the most common is [peripheral artery disease](#). Peripheral artery disease (PAD) is caused by atherosclerosis, which is a hardening of the arteries from accumulation of [cholesterol plaques](#) form on the inner lining of the arteries. This is especially common at branching points of the arteries in the legs. Blockage of the arteries from these plaques cause low blood flow to the muscles in the legs. When walking or exercising the muscles in the legs require more blood flow to increase oxygen to the cells. Atherosclerotic plaques cause decreased blood flow and decreased oxygen. The muscles of the legs can ache and burn as a result of inadequate oxygen. This is felt as cramping in the legs.

What are the symptoms of claudication?

Pain and [cramping in the legs](#) is the main symptom of claudication. Pain can be sharp or dull, aching or throbbing, or burning. The severity of the peripheral artery disease, the location of the plaque, and the activity of the muscles determine the severity of symptoms and location of pain. Calf pain is the most common location for leg cramps. This is because the atherosclerotic plaques often begin in the arteries farthest from the heart. If the blockage or plaque formation is farther up the leg, the pain from claudication may be in the thigh. If the blockage is in the aorta (the main artery from the heart to the legs) then symptoms may include pain in the buttocks, groin, or [erectile dysfunction](#).

Why does claudication come and go?

The usually intermittent nature of the pain of claudication is due to a temporary inadequate supply of oxygen to the muscles of the leg. The poor oxygen supply is a result of narrowing of the arteries that supply the leg with blood. This limits the supply of oxygen to the leg muscles and is especially noticeable when the oxygen requirement of these muscles rises with [exercise](#) or walking. Claudication that comes and goes is often referred to as intermittent claudication.

What can cause the artery narrowing that leads to claudication?

Intermittent claudication can be due to temporary artery narrowing due to spasm of the artery (vasospasm), permanent artery narrowing due to atherosclerosis, or from the complete [blockage of an artery of the leg](#).

Who typically is affected by claudication?

Intermittent claudication is more common in men than in women. The condition affects 1%-2% of the population under 60 years of age, increasing in incidence with age, to affect over 18% of persons over 70 years of age, according to the American Academy of Family Physicians.

What are the risk factors for claudication and peripheral vascular disease?

Risk factors for peripheral artery disease and claudication include:

- [Smoking](#)
- [Diabetes](#)
- [High blood pressure](#)
- [High cholesterol](#)
- African American descent
- [Heart disease](#)

How is claudication diagnosed?

A physician will take a history and the diagnosis will be based on the patient's symptoms.

Testing for claudication may include:

- [Ultrasound](#) is most commonly used to determine location and severity of the narrowing in the blood vessels.
- Ankle-arm index measures the blood pressure at the ankle compared with the blood pressure in the arm. An abnormal result is an indication of peripheral artery disease.
- Segmental blood pressure measures blood pressure in different parts of the leg (calf, low thigh, high thigh) to detect a blockage that is causing decreased blood flow.
- [Computed tomography](#) (CT) and [magnetic resonance angiography](#) (MRA) are other noninvasive tests that can help a doctor map the blood flow in the affected areas. These tests may be considered if the patient's doctor thinks that a procedure (revascularization) to treat peripheral artery disease may be helpful.

What is the treatment for claudication?

There are two main ways to treat claudication: medication and a surgical treatment, called revascularization.

Medication therapies are often used initially as they are non-invasive. The two most commonly used medications include:

- [Cilostazol](#) (Pletal) reduces the pain of intermittent claudication by widening (dilating) the arteries, thereby improving the flow of blood and oxygen to the legs.
- [Pentoxifylline](#) (Trental) decreases the "stickiness" (viscosity) of blood and thereby improves its flow through arteries. This increases the flow of blood and oxygen to muscles.

A surgical procedure called a revascularization is used in patients who do not respond to medications. There are two types of revascularization procedures: endovascular (inside the blood vessel) and surgically grafting or bypassing the artery.

- **Endovascular procedures** include
 - **Angioplasty:** A balloon is placed in the blocked area and inflated to widen the diameter of the artery and increase blood flow
 - **Stenting:** Wire mesh used to hold a blood vessel open after angioplasty and prevents scar tissue from narrowing the blood vessel
- **Surgical grafting or bypassing an artery** involves an open surgery with an incision and sewing in a graft using either the patient's vein or a synthetic tube to increase blood flow around the blocked area.

Can claudication be prevented?

Some of the risk factors for claudication are behaviors that can be modified such as:

- quit smoking,
- managing diabetes and high blood pressure, and
- maintaining a healthy diet to keep cholesterol levels normal.

Medications that help thin the blood can be used to help prevent symptoms of claudication, but they do not treat the underlying cause. Medications include:

- [aspirin](#),
- [clopidogrel](#) (Plavix),
- [ticlopidine](#) (Ticlid), and
- dipyridamole (Permole, Persantine, Aggrenox).

