On average the authors treat 100 patients per year for diabetic foot ulcers at their clinic. Common challenges faced include ischemia, osteomyelitis and infections. Treating this type of wound is usually a time-consuming and expensive process, in which the prevention of further degradation of the wound, which might lead to amputations, is of primary concern. Unfortunately, amputation can sometimes not be prevented, and (due to the presence of diabetes) postoperative wound healing still poses the same challenges as pre-operative treatment. This report describes such a case.

Case report
This 48-year-old male patient had been diagnosed with type 1 diabetes at the age of 21. He had sensitive, motor and autonomic diabetic neuropathy. On December 9, 2009 he underwent a transmetatarsal amputation of the right foot due to necrosis of the toes.

The patient uses insulin glargine and lispro to control his diabetes, and pentoxifylline to improve blood flow through peripheral blood vessels. Nifedipine and valsartan are used for his hypertension and rosuvastatine for cholesterol levels.

A resection of the fifth metatarsal bone of the right foot took place on April 14, 2010, as after the transmetatarsal amputation wound healing was very slow. The resection left the bone exposed as well as a surgical wound on the lateral side of the right foot (10x4x3cm). The surgeon decided to leave this to heal by secondary intention (Figure 1).

Odour was not a significant consideration at this time.

Method/treatment
The authors considered negative pressure wound therapy (NPWT) — a standard protocol with venous insufficiency — as well as alginate and absorbent dressings as a treatment regimen. However, NPWT is complicated in patients with more complex underlying neuropathy, as too much pressure can be applied with damaging consequences. In addition, the other dressings were costly and, in the authors’ opinion, would not, promote the necessary patient compliance and efficacy.

On 28 April, 2010 the authors introduced a honey-based gel (L-Mesitran® Soft, Triticum, NL), which was applied twice-weekly (Figure 2). Being a gel that is applied as a thin
layer on the wound surface, it would not be invasive. Furthermore, the authors had seen the results that the product could achieve and wanted to evaluate it in their own practice.

The sutures were left in place by the surgeon to achieve primary closure of the wound. However, after 48 hours they were removed without being used, as it was thought that this posed less risk of (extra) tissue damage, tissue necrosis and abscess formation.

After impregnation with honey gel, the wound was covered with an absorbent charcoal dressing as malodour had developed which needed to be controlled.

Due to diabetic neuropathy, the patient did not complain of any pain, nor was he uncomfortable during dressing changes.

Results
The wound produced small amounts of exudate, which were absorbed by the secondary dressing. Within 16 days since the start of treatment, the wound had reduced in size and granulation tissue was observed (Figure 3). Thereafter, the wound continued to progress to healing, and became superficial (Figure 4) with firm edges. The wound had completely healed by 1 July 2010 (Figure 5), two months after the start of the honey therapy.

Glycaemia evaluation was performed by the patient three times a day. His glycaemic level ranged from 90mg/dl to 250mg/dl and his HgA1C was 6.4%, all within acceptable parameters. Thus, the honey dressing did not influence the patient’s glycaemic levels and no adverse events were reported or antibiotics used.

Discussion
Large epidemiologic studies indicate that the incidence of type 1 diabetes
mellitus has been increasing by 2–5% worldwide, and that its prevalence is approximately one in 300 in the United States by 18 years of age (Maahs, 2010). The total number of people with diabetes worldwide is projected to rise from 171 million in 2000 to 366 million in 2030 (Wild, 2004).

This situation places a considerable (economic) burden on society and on individual patients in particular. Compared with diabetic patients without foot ulcers, the cost of care for patients with a foot ulcer is 5.4 times higher in the year after the first ulcer episode, and 2.8 times higher in the second year (Driver et al, 2010).

Patients with diabetic foot ulcers require more frequent emergency department visits, are more commonly admitted to hospital, and require longer length stays. However, implementation of a multidisciplinary team approach to manage diabetic foot ulcers — involving vascular and podiatric surgeons, diabetologists, tissue viability nurses, interventional radiologists and radiology coordinators — has been reported to reduce long-term amputation rates from 82% to 62% (Driver, 2010; Mehta, 2010).

In this case, the patient had already undergone amputation of all the toes on his right foot. As he was a high-risk patient this could not be avoided, despite efforts to treat the necrosis as a result of sudden infection with debridement. Delayed wound healing occurred after amputation, leading to the final amputation of the last metatarsal toe.

In a study by Moghazy (2010), 30 infected diabetic foot wounds were randomly selected, and honey dressings were applied for three months until healing, grafting or failure of treatment. Complete healing was significantly achieved in 43.3% of ulcers. Significantly, a decrease in size and healthy granulation was observed in another 43.3% of patients. The bacterial load of all ulcers was reduced after the first week of applying the honey dressing. Failure of treatment was observed in only 6.7% of ulcers.

### Key points

- Honey-based products can play a vital role in the management of diabetic foot ulcers. In this case, the deep postoperative wound healed in two months, without adverse events.
- Honey-based products can possibly prevent amputation in patients with diabetes.
- Honey-based products promote patient compliance.

### References