Lower limb complications

If every Charcot looked the same

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Groove Armada's celebration of individuality highlights the very opposite of what we are asked to achieve in the modern NHS, with protocols and guidelines threatening to do away with clinical freedom. Whilst maverick and non-evidenced practice has to be prevented, there are some situations in which there is such a lack of evidence that care has to adapt to a rapidly changing situation based on first principles. Charcot foot is one of them.

The foot has 33 joints and any of these can develop Charcot change, so the patterns of disease are widely variable and the deformities that result create an almost infinite set of challenges. The Holy Grail for foot clinics is to diagnose Charcot feet early, immobilise them and minimise these deformities. Chantelau and Richter in Germany (summarised alongside) and Ruotolo et al in Italy (summarised below) attempted to minimise the deformity by diagnosing Charcot change at the "very early stage 0" point where visible X-ray changes have not occurred. Ruotolo et al used a novel PET/CT imaging approach and Chantelau and Richter used a more conventional magnetic resonance imaging (MRI) approach in hot swollen neuropathic feet. Both had a dramatic effect on preventing deformity, leaving the midfoot looking the same as it was before the process began in all of the Italian cases and 70% of the German ones. I would need to see the results of the Ruotolo et al study replicated before I could be certain that they had the same population as the other studies. No fractures at all would be different from the Charcot patients I see, but then maybe I get them too late!

Aragón-Sánchez et al (summarised on the next page) describe two cases of an increasingly recognised situation, in which osteomyelitis triggers the Charcot process. The complex needs of ulcer care, infection control and stabilisation of the Charcot joint are often conflicting and outcomes are, in many clinics' experiences, generally poor. The pre-referral care of the patients looks to have been sub-optimal and the management approach was certainly radical, but the outcomes were good, which provides some hope for these difficult feet.

CLINICAL NUCLEAR MEDICINE

Charcot foot: PET/CT scan diagnosis

Readability	✓✓✓✓
Applicability to practice	✓✓✓
WOW! factor	✓✓✓

1 The aim of this study was to examine the effectiveness of ^{18}F-FDG PET/CT scanning in the diagnosis and clinical outcomes of stage 0 Charcot foot (CNO) in 25 adults.

2 Magnetic resonance imaging (MRI) was used to confirm CNO diagnosis and recovery. All patients underwent PET/CT scans within 1 month after the temperature difference between affected and unaffected skin went below 2ºC, and every 3 months onwards until the standardised uptake value was lower than 2.

3 The treatment was the application of a total cast contact (TCC), and then a removable cast walker until their PET/CT scans no longer detected inflammation.

4 MRI showed the highest diagnostic accuracy for CNO diagnosis. The authors report that PET/CT scanning would not replace MRI but would add extra clinical information on, for example, the level of inflammation.

5 In the follow-ups up to 21.75 ± 16.7 months using PET/CT scans, none of the participants developed bone fractures or experienced relapses.

Ruotolo V, Di Pietro B, Giurato L et al (2013) A new natural history of Charcot foot. *Clin Nucl Med* **38**: 506–9

SWISS MEDICAL WEEKLY

Analysis of MRI for acute Charcot foot diagnosis

Readability	✓✓✓✓
Applicability to practice	✓✓✓✓
WOW! factor	✓✓✓✓

1 This retrospective, observational, cohort study over a 12-year period, reviewed the management of all acute Charcot foot (ACF) cases, in one outpatient clinic, diagnosed by magnetic resonance imaging (MRI).

2 Treatment included complete offloading and immobilisation of the affected foot, and, within 3 days, a removable total contact cast (TCC) and crutches were provided.

3 From the medical charts of 59 patients with a total of 71 ACF cases, it was deduced that ACF healing is more efficient when it is diagnosed at stage 0 rather than stage 1 (P=0.0012).

4 Patients that reported foot pain were significantly more able to recall when a trauma had occurred than those that did not have foot pain. However, those with foot pain did not attend the clinic any earlier.

5 In total, 70% of those diagnosed at ACF stage 0, and 32% of those diagnosed at ACF stage 1 healed without deformity (P=0.002).

6 The authors noted that MRI was essential for ACF diagnosis at stage 0 as unremarkable X-ray results often led to misdiagnosis.

7 No amputations or further surgery had occurred 4 years after healing.

8 The authors note one limitation of the study as the fact there was no control cohort where ACF was managed on the basis of X-ray.