[Exercise](#) is recommended for patients with claudication symptoms. Frequent exercise, especially walking, greatly reduces symptoms and increases symptom-free walking distance and is one of the most effective preventive measures.

What is the prognosis and treatment for patients with intermittent claudication?

The prognosis of claudication is generally favorable with treatment. Without treatment, 26% of patients worsen over time. Over 5 years, 4% to 8% will progress to require a revascularization procedure.

The underlying cause of claudication, peripheral vascular disease, does put patients at risk for other atherosclerotic diseases. A finding of claudication or peripheral artery disease should be considered a warning sign of other potential atherosclerotic blockages in the body.

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Intermittent claudication, or pain and cramping in the lower leg is caused by inadequate blood flow to the leg muscles. This lack of blood flow causes a decrease in oxygen delivered to the muscles of the legs. Claudication is generally felt when walking and decreases with rest. In severe cases, claudication may be felt at rest. Narrowing of arteries cause claudication. Treatment includes exercise, medication, and in some cases surgery.

What is a muscle spasm?

A muscle spasm, or muscle cramp, is an involuntary contraction of a muscle. Muscle spasms occur suddenly, usually resolve quickly, and are often painful.

A muscle spasm is different than a muscle twitch. A muscle twitch, or fasciculation, is an uncontrolled fine movement of a small segment of a larger muscle that can be seen under the skin.

Muscles are complex structures that cause movement in the body. There are three types of muscle in the body:

- Heart muscle pumps blood (cardiac muscle).
- Skeletal muscle moves the external body parts, like the arms and legs, and the neck, back and trunk.
- Smooth muscle moves portions of hollow structures inside the body. Examples include the muscles that line the esophagus, stomach and intestine, muscles that line large arteries and the muscles of the uterus.

Skeletal muscles are anchored to bone, either directly or by a tendon. When the muscle contracts, the associated structure moves. This allows arms to lift, legs to run, and the face to smile. Most of these muscles are under willful or conscious control of the brain. This type of muscle is striated or striped with dark-colored muscles fibers containing large amounts of myoglobin, the protein that helps carry oxygen and light-colored fibers that have lesser amounts of the protein. The contraction of a skeletal muscle requires numerous steps within cells and fibers that need oxygen, [electrolytes](#), and [glucose](#), which are supplied by the bloodstream.

Smooth muscle is located in the walls of hollow internal structures in the body, like the arteries, intestines, bladder, and iris of the eye. They tend to circle the structure and when they contract, the hollow structure is squeezed. These muscles are involuntary and are controlled by the unconscious part of our brain function using the autonomic nervous system. The autonomic nervous system can run in the background, regulating body processes automatically for us. There is a balance between the sympathetic system (adrenergic nerves) that speed things up and the parasympathetic system (cholinergic nerves) that slow things down. These names are based on the type of chemical that is used to transmit signals at the nerve endings. Adrenaline (epinephrine from the sympathetic nervous system) allows the body to respond to [stress](#). Imagine seeing a bear in the woods; your heart beats faster, your palms get sweaty, your eyes dilate, your hair stands on end, and your bowels move. Acetylcholine is the chemical that is the anti-adrenaline and is involved in the parasympathetic nervous system. Smooth muscle has the same basic contraction mechanism as skeletal muscle, though different proteins are involved.

What causes a muscle spasm?

There are a variety of causes of muscle spasms, and each depends upon predisposing factors, the part of the body involved, and the environment the body is working in.

Spasms may occur when a muscle is overused and tired, particularly if it is overstretched or if it has been held in the same position for a prolonged period of time. In effect, the muscle cell runs out of energy and fluid and becomes hyperexcitable and then develops a forceful contraction. This spasm may involve part of a muscle, the whole muscle, or even adjacent muscles.

Overuse as a cause of skeletal muscle spasm is often seen in athletes who are doing strenuous [exercise](#) in a [hot environment](#). This is also an occupational issue with construction workers or others working in a hot environment. Usually, the [spasms](#) will occur in the large muscles that are being asked to do the work.

Overuse can also occur with routine daily activities like shoveling snow, or mowing or raking grass causing muscle spasms of the neck, shoulder, and back.

Unfamiliar exercise activities can also cause muscle spasms to occur. Abdominal spasms can occur when a person decides to begin working their abdominal muscles by doing situps and does too many too quickly.

Writer's cramps are similarly caused by prolonged use of the small muscles in the hand.

It is commonly thought that [dehydration](#) and depletion of [electrolytes](#) will lead to muscle spasm and cramping. Muscle cells require enough water, [glucose](#), sodium, potassium, calcium, and magnesium to allow the proteins within them to interact and develop an organized contraction. Abnormal supply of these elements can cause the muscle to become irritable and go into spasm.

