Clinical*DIGEST* 4

Lower limb complications

Bad to the bone: The problem with Charcot feet?



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turned 50 in June 2012 and, looking back over my career, I realise how fortunate I was to work with Profesor Andrew Boulton at Manchester Royal Infirmary (Young et al, 1995). At that time, regular meetings were held

between the diabetes foot research group and other disciplines to cross-fertilise research ideas.

There was a very successful collaboration with the Manchester bone group and working with Peter Selby, Consultant Physician and Honorary Senior Clinical Lecturer in Medicine at Manchester Royal Infirmary, led to some of the early work on bone density and Charcot feet and bisphosphonates, a type of drug that prevents the loss of bone mass (Selby et al, 1994).

The debate about bisphosphonates has still to be settled 18 years on. The problems with determining bone density in a changing Charcot situation with dissolution followed by consolidation make accurate bone measurements difficult.

As described by Greenhagen et al (2012; summarised alongside), people with diabetes have a lower bone density than individuals without diabetes. What is also clear is that peripheral bone density, particularly calcaneal bone density, as measured in this study, is crucial. More importantly, Greenhagen et al demonstrated that central bone density did not correlate directly with peripheral bone density. This has been reported previously but remains an important point. As the foot moves through the phases of the Charcot process the bone density at any particular moment will also vary. However, what this study reiterates is that if you are planning to intervene with surgery or other treatments, it is impossible to rely on central bone densities as a guide to the quality of the bone you are working with.

It is for this reason that the results reported by Carlo et al (2012; summarised below) are particularly impressive. They detail a 5-year follow up of tibio-calcaneal arthrodesis for people with diabetes and ankle Charcot. These are in an uncontrolled case series but ankle Charcot destruction carries a high risk of amputation and so their results, with 39 of 45 people able to walk independently 5 years after surgery, are remarkable. If such outcomes can be reproduced by others, they would significantly alter the prognosis for this most challenging of diabetes complications.

Young MJ, Marshall A, Adams JE et al (1995) Osteopenia, neurological dysfunction, and the development of Charcot neuroarthropathy. *Diabetes Care* 18: 34–8

J AM PODIATR MED ASSOC

Calcaneal and lumbar bone mineral density compared

Readability	<i>」 」 」 」 」 」</i>
Applicability to practice	<i>」 」 」 」 」 」</i>
WOW! factor	<i>」 」 」 」 」</i>

Diabetes is sometimes linked to debilitating bone and joint disorders that include Charcot's neuroathropathy (CN). In people with little protective sensation, diabetic CN can sometimes result from a comparatively minor trauma. This leads to damaging foot deformity, foot ulceration and premature death.

The aim of this study was to compare calcaneal and lumbar bone mineral density (BMD) in people with and without diabetes.

3 A group of 33 people took part in the study. Participants were categorised into three groups: controls, people with both diabetes and CN, and people with diabetes but not CN.

4 Bone density was compared from the onset of CN in people who have reached the unilateral, non-operative, reconstructive phase of the disease.

5 There were 15 individuals in the control group, 10 in the diabetes with CN group and eight in the diabetes without CN group. The calcaneal BMD of people with diabetes and CN was lower compared with the control group (P < 0.01), but was not notably lower than that of people with diabetes but not CN.

6 The authors concluded that peripheral BMD in people with diabetes and recontructive-stage CN is not reflected by lumbar BMD. They concluded that regional BMD and vitamin D levels should be evaluated when treating people with CN.

Greenhagen RM, Wukich DK, Jung RH et al. (2012) Peripheral and central bone mineral density in Charcot's neuroarthropathy compared in diabetic and nondiabetic populations. *J Am Podiatr Med Assoc* **102**: 213–22

J FOOT ANKLE SURG

Ankle arthrodesis outcomes for Charcot osteoarthropathy

 Readability
 ✓ ✓ ✓ ✓

 Applicability to practice
 ✓ ✓ ✓ ✓

 WOW! factor
 ✓ ✓ ✓ ✓

This observational study details the clinical outcomes of ankle arthrodesis in a group of people with diabetes who had undergone unilateral ankle arthrodesis for Charcot neuroarthropathic ankle deformity in order to avoid ulceration and bone infection.

2 Below-the-knee amputation is a common method of dealing with the Charcot osteoarthropathy with serious deformity that has resulted in osteomyelitis.

3 After a mean follow-up period of 5±2.85 years, 86.67% of individuals were able to walk independently using custom-made footwear with molded insoles.

Carlo MF, Caravaggi CM, Sganzaroli AB et al (2012) Long-term follow-up of tibiocalcaneal arthrodesis in diabetic patients with early chronic Charcot osteoarthropathy. *J Foot Ankle Surg* **51**: 408–11

Selby PL, Young MJ, Boulton AJ (1994) Bisphosphonates: a new treatment for diabetic Charcot neuroarthropathy? *Diabet Med* **11**: 28–31

66 Offloading

properties of custom-made footwear can be improved and maintained by using in-shoe plantar pressure analysis as a guide. ³³

J FOOT ANKLE RES

Shoe-length fit and diabetic peripheral neuropathy

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

Ill-fitting footwear is one of the identified mechanisms that can lead to the development of diabetic foot ulcers.

