

Diabetic Charcot Arthropathy

Summary

Charcot Arthropathy is a destructive breakdown of the joints within the foot in patients with neuropathy (abnormal sensation). The most common cause of Charcot Arthropathy is diabetes. The condition is named after Jean Marie Charcot (1825-1893), who described the collapse of the bones of the foot in patients who had lost feeling in the feet due to advanced syphilis. With neuropathy, pain usually is not an early symptom, instead swelling and redness are the main reasons patients seek medical attention. Treatment is initially non-surgical and involves minimizing weight-bearing through the foot, by using a total contact cast or walker boot until the bones in the foot become more stable. This often takes 6-12 months or more. The goal of treatment is to create a stable foot, without deformity to avoid an abnormal pressure point which may result to diabetic ulcer. Surgery is essentially reserved for unstable and deformed feet that cannot resume function. Surgery on patients with Charcot foot deformities is often associated with a high complication rate.

Clinical Presentation

The involved foot is usually swollen, red, and warm and can easily be confused with infection. Since patients with neuropathy don't feel their feet very well, pain normally is not an early sign, usually swelling and redness are the patient's main concern. This condition can be painful, but is commonly not as painful as it would be in someone with normal feeling. Some patients may have had a period of increased activity, leading to repetitive loading stress through their foot or ankle, or they may have had a mild injury. It is important to know that Charcot arthropathy can look similar to an infection and is commonly mistaken for this. Charcot arthropathy has three stages;

1. Fragmentation; when the foot is swollen, red, and warm, this may last several weeks. In this stage, the bones in the foot weaken and become soft, allowing for collapse and destruction of the bones and joints.
2. Coalescence; when redness disappears and swelling decreases. In this stage, destruction slows down and the body is trying to mend itself.
3. Resolution; when redness and swelling are resolved. In this stage, foot bone architecture is recovering and restoring itself to become stronger.

The three commonly involved locations in human foot include the tarso-metatarsal (middle of the foot) joints, the transverse tarsal joint (hindpart of the foot just in front of the ankle), and the ankle joint.

Charcot arthropathy is a particularly frustrating and debilitating condition because it can take 6-12 months or more to resolve. Furthermore, when it does get better, the foot may have collapsed and changed shape. The resulting deformity can put the patient at risk to develop an ulcer over new prominent bony areas.

Physical Examination

Observation of the foot usually shows swelling and redness. This redness will usually resolve or improve with elevation of the foot above the heart. This makes it different to infection, which will often remain red when elevated. It is important to look for breaks in the skin, as this may suggest infection instead of Charcot arthropathy. Although the two can be present at the same time, it is usually one or the other.

It is important to look for deformity. The goal of treatment is to prevent deformity, so noticing early deformity is crucial to keep it from getting worse. As this process usually happens in people with loss of feeling in the foot, examination will often demonstrate abnormal (but not completely absent) sensation. However, Charcot arthropathy often happens before the patient has noticed any changes in the sensation of the feet. Blood supply to the foot should also be assessed (as with any patient).

It is also important to look at the other foot. Charcot arthropathy on one foot greatly increases that chance that the patient will develop a similar situation on the other foot. This can happen at the same time, but more commonly happens sometime after the other foot gets better. Diabetic patients should always be checking their feet regularly for problems.

Imaging Studies

Regular x-rays are important. In early disease, x-rays may not show any abnormality. Sometimes they will show a decrease in bone density (osteopenia) or a break in the bones involved. If the process has progressed, the x-ray will show deformity of the foot or ankle.

CT scans can be helpful to look at a more detailed picture of the collapse, but this is often unnecessary unless surgery is planned or there is such distortion of the anatomy that plain x-rays are not helpful.

Bone Scans can sometimes be helpful to sort out whether the problem is an infection or Charcot arthropathy.

MRI scans are very sensitive for diagnosis of bone infection (which can still be confused for Charcot arthropathy) and soft tissue infection (not seen on bone scan).

Treatment

Before attention is directed toward the treatment of Charcot foot, patients need to be reminded about the treatment of the underlying cause. Diabetes is the most common cause and treatment goal should be directed toward tight sugar control and aim for HbA1C between 6 and 8.

Non-Operative Treatment

When detected early, treatment involves a period of non-weight bearing or limited weight-bearing in either a special cast, often called a total contact cast, or in a diabetic removable boot, such as a CROW (Charcot Restraint Orthotic Walker). This is a removable boot with a custom made lining made from a mould of the patient's foot. Later in the process, when the bones have started to stabilize, the patient can walk more and put increasingly more weight on the leg.

There are devices that are available, such as rolling knee walkers and scooter or roll about, which can help keep the weight off the bad foot while allowing patients to be mobile and not over-loading the better foot.

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There are some studies that suggest that the use of bisphosphonates (anti-osteoporosis medications) may be helpful in treating Charcot arthropathy by trying to limit the activity of the cells that eat away bone.

Operative Treatment

If a severe deformity has occurred, or if the foot or ankle has become unstable, then surgery may be recommended. Surgery ranges from simple removal of prominent bone [exostectomy], to reconstruction of the foot with fusion of the bones after the deformity is corrected. This can involve the use of screws and plates, or rods that go inside the bone, or pins that come out of the bone and skin and attach to a frame on the outside of the foot and ankle. Lengthening of the Achilles tendon can also be a benefit, either alone or combined with other procedures. In rare cases of unmanageable or grossly infected feet, amputation may be the end outcome.

The goal of surgery is to create a stable foot which can bear weight, and can fit in a shoe or brace and prevent ulcers developing over prominent areas of bone. Most surgical procedures that involve fusion will typically require a long period of not putting any weight on the foot or leg for 3 months or more.

Potential Complications

Surgery for Charcot arthropathy is associated with significant risks. These include increased risks of:

- Infection: Due to lack of blood circulation to the foot
- Wound healing problems (which is commonly a problem with diabetic patients).
- Non-union: There is an increased risk of bones not healing together because patients often don't realize how much pressure they are putting on the foot during the healing process. However, a failure of the bone to heal is not necessarily a failure of treatment. If the goals listed above are met, then the surgery was a success.

Desired Outcomes

The aim of non-operative treatment after diagnosis of Charcot arthropathy is to maintain foot position and shape found at the time of diagnosis. Foot position and shape can only be improved by surgery.

The end result of Charcot arthropathy will either be a foot that looks like a normal foot or has minimal deformity; this can be managed with a regular shoe +/- an orthotic (insert) OR an abnormally shaped foot which will require a custom made shoe.