Atherosclerosis or narrowing of the arteries (peripheral artery disease) may also lead to muscle spasm and [cramps](#), again because adequate blood supply and nutrients are not able to be delivered to the appropriate muscle. Peripheral artery disease can decrease the flow of blood to the legs causing pain with activity. There may also be associated [muscle cramps](#).

Leg spasms are often seen related to exercise, but cramps may also be seen at night involving calf and toe muscles. Nocturnal leg cramps and restless legs syndrome are considered a type of [sleep](#) disturbance.

Systemic illnesses like [diabetes](#), [anemia](#) (low red blood cell count), kidney disease and thyroid and other hormone issues are also potential causes of muscle spasms.

Diseases of the nervous system, such as [multiple sclerosis](#) or spinal cord injury, can be associated with muscle spasm.

Smooth muscle can also develop spasm. When a hollow structure filled with air or fluid is squeezed by the muscle spasm, significant pain can occur since the fluid or air cannot be compressed. For example, smooth muscle in the intestinal wall can go into spasm, causing waves of pain called colic. Colicky pain which tends to be rhythmic (coming and going) may also occur within the bile duct that empties the gallbladder and may develop after eating.

- When [kidney stones](#) try to pass, the smooth muscles that are in the walls of the ureter that connect the kidney to the bladder, may spasm and cause significant pain. Often this type of pain is associated with [nausea and vomiting](#).
- Muscles that surround the esophagus can go into spasm when irritation occurs with reflux [esophagitis](#) or [GERD](#).
- [Diarrhea](#) can be associated with colicky pain, whereby the muscles within the colon wall spasm just before a watery bowel movement.

Dystonias are movement disorders where groups of muscles forcefully contract causing twisting and repetitive movements or the inability to have a normal posture as a result of muscle spasm and cramping. The symptoms may be very mild initially but gradually progress to become more frequent and aggressive. Occasionally, there is no progression. Examples of this type of muscle spasm include [torticollis](#) (where the neck muscles spasm and cause the head to turn to one side), [blepharospasm](#) (where there is uncontrolled blinking of the eyes), and laryngeal [dystonia](#) that affects the muscles that control speech. Dystonias may be caused by abnormally functioning neurotransmitter chemicals in the part of the brain called the basal ganglia. These chemicals (serotonin, dopamine, acetylcholine, and GABA) are required to properly send messages that begin muscle contraction. Dystonia symptoms may occur as a complication of [stroke](#).

What are the symptoms and signs of muscle spasms?

The symptoms of muscle spasm depend upon the muscle involved and the circumstances leading up to the spasm.

Skeletal muscle spasm usually involves muscles that are being asked to do excessive work. There is acute onset of pain as the muscle contracts. A bulging muscle may be seen or felt underneath the skin where the muscle is located. Most often, the spasm resolves spontaneously after a few seconds though it may last many minutes or longer. Usually, the patient will feel the need to stretch the muscle involved, thus relieving the spasm and resolving the episode. With [heat cramps](#), the muscle spasm may occur after the activity is completed.

A muscle fasciculation or twitch may last just a few seconds or may be a recurrent event. Usually, it's just a momentary repetitive contraction of just a few muscle fibers of a larger muscle in a localized area served by one nerve [fiber](#). This often involves the eyelid, calf, thigh, or thumb. The fasciculations often come and go and may be related to [stress](#) or [anxiety](#). Ingestion of stimulants like [caffeine](#) and pseudoephedrine found in [over-the-counter](#) cold medications may also cause the twitch. Medications such as [albuterol](#) (Ventolin, Proventil, AccuNeb, VoSpire, ProAir) used for the treatment of [asthma](#) and medications used to treat [attention deficit disorder](#) may be associated with twitching. These twitches are considered benign fasciculation.

However, muscle twitching may also be associated with neurologic disorders such as [muscular dystrophy](#), [amyotrophic lateral sclerosis](#), and [myopathy](#) (a primary muscle illness). With these diagnoses, associated symptoms include [weakness](#), muscle wasting with loss of muscle size, and change in sensation.

Smooth muscle spasm will cause colicky pain that comes and goes. The symptoms will depend upon the organ involved.

How are muscle spasms diagnosed?

Most people have experienced a skeletal muscle spasm due to overexertion, especially in a warm environment and are able to self-diagnose. However, if the spasms are severe, last a long time, and keep recurring, the patient may present to a health-care professional for evaluation.

The diagnosis usually begins with a history and physical examination. It is helpful to know the circumstances surrounding the muscle spasms.

- When did they begin? How long do they last? How frequently do they come? Is it always the same muscle group of the body involved?
- Other information that is helpful includes whether there have been any recent illnesses or whether any medications have been taken, including prescription, over-the-counter, and food supplements.
- Past medical history may give a clue as to the reason for the muscle cramps. These may include a history of diabetes, [hypothyroidism](#), kidney disease, and spinal cord injury.
- Work or exercise history may be of importance.