Chantelau EA and Richter A (2013) The acute diabetic Charcot foot managed on the basis of magnetic resonance imaging – a review of 71 cases. *Swiss Med Wkly* **143**: w13831

CLINICAL BIOMECHANICS

Optimal rocker shoe design for individuals with no diabetic foot

Readability	✓✓✓
Applicability to practice	✓✓✓
WOW! factor	✓✓✓

1 This is the first study to attempt to find the optimum rocker shoe design for individuals with low-risk diabetes. Twelve shoe designs in a variety of values for the apex angle, apex position and rocker angle (plus a flexible control) were tested.

2 In total, 24 people with low-risk diabetes with no previous foot complications, and 24 healthy participants walked a 20 m walkway at 1 m/s ± 10% distance in each shoe design (25–35 continuous steps per shoe).

3 Peak plantar pressure was measured for the (1) 1st metatarsophalangael (MTP) joint, (2) 2nd–4th metarsal head (MTH), (3) hallux, (4) 5th MTH and (5) heel.

4 When the apex angle was incrementally increased from 70º to 100º, the biggest reduction in pressure relative to the control shoe was observed in the 2nd–4th MTH regions (39%).

5 There was no clear trend in foot pressures across the foot when varying the apex position from 50% to 70%.

6 When the rocker angle was increased from 10º to 30º, there was a decrease in peak pressure under the 5th MTH.

7 The results suggest that for the optimum shoe design a 95º apex angle, an apex position of 60% of shoe length and a 20º rocker angle should be considered.

Chapman JD, Preece S, Braunstein B et al (2013) Effect of rocker shoe design features on forefoot plantar pressures in people with and without diabetes. *Clin Biomech* **28**: 679–85

DIABETIC MEDICINE

Limb salvage case reports

Readability	✓✓✓✓
Applicability to practice	✓✓✓✓
WOW! factor	✓✓✓✓

1 The authors presented the case reports of two people with osteomyelitis and Charcot neuroarthropathy: one where the tarsometatarsal joints were affected, and the other, the transverse tarsal joint. Amputation of the limb was suggested, but both individuals sought a second opinion.

2 Limbs were salvaged with surgery to partially remove the infected bone, followed by culture-guided post-operative antibiotics and bed rest before the addition of a total contact cast (TCC), which was changed weekly to check the healing process.

3 Patients had their separate TCCs removed at 5.7 and 9.2 weeks, and there was no recurrence of symptoms at 3 and 8 months follow-up, respectively.

Aragón-Sánchez J, Lázaro-Martínez JL, Quintana-Marrero Y et al (2013) Charcot neuroarthropathy triggered and complicated by osteomyelitis. *Diabet Med* **30**: e229–32

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Skin graft healing

Readability	✓✓✓
Applicability to practice	✓✓✓
WOW! factor	✓✓✓

1 The authors of this retrospective study compared the healing time, post-operative infection rate and need for revisional surgery after split-thickness skin grafts (STSG) in patients with diabetes (further split into those with or without comorbidities) and those without to identify the characteristics for a successful outcome.

2 Records of 203 individuals (mainly male, hispanic, and more than half with diabetes) were analysed.

3 Overall, the healing time was 1.99 weeks longer for those with diabetes than those without ($P<0.0001$), and there was a 5.15 times higher risk of post-operative complications after STSG for those with diabetes ($P=0.009$). These risks were higher still for those with a comorbidity.

4 There was no specific comorbidity found that was a predictor of post-operative complications, and there was no statistically significant difference for the infection risk between patients without diabetes, and patients with diabetes without comorbidities.

Ramanujam CL, Han D, Fowler S et al (2013) Impact of diabetes and comorbidities on split-thickness skin grafts for foot wounds. *J Am Podiatr Med Assoc* **103**: 223–32

DIABETES RESEARCH AND CLINICAL PRACTICE

LEA predictors based on kidney function

Readability	✓✓✓
Applicability to practice	✓✓✓
WOW! factor	✓✓✓

1 This retrospective study examined the risk factors for lower extremity amputation (LEA) in people being treated for diabetic foot ulcers (DFU) undergoing dialysis treatment (dialysis cohort; $n=97$) or not (non-dialysis cohort; $n=561$).

2 The major independent risk factors for LEA in the dialysis cohort were poor monophasic Doppler waveforms or the absence of flow at below-the-knee arteries.

3 The major independent predictors for LEA in the non-dialysis group were Wagner wound grades 4 or 5, reduced serum albumin levels and low ratios of ankle to brachial blood pressure.

Tsai CY, Chu SY, Wen YW et al (2013) The value of Doppler waveform analysis in predicting major lower extremity amputation among dialysis patients treated for diabetic foot ulcers. *Diabetes Res Clin Pract* **100**: 181–8

> *"The results suggest that for the optimum shoe design a 95º apex angle, an apex position of 60% of shoe length and a 20º rocker angle should be considered for individuals with low-risk diabetes."*