

# Case report: a novel, dual-action treatment for diabetic foot ulcers

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## Article points

1. People with diabetic foot ulcers have complex care needs, especially if they work during treatment.
2. The maintenance of a care plan is challenging and patient concordance is vital.
3. New technological advances can optimise healing.

## Key words

- Diabetes
- Foot ulcer
- Intermittent plantar compression
- Offloading
- Patient concordance

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**This case report details the use of a novel dual action treatment for a diabetic foot ulcer that was used after there were issues with concordance with treatment options. The patient was reluctant to use offloading devices and was determined to return to work. By using the PulseFlowDF™ (PulseFlow Technologies), the patient was able to continue working without hindering the ulcer's healing process. The use of multimodal treatment options must be considered when treating diabetic foot ulcers and when confronting non-concordance as it can allow patients to remain mobile throughout their treatment, without hindering healing.**

Diabetes is a significant cause of lower-limb complications, including peripheral ischaemia, neuropathy and ulceration, resulting in hospital admissions, minor and major amputations (Humphrey et al, 1996; Shaper et al, 2012). There is a high mortality risk associated with foot ulceration and amputation (Young et al, 2008). A recent study by Walsh et al (2016) analysed data from 414,523 people with diabetes from this cohort of patients 20,737 developed a foot ulcer; of those patients that developed a new foot ulcer, 5% died within 12 months and 42.2% of patients with a foot ulcer had died after 5 years.

Traditional therapies for diabetic foot ulcers, such as offloading via a total contact cast, can interfere with patients' mobility, which can be difficult, especially if patients need to work during treatment. This case report highlights the positive effect of a sustainable, realistic care plan for treating a patient with a diabetic foot ulcer. It also highlights the value of new multimodal technologies.

## Case history

The patient was a 56-year-old man who had been diagnosed with type 1 diabetes at the age of 21. He worked as a self-employed builder. A non-smoker, he was drinking up to 15 units of alcohol a week and struggled to maintain good glycaemic control.

He had palpable pedal pulses and bilateral, dense, sensory neuropathy. A vascular evaluation indicated some calcification in the tibial arteries that did not require intervention. He had a 10-year history of foot ulceration that had led to his left hallux being amputated, but he had declined to wear hospital footwear after this.

In 2015, the patient developed an ulcer over the plantar aspect of the left third metatarsal head caused by a work-related puncture wound. After hospitalisation, antibiotics and surgical debridement, the ulcer began to improve slowly. He remained off work for more than six months, attending the foot clinic twice a week and also dressing the ulcer himself.

The patient could not tolerate any devices issued to offload the lesion; casts made his ankle uncomfortable and a walker boot was declined. He continued to wear his own trainers, elevated his foot when possible during the day and dressed his foot daily. He also continued to report high blood sugars and although there were no episodes of infection, the ulcer improved — but only very slowly (*Figure 1*).

The patient had been off work for so long that he was living off his savings and he was desperate to return to work so a newly available treatment modality was considered. PulseFlowDF (PulseFlow Technologies) is a dual-action medical device consisting of a pair of anatomically correct left and



Figure 1. Ulcer before pulse boot was issued.



Figure 2. Pulse boot with contralateral shoe.

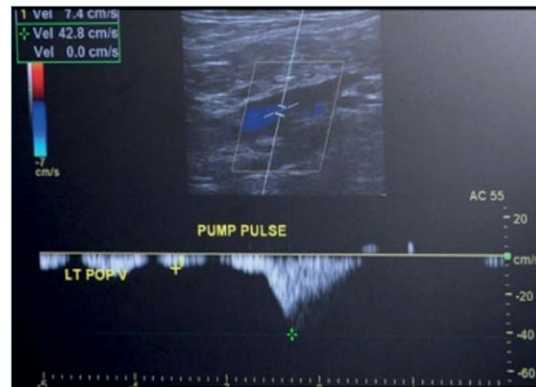


Figure 3. Effect of intermittent plantar compression.



Figure 4. Ulcer when the device was issued.



Figure 5. Ulcer after two weeks of using the device.



Figure 6. Ulcer after five weeks of using the device.

right footwear with an offloading mechanism and intermittent plantar compression (IPC) system fitted to the ulcerated side (Figure 2).

The device's offloader acts to reduce shear and impact pressures, promote a normal gait pattern and maintains gait velocity. Its IPC system includes a bladder located in the footwear insole beneath the plantar arch, which inflates 160mmHg for one second

every 20 seconds. This increases the volume and velocity of peripheral blood flow, which can be seen on ultrasound examination (Figure 3), reducing ulcer maceration and aiding healing (Kavros et al, 2008, Mohamed and Bahey El-Deen 2015).

Traditional treatment methods, where just one boot or cast is fitted to the patient's ulcerated side, create an unbalanced gait pattern and an obvious leg length issue, risking an increase in pressure on the untreated side and negative effects further up the kinetic chain. PulseFlowDF's paired footwear addresses these concerns.

The PulseFlowDF concept was explained to the patient and he was given instructions as to how to use it. He agreed to use the device, dress his foot and attend follow-up appointments, and was scheduled to return to clinic the following week for it to be fitted. During this period, the patient had returned to work without the clinical team's knowledge and when he presented at the fitting appointment, the ulcer had significantly deteriorated (Figure 4). He started a course of oral antibiotics, but declined to be admitted

as he could not take any more time off work due to his financial circumstances. However, he was happy to continue with the care plan as agreed the previous week. The PulseFlowDF device was issued and the patient was instructed to use it in the evenings and at weekends, and to continue with his foam dressings.

The patient complied with the care plan and the wound improved after one week. He continued to work as a carpenter/builder and used PulseFlowDF in the evenings and some weekends. The home dressings and weekly outpatient podiatry appointments remained the same and the lesion continued to improve (*Figures 5 and 6*). Maintenance of the device was straightforward, requiring only overnight charging.

### Conclusion

PulseFlowDF provided a relatively simple treatment modality that the patient found acceptable. Although the treatment did not cause significant disruption to

his home or work routine, his concordance — as with previous therapies — was not 100%. Despite this, and the fact that he continued working in a physically demanding environment, PulseFlowDF still had a positive effect on the ulcer. ■

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