

## Diabetic (Charcot) Foot

*This article is also available in Spanish: [Pie diabético \(Charcot\) \(topic.cfm?topic=A00683\)](#).*

Diabetes is a condition of elevated blood sugar that affects about 6 percent of the population in the United States, or about 16 million people. Diabetic foot problems are a major health concern and are a common cause of hospitalization.

Most foot problems that people with diabetes face arise from two serious complications of the disease: nerve damage and poor circulation. One of the more critical foot problems these complications can cause is Charcot arthropathy, which can deform the shape of the foot and lead to disability.

There are treatment options for the wide range of diabetic foot problems. The most effective treatment, however, is prevention. For people with diabetes, careful, daily inspection of the feet is essential to overall health and the prevention of damaging foot problems.

### Description

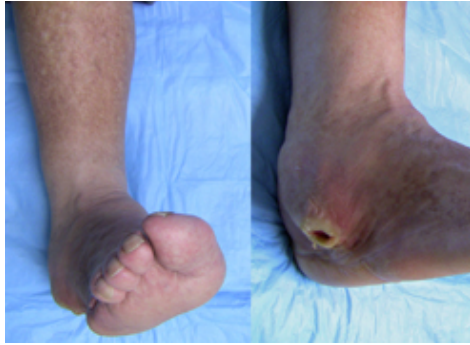
Nerve damage (neuropathy) is a complication of diabetes that leads to a loss of sensation in the feet. Some people with diabetes can no longer feel when something has irritated or even punctured the skin. A wound as small as a blister can progress to a serious infection in a matter of days.

Diabetes also damages blood vessels, decreasing the blood flow to the feet. Poor circulation weakens bone, and can cause disintegration of the bones and joints in the foot and ankle. As a result, people with diabetes are at a high risk for breaking bones in the feet.

When a diabetic fractures a bone in the foot, he or she may not realize it because of nerve damage. Continuing to walk on the injured foot results in more severe fractures and joint dislocations. Sharp edges of broken bone within the foot can point downward toward the ground, increasing the risk of chronic foot sores from the abnormal pressure.



A severely infected big toe. This infection began two days previously as a small blister at the tip of the toe.



**(Left)** This patient with Charcot of the ankle has developed a deformity that places abnormal pressure on the outside of the ankle. **(Right)** This pressure has led to the development of a chronic sore (ulcer) that can be extremely difficult to treat.

The combination of bone disintegration and trauma can warp and deform the shape of the foot. This condition is called Charcot arthropathy, and is one of the most serious foot problems that diabetics face.



This patient with Charcot arthropathy has a severe deformity caused by the breakdown of the ankle joint.

*Reproduced from Harrelson JM: The diabetic foot: Charcot arthropathy. Instr Course Lect 1993; 42:141-146.*

## Symptoms

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Although a patient with Charcot arthropathy typically will not have much pain, they may have other symptoms.

- The most sensitive sign of early Charcot foot is swelling of the foot. This can occur without an obvious injury.
- Redness of the foot can also occur in the early stages.
- The swelling, redness, and changes to the bone that are seen on x-ray may be confused for a bone infection. A bone infection is very unlikely if the skin is intact and there is no ulcer present.

## Doctor Examination

### Medical History and Physical Examination

Your doctor will talk with you about your general health as well as any symptoms you may have. If you know how you may have injured your foot, your doctor will also want to discuss that.

After discussing your symptoms and medical history, your doctor will carefully examine your foot.

### Imaging Tests

**X-rays.** These imaging tests provide detailed pictures of dense structures, like bone. In the very early setting of Charcot, the x-rays may be normal. If the condition has progressed to the intermediate stages, multiple fractures and dislocations of the joints can be seen in an x-ray.

**Magnetic resonance imaging (MRI) and ultrasound.** These studies can create better images of soft tissues of the foot and ankle. These may be ordered if your doctor suspects a bone infection. If there is not a break in the skin, infection of the bone is extremely rare.

**Bone scan/indium scan.** A bone scan is a nuclear medicine test that is very effective in determining whether there is a bone infection. There are different types of bone scans, and the doctor must determine which type(s) are best to use for a particular problem. An indium scan is a specialized test that involves placing a marker on white blood cells. These cells are traced to learn whether they are going to the bone to fight an infection.

Both Charcot foot and bone infection will cause a positive bone scan (increased activity). However, only an infection will show significantly increased activity on the indium scan.



These x-rays show Charcot changes to the ankle after the patient fell 4 weeks earlier. This resulted in several bones shifting position. **(Right)** The talus (red arrowhead) is normally located below the tibia. As a result of Charcot, the talus has shifted forward and the tibia has dropped down. The curved line indicates the abnormal position of the lower end of the tibia.



The patient shown in the x-ray had noticed swelling of the foot for approximately 3 weeks without any known injury. The x-ray shows several fractures (arrowheads) and a dislocation of the first metatarsal (arrow). This severe injury is typically seen only after a high-energy trauma in patients without diabetes.

