

Lower limb complications

These boots are made for (not) walking...



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This classic song from Nancy Sinatra encapsulates most of what is wrong with our attempts to heal the diabetic foot, at least according to two of this issue's papers on aspects of off-loading the diabetic foot ulcer.

Patients with neuropathic foot ulcers develop ulceration through a combination of insensitivity and pressure. This pressure is caused either by a single high pressure, such as a penetrating injury, or, more commonly, by recurrent minor trauma, otherwise known as walking. The exact mechanisms (perhaps repetitive ischaemia-reperfusion cycles) by which this causes ulceration are not entirely understood, but it is clear from observational evidence that patients who continue to walk on their ulcers do not achieve healing.

David Armstrong is among the latest of a number of largely US diabetic foot specialists who champion the total contact cast as the solution to our problems off-loading the diabetic foot. Armstrong's recent paper examines activity patterns in patients with diabetic foot ulceration who have been provided with removable cast walkers. Using pedometers on the patients, and on the removable cast walker itself, Armstrong et al compared the total number of steps taken with the number taken wearing the off-loading device.

Despite advice to rest, most patients still took a mean of more than 1200 steps a day, which appears to be a large number for a US population. Most importantly, more than two-thirds of these steps were taken with the cast walker removed, and therefore without any offloading of the foot ulcer. The researchers assert that non-removable casts would increase the wear time and therefore improve the healing rate of diabetic foot ulceration. This seems a reasonable view, but is still very hard to achieve in UK practice in most centres.

Matricali et al's paper on the outcome and recurrence of foot ulceration with total contact casting is perhaps more real world in its approach. It is a small study, with only 15 patients collected over a year, of whom only 12 were available for follow-up. However, the lessons are more widely applicable. Use of a total contact cast healed 11 of 14 ulcers in a mean of 8.5 weeks – curiously similar to my own department's results with only occasional use of casting. However, these are better than most published figures. The main problem was ulcer recurrence. Two-thirds of patients developed recurrent ulcers over 22 months follow-up, despite monthly visits. It is important to stress that these figures are not that unusual in many series, but they do highlight the point that healing an ulcer is not the end – it is efforts to keep a patient healed that may be the next big push in diabetic foot research.

DIABETES CARE



Off-loading devices worn for a minority of steps taken

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

- This study aimed to evaluate the activity of people with diabetic foot ulceration and their adherence to their pressure off-loading device.
- Twenty people who were being treated for neuropathic diabetic foot wounds were enrolled in the study; all were off-loaded using a removable cast walker (RCW).
- Total activity (measured in activity steps per day) was recorded on a waist-worn computerised accelerometer and subsequently correlated to activity recorded on an RCW-mounted accelerometer, which was not readily accessible to the patient.
- A mean of 1219.1 ± 821.2 activity units (steps) were taken per patient per day. Participants logged more daily activity units with the protective RCW off than on ($P=0.01$). Only 28% of daily activity was recorded while participants were wearing their RCW.

FOOT AND ANKLE INTERNATIONAL



TCC: good for healing but complications still occur

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

- This study examined healing and final outcome after total contact cast (TCC) treatment in people with diabetes.
- Over 22 months, 15 consecutive patients with a total of 17 ulcers were treated with a TCC and followed up for an average of 91 weeks.

- All ulcers healed, but there was a high frequency of recurrence and/or other complications.
- Only four of the 12 people who completed the study had no new ulcer problems.
- TCC was an efficient tool for healing neuropathic foot ulcers, but the recurrence rate and frequency of other complications remained high.
- Poor patient compliance was one of the main reasons for recurrences.
- It is extremely difficult to prescribe and manufacture reliable footwear, and to achieve reliable preventive general foot care.

Matricali GA, Deroo K, Dereymaeker G (2003) Outcome and recurrence rate of diabetic foot ulcers treated by a total contact cast: short-term follow-up. *Foot and Ankle International* **24**(9): 680–4

- Although 30% of participants recorded more daily activity units while wearing their RCW, this subset, who were the most adherent to their off-loading regimen, still only wore the device for a total of 60% of their total daily activity.
- People with diabetic foot ulceration wear their off-loading devices for a minority of steps taken each day. This could explain the poor results reported from trials of agents designed to help speed the healing of these wounds.

Armstrong DG, Lavery LA, Kimbriel HR, Nixon, BP, Boulton AJ (2003) Activity patterns of patients with diabetic foot ulceration: patients with active ulceration may not adhere to a standard pressure off-loading regimen. *Diabetes Care* **26**(9): 2595–7

‘Gadolinium-enhanced MR angiography can be used for first-line preoperative imaging in the management of lower limb ischaemia for people at high risk of complications after contrast angiography.’

