Larvae – a key member of the multidisciplinary foot team?

I Yates, M Fox, M Crewdson, AB Woodyer

ARTICLE POINTS

1 Patients with deep to bone, infected ulcers are at high risk of amputation.

2 Such patients are often managed by a hospital-based multi-disciplinary team (MDT) to achieve best outcomes.

3 In this case, the patient rejected hospital-based care, so was offered an alternative, community-based, MDT plan.

4 This plan still involved the use of specialist input and therapies, e.g. larvae and Scotchcast boot.

5 The positive outcome achieved was thought to be due to a patient-centred approach by the MDT, delivered mainly in community settings.

KEY WORDS
- **Wound management**
- **Amputation**
- **Larvae**
- **Antibiotic therapy**
- **Offloading**

I Yates is a Clinical Nurse Specialist, M Fox is a Community Diabetes Podiatrist, M Crewdson is a Staff Nurse, AB Woodyer is a Consultant Vascular Surgeon, Tameside & Glossop PCT & Vascular Clinic, Tameside General Hospital, Lancashire

Introduction

We describe the use of a variety of wound management strategies to prevent amputation, optimise wound healing and improve the quality of life of a patient with diabetic foot infection. Wound classification at the outset of the study would have predicted amputation, however, the outcome was healing with no amputation other than local removal of destroyed bone. The treatment plan incorporated multiskilled teamworking, use of advanced wound care products (larvae) and offloading excess pressure from the ulcer site during daily activity. Together with negotiated empowerment of the patient, this resulted in a positive outcome.

Neuroischaemic diabetic foot ulcers in patients with a history of non-adherence to clinical plans are notoriously difficult to heal. We describe a patient in whom a variety of wound management strategies were employed to prevent amputation, optimise wound healing and improve quality of life.

Case study

Mrs A presented at the vascular clinic of the local district general hospital as a fast-track referral from the podiatrist at the diabetes centre where she had attended that morning. She had missed a number of appointments at both the diabetes centre and podiatry clinic due to family problems. Her husband had recently died after a long illness for which she had provided the main care. She was at that point feeling very low, depressed and admitted neglecting both her diabetes control and her feet. Her alcohol consumption was very high. Mrs A had previously been identified and made aware of having a high-risk foot status due to neuroischaemic changes and bony deformity, by the podiatry clinic. On examination, the left leg was oedematous, red and hot. The left foot was ulcerated over the plantar medial aspect of the hallux, extending proximally over the 1st metatarsal shaft (*Figure 1*). There was another ulcer on the lateral border of the same foot over the 5th metatarsal phalangeal joint. The ulcers were deep to bone, sloughy and malodourous. The popliteal pulse was palpable, but foot pulses were not. The ankle brachial pressure index was 0.53. Using the

Figure 1. Initial presentation

University of Texas ulcer classification system (Armstrong et al, 1998) this wound would be classified as a DIII, predicting a high potential for amputation.

Mrs A had a low perception of pain in the foot and 10g monofilament could not be perceived. She had a history of recurrent ulceration on the same site over the last 2 years. Prior to the vascular clinic assessment appointment, Mrs A had received antibiotic therapy of metronidazole (400 mg three times a day) and clindamycin (300 mg three times a day) in response to the clinical assessment and microbiological report identifying the growth of methicillin resistant *Staph aureus* (MRSA). The patient had not accepted adequate protective footwear up to this point, although this therapy had been repeatedly discussed and offered.

Mrs A was reviewed by the vascular consultant, who at that time felt that arterial reconstruction was not indicated. Forefoot amputation was discussed, but was emphatically rejected by the patient. Mrs A was generally agitated and anxious. She was insistent about going home as soon as possible.

Three part treatment plan

Mrs A was then offered a three part plan in an attempt to prevent amputation becoming

Figure 2. Foot prior to first application of larvae

Figure 3. Foot prior to first application of larvae

Figure 4. Foot after removal of larvae

Figure 5. Foot after removal of larvae

Figure 6. Foot prior to second application of larvae

a medical necessity:

- Agreement to accept multidisciplinary wound care in the hospital and her own home
- Larval therapy
- Offloading the foot in a Scotchcast boot

Mrs A accepted the plan and it was commenced. Oral antibiotic therapy was prescribed at various points during the treatment plan, but was not taken as she complained it made her feel too ill.