## Treatment

The goal of treatment for Charcot arthropathy is to heal the broken bones, as well as prevent further deformity and joint destruction.

### Nonsurgical Treatment

**Casting.** The early stages of Charcot are usually treated with a cast or cast boot to protect the foot and ankle. The use of a cast is very effective in reducing the swelling and protecting the bones.

Casting requires that the patient not put weight on the foot until the bones begin to heal. Crutches, a knee-walker device, or a wheelchair are usually necessary. Healing can sometimes take 3 months or more. The cast will usually be changed every week or two to make sure that it continues to "fit" the leg as the swelling goes down.

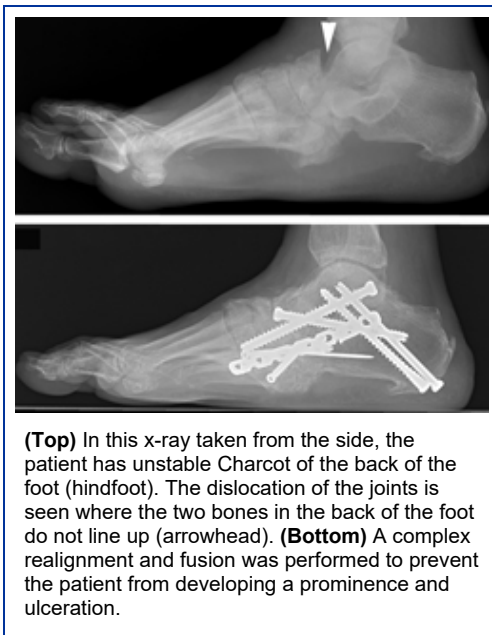
**Custom shoes.** After the initial swelling has decreased and the bones begin to fuse back together, a specialized custom walking boot or diabetic shoe may be recommended. The specialized shoe is designed to decrease the risk of ulcers (sores that do not heal). Some diabetics may not be able to wear regular, over-the-counter shoes because they do not fit the deformed foot correctly.

### ***Surgical Treatment***

Surgery may be recommended if the foot deformity puts the patient at a high risk for ulcers, or if protective footwear is not effective. Unstable fractures and dislocations also require surgery to heal.

- **Mild deformity with tightness at the heel.** In some cases, the deformity is mild and associated with tightness at the back of the heel. Ulcers in the front of the foot that do not respond to a period of casting and protective footwear, may be treated through Achilles tendon lengthening. Surgically lengthening the tendon that runs down the back of the leg and attaches to the back of the heel decreases the pressure on the midfoot and front of the foot. This allows the ulcer to heal and reduces the chance that it will return.
- **Bony prominence on the bottom of the foot.** A more severe deformity is the appearance of a very large bony bump on the bottom of the foot. If this cannot be addressed with shoe modification, it requires surgery. The type of surgery depends on the stability of the bones and joints in the foot.
- **Stable deformity.** Surgery involves a simple removal of the prominent bone by shaving it off.
- **Unstable deformity.** When the bones are too loose at the sight of the prominence, a simple removal of the bump will not be effective. The loose bones will simply move and a new prominence will develop. In this situation, fusion and repositioning of the bones is needed.

Fractures that occur in the softer bone of diabetics are typically more complex. Operations to fix them generally involve more hardware (plates and screws) than would normally be required in people without diabetes. The screws and plates may even be placed across normal joints to provide added stability.



This operation is extremely difficult to perform and carries a higher risk of wound complications, infections, and amputation, compared to routine foot and ankle fracture surgery.

After this type of operation, there is typically a period of no weight on the foot for at least 3 months. Placing weight on the foot early and failing to follow the doctor's instructions will likely lead to complications, such as the return of the deformity or even worsening of the deformity.

- **Ankle deformity.** Charcot of the ankle is difficult to treat simply with a brace or shoe and commonly requires surgical fusion of both the ankle and the joint below the ankle (subtalar) to hold the foot straight. Given the amount of destruction of the bone and the poor quality of the soft tissue, the risk that the bone will not heal and the risk of infection are very high. Amputation may be required, either as the first operation or to salvage a fusion that has not healed or has become infected.



This patient developed an infection of the bone nine months after an ankle joint fusion to reconstruct a Charcot deformity. After attempts to cure the infection were unsuccessful, it was necessary to amputate his foot and ankle. He returned to walking pain-free with a prosthesis.

## Conclusion

To ensure the best outcome from treatment, it is essential that the patient follows doctor's instructions regarding when it is safe to put weight on the injured foot. In addition, the sooner Charcot arthropathy is diagnosed and treated, the better the final outcome. Patients must carefully inspect both feet everyday and control their blood sugar levels. Both responsibilities are important in recognizing Charcot foot early, and in avoiding future complications.

For more information about daily foot inspection: [Care of the Diabetic Foot \(topic.cfm?topic=A00148\)](http://orthoinfo.aaos.org/topic.cfm?topic=A00148)

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