JOURNAL OF VASCULAR AND INTERVENTIONAL RADIOLOGY

Gd-MRA as first-line preoperative imaging

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

1 This study assessed the clinical relevance of gadolinium-enhanced MR angiography (Gd-MRA) as first-line angiographic examination for planning lower limb revascularisation in people at high risk of complications after contrast angiography (CA).

2 A total of 45 people at high risk of post-CA complications had Gd-MRA as first-line angiography before an endovascular or surgical procedure for lower limb ischaemia.

3 Cumulative patency rates at 1 and 24 months were: 91% and 91% for suprainguinal bypass; 100% and 92% for infrainguinal above-knee bypass; 80% and 57% for below-knee bypass; and 92% and 76% for iliofemoral angioplasty.

4 After 2 years, limb salvage, amputation and mortality rates were 86%, 3.5% and 7% for stage II ischaemia, and 48%, 11% and 30% for stages III and IV.

5 Gd-MRA can be used for first-line preoperative imaging in the management of lower limb ischaemia for people at high risk.

Brillet PY, Vayssairat M, Tassart M et al (2003) Gadolinium-enhanced MR angiography as first-line preoperative imaging in high-risk patients with lower limb ischemia. *Journal of Vascular and Interventional Radiology* **14**(9 Pt 1): 1139–45

‘VAC dressings decreased wound depth and volume more effectively than moist gauze dressings over the first weeks of treatment.’

DIABETES CARE

High coordination equals low amputation

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

1 This cross-sectional descriptive study investigated the relationship between provider coordination and amputations in people with diabetes.

2 All providers of diabetes foot care at 10 medical centres, and a sample of primary care providers at each centre, were surveyed.

DIABETES CARE

Dalteparin improves the outcome of chronic foot ulcers

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

1 This prospective, double-blind, placebo-controlled trial investigated the effect of dalteparin on ulcer outcome in people with diabetes who had peripheral arterial occlusive disease and chronic foot ulcers.

2 A total of 87 patients were randomised to treatment with subcutaneous dalteparin 5000 units (44) or an equivalent volume of physiological saline (43) once a day until the ulcer had healed or for a maximum of 6 months.

3 A total of 29 patients healed with intact skin (14) or had a decreased ulcer area $\geq 50\%$ (15) in the dalteparin group, compared with 20 (9 and 11 respectively) in the placebo group.

4 Two patients in the dalteparin group compared with eight in the placebo group had amputations. Five patients in each group had impaired ulcer healing.

5 Dalteparin improves the outcome of chronic foot ulcers in people with diabetes and peripheral arterial occlusive disease.

Kalani M, Apelqvist J, Blombäck M et al (2003) Effect of dalteparin on healing of chronic foot ulcers in diabetic patients with peripheral arterial occlusive disease: a prospective, randomized, double-blind, placebo-controlled study. *Diabetes Care* **26**(9): 2575–80

3 The main outcome measures were the Foot Systems Assessment Tool (FootSAT), non-traumatic lower extremity amputation rates and investigators' ordinal ranking of site effectiveness based on site visits.

4 Scale scores for programming coordination and feedback associated with amputation rates.

5 The FootSAT was more strongly associated with amputation rates than were site visit rankings.

Wrobel JS, Charns MP, Diehr P et al (2003) The relationship between provider coordination and diabetes-related outcomes. *Diabetes Care* **26**(11): 3042–7

ANNALS OF VASCULAR SURGERY

VAC dressings may accelerate healing of large foot wounds

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

1 This study compared the rate of wound healing with the vacuum-assisted closure (VAC) device to conventional moist dressings in people with diabetes who had significant soft tissue defects of the foot.

2 Participants were randomised to receive either VAC treatments or moist gauze dressings. After 2 weeks' treatment, participants were treated with the alternative dressing for an additional 2 weeks.

3 Wounds were photographed each week and their dimensions calculated in a blinded fashion with spatial analysis software. Percentage changes in wound dimensions were calculated and compared.

4 Ten people were recruited to the study, but complete data were available for analysis on only 6 patients with a total of 7 wounds.

5 Wound depth alone decreased significantly over the trial period. VAC dressings decreased wound volume and depth significantly more than moist gauze dressings, and were associated with a decrease in all wound dimensions. Wound length and width increased with moist dressings.

6 VAC dressings decreased wound depth and volume more effectively than moist gauze dressings over the first weeks of treatment.

7 This could ultimately result in more rapid and complete wound healing, and prevention of wound complications often encountered in this patient group.

Eginton MT, Brown KR, Seabrook GR, Towne JB, Cambria RA (2003) A prospective randomised evaluation of negative-pressure wound dressings for diabetic foot wounds. *Annals of Vascular Surgery*. E-pub 13 October