Larval therapy was offered in an attempt to deslough, promote granulation tissue and minimise local clinical infection (Sherman, 2003; Thomas et al, 1999). Mrs A agreed to have this treatment and arrangements were made to carry out the application at home with the help of district nurses. *Figures 2 and 3* show the ulcer sites just prior to the first application of larvae.

Larval treatment

Two pots of sterile larvae (Biological Research Unit, Bridgend, South Wales) were applied between both wounds. Loose larvae were selected to access all areas of the wound (Thomas, 1999b).

The toes and surrounding skin were protected with Viscopaste (Smith and Nephew) bandage strips, and the net bag secured to Granuflex (Convatec), which encircled the mid foot. The foot was then covered with Tubiton 78 (Seton Healthcare) and Soffban Natural (Smith & Nephew) wool bandage and further layers of Tubiton.

The specialist nurse recommended that the outer dressing be changed regularly if it became too wet from increased levels of exudate due to larval secretions liqueifying the necrotic tissue (Thomas et al, 1996). The patient agreed to have the help of district nurses to change the outer dressings. A Darco postoperative sandal was fitted over the dressings. The importance of treating the foot gently and resting was emphasised to Mrs A.

When the larvae were removed 4 days later in the patient's home, they had increased in size, to reveal more moist but still sloughy wound beds with some necrosis of the right hallux (*Figures 4 and 5*).

A further supply of larvae were ordered and the specialist nurse decided to use Mesalt (Molnlycke) dressings over the interim period. Mesalt is a highly absorbent sodium chloride impregnated viscose/polyester dressing for the management of exuding wounds. This dressing was selected to maintain an optimum moist environment that would continue to deslough the wound with the minimum secondary dressings in place. Mrs A was advised to rest as much as possible. *Figure 6* shows the wound just prior to the second application of larvae, at which point soft loose slough covered the wound bed and the halllux was necrotic at the apex.

The second application of larvae was applied using the same technique 4 days later in Mrs A's home, with the district nurses present. These were removed in the vascular clinic by specialist nurses (*Figures 7 and 8*).

The wound was now much cleaner and most of the slough had gone (*Figure 9*). Red granulation tissue was evident with free bleeding over most of the wound bed.

There was a noticeable reduction in wound odour following the use of the larvae. The 1st metatarsal bone and proximal phalanx of the hallux were protruding from the ulcer bed, which was now free from necrotic tissue. Both bones were fragmented. The podiatrist, using a scalpel and forceps, removed loose pieces of bone from the ulcer site, over a number of review appointments.

Wound care and quality of life

Following the use of larvae, the wound bed appeared to be stimulated to promote healthy granulation. This was noted over the following weeks, with the use of conventional dressings and has been observed with other patients managed with larvae therapy within the trust. The wounds were subsequently dressed with Aquacel (Convatec) to maintain a moist environment that would continue to promote granulation whilst absorbing excessive wound exudate. It is a dressing that generally remains in place; an important issue in diabetic foot wounds.

Mrs A was then fitted with a Scotchcast boot by the podiatrist to facilitate limited daily mobility as she felt depressed and frustrated at not being able to walk. She agreed to wear this at all times. A motivating factor was that she planned to go on her first holiday abroad for many years in a couple of months time. We cautioned her that this would only be advisable if the wounds continued to improve.

Now that the larvae had significantly

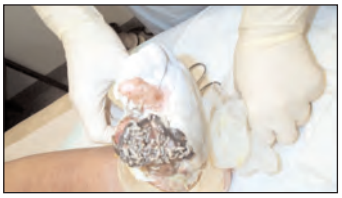

Figure 7. Larvae prior to removal

Figure 8. Larvae prior to removal

Figure 9. Foot after removal of second batch of larvae

Figure 10. Patient wearing her Scotchcast boot

improved the wound state, offloading was considered necessary for further healing. Mrs A wore the Scotchcast boot daily for the next 2 months, and the Darco sandal for driving as she became more independent (*Figure 10*).