Sometimes the physical examination may be normal since the muscle spasms may not occur during the visit. However, the physical examination may be useful in detecting underlying medical issues that may be helpful in making the diagnosis. For example, if the patient is complaining of leg muscle spasm, the examination may include palpating or feeling for pulses in the feet. [Atherosclerosis](#), or hardening of the arteries, may be associated with the loss of arterial pulse in the involved extremity.

For those having pain from smooth muscle spasm, the pain may be severe enough to present to an emergency department. The history and physical examination will be directed to finding the source of the pain, while at the same time trying to control the symptoms. Kidney stone pain (renal colic) and gallbladder pain sometimes require anti-inflammatory narcotic pain medication and anti-nausea medication for relief. Some patients with irritable bowel condition may also present with significant intestinal spasm.

For patients with recurrent muscle spasm where the cause is not easily diagnosed by history and physical examination, testing may be needed to give direction as to potential causes.

Blood tests may or may not be indicated depending upon the situation and whether or not the diagnosis can be made by history and physical examination. Tests may include a [complete blood count](#) (CBC) looking for anemia, electrolytes (especially sodium, potassium, calcium and magnesium), glucose, and creatinine (to check for kidney function). Thyroid function tests may also be considered.

If there is concern that the spasms are due to a nerve or muscle disorder, [electromyography](#) (EMG) may be done to determine whether there may be an abnormality of the muscle, of the nerves, or both.

If there is concern about the potential for peripheral artery disease, tests of blood flow to the legs may be considered, including an ankle-brachial index (ABI) which compares blood pressures in the arms and legs and [ultrasound](#) and angiography (often using [CT](#) or [MRI](#)) to directly assess the blood vessels.

How are muscle spasms treated?

[Prevention](#) is the key to most skeletal muscle spasm episodes. Since they are often associated with dehydration and electrolyte disturbances, it is important to keep the body well hydrated. If the fluid loss is due to an illness with [fever](#) or [vomiting](#) and diarrhea, controlling the symptoms will help limit fluid loss and prevent spasms. Similarly, for those who work or exercise in a hot environment, drinking enough fluids to keep hydrated is very important.

Muscles should also be prepared for the activity that they are expected to do. Just as athletes stretch and warm up before the game, nonathletes should warm up before heavy labor, including jobs like raking, mowing, and shoveling snow.

Should a skeletal muscle go into spasm, the initial treatment is to gently stretch the muscle back to length to break the spasm cycle and resolve the acute situation.

Further treatment will depend upon the underlying cause of the muscle spasms. For muscles that have been damaged or strained, medications may be required for short-term pain relief, including anti-inflammatories ([ibuprofen](#) [Advil]), narcotics, and muscle relaxants.

The treatment of smooth muscle spasm also depends upon the underlying cause. Often, pain control will occur simultaneously with the care provider's efforts to make the diagnosis.

There is no one effective treatment for the dystonias. Medication may be used to try to restore balance to the brain's neurotransmitters. The decision as to which medication to use depends upon the patient's presentation. It may take trial and error to find the right medication in the right dose to control symptoms.

- Anti-Parkinsonism drugs, like trihexyphenidyl HCl (Artane) and [benztropine mesylate](#) (Cogentin), decrease acetylcholine levels.
- Muscle relaxants like [diazepam](#) (Valium) and [baclofen](#) (Lioresal) affect GABA receptors.
- [Levodopa](#) (Sinemet) and [reserpine](#) (Harmony) affect dopamine levels.
- [Carbamazepine](#) (Tegretol), a [seizure](#)-control drug, may be useful in some patients.
- [Botulinum toxin type A](#) ([Botox](#)) may be injected into a specific muscle to paralyze it and relieve the muscle spasm. This was initially used for blepharospasms but is now able to be used where other muscles are involved.

Muscle Spasms At A Glance

- Spasms may affect many different types of muscles in the body, leading to many different symptoms and presentations.
- Spasms of skeletal muscles are most common and are often due to dehydration and electrolyte abnormalities. The spasm occurs abruptly, is painful, and usually short lived. It may be relieved by gently stretching the muscle.
- If muscle spasms are especially painful, if they do not resolve or if they recur, medical care should be accessed to look for potential underlying causes.
- Smooth muscles that are within the walls of hollow organs in the body can go into spasm, causing significant pain. Often this pain is colicky, meaning that it comes and goes. Examples include the pain associated with diarrhea, gallbladder pain, and passing a kidney stone.
- A special form of muscle spasms are the dystonias whereby an abnormality perhaps exists with the chemicals that help transmit signals within the brain. Examples include torticollis and blepharospasm. Treatment may include medications to help restore the neurotransmitter levels to normal and Botox injections to paralyze the affected muscle and relieve the spasm.