The study authors aimed to demonstrate whether appropriate length footwear is worn by people with diabetic sensory neuropathy.

DIABET MED

Value of custommade footwear for plantar ulceration

 Readability
 ✓ ✓ ✓ ✓

 Applicability to practice
 ✓ ✓ ✓ ✓ ✓

 WOW! factor
 ✓ ✓ ✓ ✓

The researchers assessed the effectiveness of using dynamic plantar pressure analysis to improve and maintain the offloading properties of custom-made footwear for people with diabetes.

J VAS SURG

Test characteristics of the ankle-brachial index in T1D

 Readability
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 Applicability to practice
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 WOW! factor
 ✓ ✓ ✓

The authors hypothesised that on X-ray imaging an ankle–brachial index (ABI) >1.30 and ankle–brachial difference (ABD) >75 mm Hg would have high specificity but low sensitivity for medial arterial calcification (MAC). **3** Internal shoe length and foot length was compared between a group of people with diabetes and peripheral neuropathy, and a control group.

While the mean difference between shoe and foot length was not notably different between the two study groups, a significant number of people in both groups had a shoe-to-foot length difference that was not within a 10–15 mm range (previously suggested as the required size gap).

5 The authors concluded that there is a need for standardisation when taking into account establishing criteria for good-fitting footwear.

McInnes AD, Hashmi F, Farndon LJ et al (2012) Comparison of shoe-length fit between people with and without diabetic peripheral neuropathy: a case-control study. *J Foot Ankle Res* **5**: 9

2 Data was collected on the plantar pressures in the footwear of a group of people with diabetes, neuropathy and a healed plantar foot ulcer (*n*=117).
3 Peak pressures lowered by 23% at the site of the healed ulcer. Reduced pressures were maintained or decreased further over time.

4 The authors concluded that the offloading properties of custommade footwear can be improved and maintained by using in-shoe plantar pressure analysis as a guide.

Waaijman R, Arts ML, Haspels R et al (2012) Pressure-reduction and preservation in custommade footwear of patients with diabetes and a history of plantar ulceration. *Diabet Med* 30 Apr [Epub ahead of print]

The study analysed the ABI and ABD of 185 people with T1D. X-ray MAC was observed in 97 participants: 15 had an ABI >1.30 and 14 had an ABD >75 mm Hg.

The authors found it probable that individuals with high ABI or ABD would have MAC on X-ray imaging, yet many with MAC would not have high measurements of ABI or ABD. Due to the high specificity, assessing high ABI or ABD could underestimate the prevalence of MAC.

Ix JH, Miller RG, Criqui MH (2012) Test characteristics of the ankle-brachial index and ankle-brachial difference for medial arterial calcification on X-ray in type 1 diabetes. *J Vas Surg* **56**: 721–7

J WOUND CARE

Efficacy of new wound dressing for diabetic foot ulcers

Readability	<i>」 」 」 」</i>
Applicability to practice	<i>」 」 」 」</i>
WOW! factor	<i>」 」 」 」 」</i>

The aim of the study was to assess how efficient a new wound dressing called UrgoStart Contact was in the management of neuropathic diabetic foot ulcers in people with type 1 or 2 diabetes.

The dressing, based on lipidocolloid technology (TLC), is formed of carboxymethylcellulose particles, which are spread in a petroleum jelly network and saturated with nanooligosaccharide factor (NOSF).

The excessive production of matrix metalloproteases (MMPs), along with the impaired condition of the tissue inhibitors of MMPs, has been highlighted as being a chief abnormality within the neuropathic diabetic foot ulcer.

The TLC-NOSF dressing was used on a group of 33 adults with type 1 or 2 diabetes, who had an uninfected, neuropathic foot ulcer (grade 1A [Texas classification]) measuring 1–15 cm² for a duration of 1–20 months.

5 The main goal of the study was to achieve a reduction in wound surface area, while the rate of healing and acceptability of the test dressing were also assessed.

G The wound mean surface area at was $2.7 \text{ cm}^2 \pm 2.4 \text{ cm}^2$ at baseline. After 12 weeks, the median surface area reduction was 82.7%, whilst the wounds of 10 of the 33 analysed individuals had healed.

The authors concluded that the healing of neuropathic diabetic foot ulcers could be encouraged by using UrgoStart Contact dressing alongside offloading and debridement.

Richard JL, Martini J, Bonello Faraill MM et al (2012) Management of diabetic foot ulcers with a TLC-NOSF wound dressing. *J Wound Care* **21**: 142–7