The Scotchcast boot was re-lined 8 weeks later, before Mrs A's holiday. The wound had continued to heal well with healthy granulation tissue and epithelialsation occurring at the wound margins. The wound was now superficial with no bone in the base (Texas class, CI). The hallux having lost the proximal phalanx was now non-functional, but causing no clinical problem (*Figure 11*).

Mrs A had a successful holiday with no deterioration of the wounds during which she used the Scotchcast boot and Darco sandal. She continued to use them until full healing occurred. The wounds continued to heal with no adverse events under the care of the diabetes centre, vascular clinic, podiatrists and district nurses. Mrs A is aware of the high risk of further ulceration and now wears suitable specialist footwear. She has had no further significant foot ulceration in the following 12 months (*Figure 12*).

Discussion

The issues presenting with this patient were multifactorial, including both medical and psychosocial elements. Hospital-based multidisciplinary management as described in the literature (Thomson et al, 1991) would have been the plan of choice, but was rejected by the patient. Therefore under the direction of the vascular consultant, a combination of hospital and community based care was negotiated, which involved treatment with larvae and Scotchcast boots being facilitated and monitored off the hospital site. This was a more realistic plan that was acceptable to the patient.

Wound and infection control

Prolonged use of antibiotics is widely accepted as an essential part of a treatment plan, for infected, deep to bone foot ulcers, but these were again rejected by the patient. Therefore, once cellulitis had been controlled with short-term antibiotics, the larvae were used partly for their bactericidal action and action against MRSA (Thomas et al, 1999; Courteney M, 1999). We also wanted to use larvae as a therapy that would give a rapid change in visual appearance of the ulcer (from sloughy base to clean base) in order to demonstrate to the patient that there was some potential for salvage of a very critical foot problem. The use of larvae directly preceded a turning point in the patient's adherence. She only accepted this plan because we agreed to apply the larvae in her own home as part of a nursing visit.

Further research is required into the effect of larval stimulation on granulation tissue. Our experience has been similar to other reports (Sherman et al, 2000). Currently, as larvae are not available on prescription, funding has to be negotiated via general practitioner/primary care trust or via consultant-led funding, as was the case with Mrs A.

The rapid local improvement in the ulcer state, particularly after the second application of larvae (*Figures 2 and 3 – Figures 4 and 5*) seemed to influence the patient's motivation to work with us on the other key issues of effectively offloading of the foot and attending further appointments.

Offloading

Although the most effective method of offloading diabetic foot ulcers is the total contact cast, it is not suitable for infected, neuroischaemic ulceration (Armstrong et al, 2001; Mueller et al, 1989). The Scotchcast boot has been advocated for this type of foot ulcer (Knowles et al, 2002; Jones, 1991). The Scotchcast boot in this case was used by the patient during most of her daily activity, but was supplemented with a Darco postoperative sandal for driving.

Although effective offloading is recommended at all times during weight-bearing to facilitate healing, some patients find this impossible. We find that when we negotiate a compromised offloading plan, which takes into account the patient's essential lifestyle requirements, they are more likely to adhere to this and positive outcomes are often achieved.

Patient centred plan

As part of the ongoing strategy for the best outcome, most of the treatment plan was carried out in the community setting, in the patient's own home. Due to the fact that the patient had previously missed appointments,

Figure 11. Ulcer is shallow and granulating before patient's holiday

Figure 12. Ulcer now fully healed

further hospital appointments were kept to a minimum and their specific purpose explained carefully. This plan relied on involvement of the district nurses who were closely linked to the vascular team, to feedback any adverse developments. We set agreements with Mrs A on issues of wound care, infection control and offloading, giving her an active role in the treatment plan, which seemed to further aid with motivation. The use of giving active roles to patients with non-healing foot ulcers is not well established in the literature, but has some support in recent journal reports focusing on similar problems in leprosy patients with chronic foot ulcers (Cross and Newcombe, 2001; Benbow and Tamiru, 2001). ■

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