Diabetic Charcot neuroarthropathy: The diagnosis must be considered in all diabetic neuropathic patients presenting with a hot, swollen foot

Ibrahim S Al-Busaidi, Rhett Mason, Helen Lunt

ABSTRACT
The diagnosis of diabetic Charcot neuroarthropathy (CN) is challenging. This is especially true early in the disease process, when its classical presentation of an acutely inflamed foot may masquerade as other more common lower limb conditions. Prompt diagnosis and appropriate treatment reduces the risk of CN causing permanent incapacitating foot deformity or amputation. We report two cases in which the diagnosis was delayed, resulting in long-term sequelae. These cases highlight the importance of considering CN in patients with diabetic peripheral neuropathy, who present with a red, hot, and swollen foot.

Charcot neuroarthropathy (CN) is an uncommon, but debilitating and costly complication of diabetes. Typically, it presents in patients with established diabetic peripheral neuropathy as a hot, swollen foot, either with or without pain. The diagnosis is based primarily on history and clinical examination, with no single test able to confirm or refute the diagnosis. Plain weight-bearing X-rays are used to confirm the diagnosis, but may be normal or show subtle changes in early CN. If a concomitant wound is present, advanced imaging techniques, including magnetic resonance imaging and bone scans, should be considered to differentiate between acute CN and other diagnoses, such as osteomyelitis.

It is frequently necessary to treat a foot with suspected but not confirmed acute CN by early offloading using total contact casting (a specialised casting technique) to prevent the development of irreversible complications, including ulceration, deformity, infection, and amputation.

We report two patients who were treated initially for alternate diagnoses, before a late diagnosis of CN was made.

Case reports
Case 1: A 61-year-old woman fell downstairs, injuring her left foot. Initial X-rays were unremarkable (Figure 1a); a foot sprain was diagnosed. Two months later, swelling and pain persisted. Another plain X-ray showed minor osteoarthritic changes at the first metatarsophalangeal joint. Ten months after the initial presentation, there was persistent pain and swelling. Plain X-rays now showed extensive abnormalities through the tarsometatarsal (TMT) joints. A Charcot's foot was suspected. One year after the initial fall, X-rays showed progression of the midfoot changes (Figure 1b). The patient was treated with immobilisation by total contact casting,
**Figure 1a–c:** Plain X-rays of the left foot

Panel a displays unremarkable X-ray at first presentation. Panel b was obtained at the time of Charcot left midfoot arthropathy diagnosis. Panel c demonstrates shortening of the medial column and lateral subluxation of the lesser metatarsals 6 months after initiating treatment for Charcot arthropathy.

**Figure 2a–d:** Plain X-rays of the right ankle

Panels a & b display X-rays of the ankle after an open reduction and internal fixation with tension band construct for a displaced Weber B fracture. Panels c & d show collapse of the talar dome 11 months post CN diagnosis.
then used a prefabricated walker (Moon Boot), followed by customised shoes with orthotics. Eighteen months from initial presentation, residual midfoot deformity was present on X-ray (Figure 1c). Clinical characteristics are detailed in Table 1.

**Case 2:** A 75-year-old woman sustained a displaced Weber B right ankle fracture, following a fall. Surgery was complicated by a wound infection (Figures 2a & b). A few months later, she presented with a suspected DVT. A lower leg venous Doppler ultrasound scan was normal and no specific treatment was therefore given. Signs and symptoms persisted and she was admitted to hospital for treatment of suspected cellulitis. Despite a course of oral antibiotics, signs and symptoms did not settle and she was re-admitted two weeks later with suspected osteomyelitis/septic arthritis. Investigations included a normal neutrophil count, an elevated erythrocyte sedimentation rate of 87 mm/h (N 1–30) and a modestly elevated C-reactive protein (59 mg/L). Plain X-rays were consistent with osteomyelitis of the right distal tibia and fibula and she was commenced on IV flucloxacillin. A joint aspirate grew no organisms and the clinical picture was then considered compatible with a right ankle CN. A course of offloading therapy was prescribed. There was, however, complete collapse of the talar dome 11 months post CN diagnosis (Figures 2c & d). Clinical characteristics are detailed in Table 1.

**Discussion**

The presentation of both cases, of an acutely inflamed foot or ankle in a patient with established diabetic peripheral neuropathy, is consistent with diabetic CN. Preceding foot trauma or surgery are common, but not universal, precipitants. Before reaching the diagnosis of CN, other diagnoses were considered, including foot sprain, osteoarthritis, DVT, cellulitis, septic arthritis, and osteomyelitis (see Table 1). Unfortunately, even after receiving appropriate treatment for their CN, both patients experienced residual bony deformities.

Diagnostic delays in diabetic CN are common. CN may masquerade as gout, DVT, erysipelas/cellulitis, ankle sprain, rheumatoid arthritis, osteomyelitis, and fractures. Such misdiagnoses may be partially attributed to a lack of awareness of this condition by treating professionals, and also to the lack of specific diagnostic tests, which makes a firm early diagnosis especially challenging.

In conclusion, a Charcot process should be considered in any patient with diabetes and peripheral neuropathy, who presents with an acutely inflamed foot with intact skin. Offloading of a foot with suspected CN often needs to be commenced before the diagnosis is confirmed. Locally, we are trying to increase awareness of this condition amongst at-risk patients and healthcare professionals, and would recommend other diabetes services do the same.

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<tr>
<th>Table 1: Summary of demographic and clinical characteristics of two cases with delayed diabetic CN diagnosis</th>
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<td><strong>Case No (gender;age)</strong></td>
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<td>Smoking status</td>
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<td>Diabetes Characteristics</td>
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CLINICAL CORRESPONDENCE

Competing interests: Nil
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